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Examining Gender

Gender and Achievement in the Junior and Leaving Certificate Examinations 2000/2001

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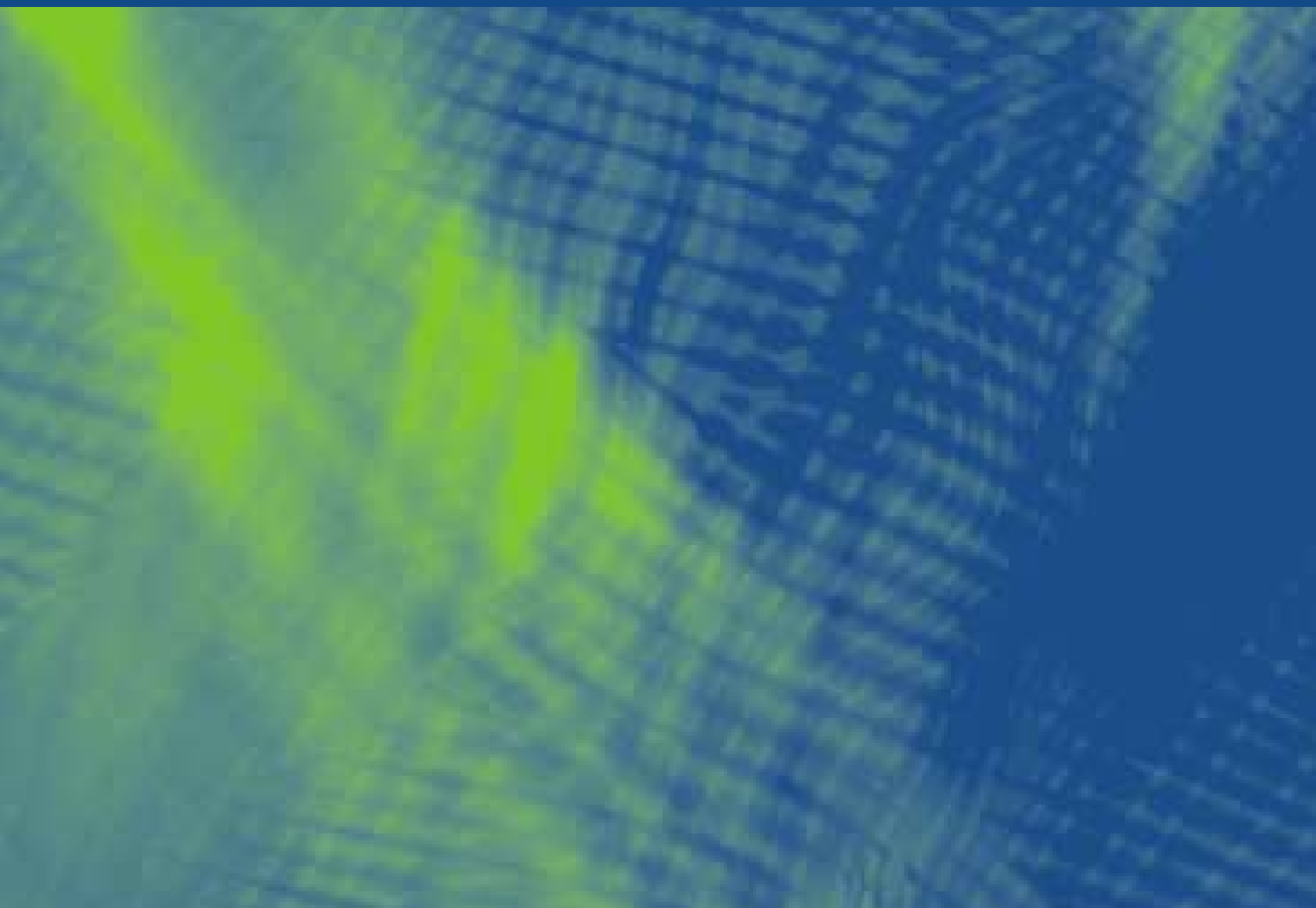

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Research conducted on behalf of the National Council for Curriculum and Assessment

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The findings and recommendations in this report are those of the authors. It should not be implied that the NCCA recommends, endorses or approves any of the views expressed therein.

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Contents

APPENDICES Appendices to this report, containing graphs, statistical charts and electronic versions of the relevant Junior Certificate and Leaving Certificate examination papers, are available on CD-ROM. For further details contact NCCA.

SECTION 1

Introduction

Introduction

Context

This report is the product of a six-month study, on behalf of the National Council for Curriculum and Assessment (NCCA) and funded by the Gender Equality Unit of the Department of Education and Science (DES), to investigate differential performance by gender and achievement in the Junior Certificate and Leaving Certificate examinations in 2000 and 2001. The research took as its main focus the contribution that examinations systems and assessment techniques make to gender-related differences in examinations. Such a focus in investigating the question under discussion is the first of its kind in Ireland but is based on extensive research into gender and examination performance in other educational systems, notably the UK, which found that examination systems and assessment techniques have a considerable role to play, creating the patterns of achievements we observe between boys and girls in school. The present research acknowledges, however, that the examination systems and assessment techniques used in the Junior Certificate (JCE) and Leaving Certificate (LCE) examinations are only one of a set of many factors that can influence achievement amongst boys and girls in these two important phases of schooling. However, by looking at the 'whole' examination system, the syllabuses, examination papers and the structures of the examination (i.e. different levels of entry), a new

dimension to the debate on boys' and girls' achievement is introduced and provides further evidence on which to base our understandings as to why the gender gap in performance in these significant examinations continues to occur.

Aims

In investigating the results of the 2000 and 2001 certificate examinations by gender and achievement, the study aimed to

- provide a comprehensive and authoritative review of the most relevant and up-to-date research on gender and achievement in public examinations and tests. It indicates the broad performance trends between boys and girls across the two years under investigation and indicates how these patterns are typical of those in other developed countries with similar examination systems, especially the UK

- analyse the 2000 and 2001 Certificate examination results to identify the extent of the gender gap. This analysis considered not only performance patterns but also general entry patterns of boys and girls in the two examination systems as well as differential entry gaps across the levels of entry at each of the two phases of examining. It used English, mathematics and physics (science at Junior Certificate) to illustrate some of the issues further

- position the gender gap in an international context and review explanations that have been put forward for such trends in the achievements of boys and girls, focusing on research-based studies and more general social commentary

- indicate possible directions for further research which will be of benefit to NCCA/DES in their role as the developers of the certificate examinations in Ireland and to schools, teachers and students throughout the country who take part in the JCE and the LCE.

RESEARCH APPROACH

In presenting the findings of the research, this report takes a broad approach to the issues that have emerged. The introduction (section 1) is followed by five further sections: section 2 places the research in the context of other research in this field, from both a national and international perspective; section 3 presents the broad patterns in differential achievement in the certificate examinations in 2000 and 2001; section 4 presents the review of the examination syllabuses and papers in English, mathematics and physics/science at both junior cycle and senior cycle levels; section 5 discusses the patterns of performance found in the LCE and JCE in relation to gender differences in performance in other jurisdictions; and section 6 concludes the report and presents areas for further research which are based on the findings of the study and reflections on the work carried out.

SECTION 2

Background

Background

GENDER DIFFERENCES IN EXAMINATION PERFORMANCE

Gender related differences in examination and test performance, and particularly gender differences in achievement, annually generate much attention and debate. The media coverage of such outcomes, seen in response to the 2000 and 2001 certificate examination results in the Republic of Ireland, parallels similar coverage of examination and test results in the UK, Australia, New Zealand, USA and, increasingly, other countries across Europe. In many of these countries, the interest in comparative performances of boys and girls covers the whole spectrum of education. For example, in England, interest in gender differences in performance ranges from the outcomes in national curriculum tests for 7 year olds to the variations in male and female success rates at university degree level (Arnot, Gray, James and Rudduck, 1998; Elwood, 1995, Gallagher, 1997).

The perceived underachievement of boys is another particular recent concern, common to many education systems. This concern is voiced particularly about the underachievement of boys at the end of compulsory schooling. In the UK, for example, media coverage of General Certificate of Secondary Education (GCSE) results and the publication of school league tables have made much of these

concerns (Bright 1998; Lepowska, 1998). Furthermore, the ex-chief inspector of schools in England regarded the underachievement of boys as: 'one of the most disturbing problems [faced] within the whole education system' (Woodhead, 1996).

Indeed, the recent longitudinal research carried out for the NCCA into those candidates who took the Junior Certificate examination in 1994 and who subsequently took the Leaving Certificate examination in 1996 and 1997 (Millar, Farrell and Kellaghan, 1998; Millar and Kelly, 1999), identified gendered patterns in performance which tend to mirror those patterns outlined above. This research showed that a difference occurred in mean overall performance scores between boys and girls at both the Junior Certificate examination (JCE) and the Leaving Certificate examination (LCE). At both examination stages, proportionally more boys achieved lower overall performance scores than girls and there is a: 'tendency for boys to be over-represented in the group of students receiving low grades' (Millar and Kelly, 1999, p.xx). Thus: 'boys clearly underachieve more often than girls' (Millar, Farrell and Kellaghan, 1998, p. xxxi).

More generally, we seem to be witnessing a sense of 'moral panic' about the underachievement of boys and their lack of opportunity to do well (Pyke, 1996). However, girls are still being 'blamed' in some way for the failure of boys: critics have suggested that the legacy of equal opportunities policies to enhance equality of access and resources has benefited girls more than 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; Francis, 2000). However, we have yet to fully understand the impact of such perspectives on the achievement of both boys and

girls. What is clear is that the deficit models of equal opportunity which 'blame' any one group are counter-productive in providing a better educational experience for all.

This sense of moral panic that is portrayed in the media, and the inaccessibility of some academic research, has, therefore, led to conflicting messages reaching teachers, students, management bodies, policy makers, parents and the Department of Education and Science. One such conflicting message is that it is all boys who are underachieving and all girls who are overachieving. However, the situation is far more complex and raises important and critical questions: which boys and indeed, which girls, are over/underachieving; at what stage of education and according to which criteria are they being presumed to under/over achieve; how do issues of class and 'race' interact with gender to contribute to variations in achievement? Thus, the story is much more complex than is reported in the press. Factors such as: male and female experiences of the curriculum and classroom cultures; their opportunities to learn and show their leaning to good effect; the provision, allocation and choice of subject, and the wider social arena in which they operate, must all bear upon the performance differences observed.

This study attempts to present the more complex issues that are 'hidden' behind the general examination statistics. It starts from a position of acknowledging that, at some of the most important stages of schooling in Ireland and elsewhere, the performance patterns of girls and boys are changing; that the old stereotypes no longer hold firm, and that what we are looking at are new complexities in performance that demand more detailed analysis and understanding.

Gender and examinations research

Recently in the UK there have been major research studies that have had the social impact of testing and assessment at their core, and particularly the impact of such assessment and examining techniques on gender differences in performance (Stobart, White, Elwood, Hayden and Mason, 1992; Elwood and Comber 1996). These studies were concerned with differential performance in the General Certificate in Secondary Education (GCSE) mathematics and English, and gender differences in GCE A level examinations. What made both these studies unique was the exploration of the role of examination techniques in creating gendered differences in performance. The critical focus of both these studies was the investigation of the ways that public examinations shape the experiences of students, their perceptions of subjects and the ways in which their understanding is assessed, and how these factors then contribute to the differences observed. The difficult task in understanding gender differences in examinations is: 'how much of the problem resides in the pupils' perceptions and outside experiences and how much in the structure and assessment of subjects' (Stobart, Elwood and Quinlan, 1992, p 262).

The above research (Stobart et al, 1992b; Elwood and Comber, 1996) identified several factors in the design of examination systems and the assessment techniques used that contribute significantly to gender differences in performance. Two of these factors, tiered entry systems and styles of examining, are of particular interest to this study. Tiered entry systems are similar to the system of levels of entry used in Ireland. In parallel with the use of foundation, ordinary and higher levels of entry in the JCE and LCE, the UK examinations, especially at GCSE, are structured into three different levels of entry,

foundation, intermediate and higher. The common term used in the UK for this structure of examining is 'tiering'. Tiered entry systems are considered below, along with other assessment structures and techniques in relation to our understanding of the contribution they make to the gender-related differences in examinations.

The following sections are concerned with those areas of the literature that concentrate on how the various assessment techniques and structures within public examinations may contribute to gender differences in performance. The various aspects of examinations and assessments which are reviewed here 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 styles of examinations; the use of 'real life' contexts in which examination and assessment tasks are set, and the sampling of subject content for examination papers. The research evidence has been brought together here to illustrate 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

The work on different response modes was predominantly carried out in the 1970s and 1980s. There has been little significant work carried out on response modes and their influence on gender and performance since then (Elwood, 1998). However, what the earlier work on different response modes has shown is that the mode of response chosen will have a critical influence in the relative performance of various groups of students (Harding, 1979; Murphy, 1979, 1980, 1982; Wood, 1976, 1978).

The 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 work 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 the greater maturity of girls. 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 study in relation to the groupings within subjects, especially at Leaving Certificate level.

More recent research has focused on whether contextual variables in objective test items have an effect on the differential responses of students 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 suggest 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 suggests 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.

Beller and Ganfi (1996) suggest that the *difficulty* of the item actually overrides any gender effect due to the format of the item. They 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). They go on to conclude that item format per se cannot account for gender differences in test performance. A relationship exists between item difficulty and gender effect regardless of item format.

Coursework

There is a widespread perception that coursework, or school based assessed work, as part of public examinations generally benefits pupils. However, there is also the perception that it is the girls who gain from it most (Elwood, 1999). Stobart et al (1992b) and Elwood (1999a) investigated further whether coursework may account for much of the advantage that girls demonstrate over boys in examinations at the age of 16 in the UK. Evidence from this work suggests that when the proportion of coursework within the syllabus was substantial (e.g. 50% or more) it played only a minimal role in explaining patterns of gender-related performance. This research also suggested 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 the subject grades of students. Both Stobart et al (1992b) and Elwood (1999a) argue that any continued claims, therefore, that the success of girls in examination at the age of 16 in the UK is due to their better performance in coursework components would perhaps seem misplaced.

Tiered levels of examination entry

As with the different levels of entry in the JCE and LCE, national tests for 11 and 14 year olds and examination syllabuses for 16 year olds in the UK are structured into two or three different levels of entry (commonly know as tiers of entry). However, unlike the model of differentiation used in Ireland, the different levels of entry used in UK examinations have restricted sets of grades associated with them. For example, the two tier model, used in the majority of subjects including English and science, has a foundation tier (grades C-G) and a higher tier (grades A*-D). The three-tier model, used in mathematics, has a foundation tier (grades D-G), an intermediate tier (grades B-E), and a higher tier (grades A*-C). Students are only permitted to enter for one tier at any one sitting of the examination and any candidate not achieving the lowest restricted grade on any tier is unclassified.

Proponents of tiered entry schemes suggest that tiering actually increases the reliability of the assessment, with little or no adverse impact on validity (William, 1995). They also claim that it is a more efficient use of the assessment time, as students are only asked those

questions which are likely to tell us something useful about what they know and understand. However, entry decisions are based on a teacher's knowledge of the student and it is the judgment of the teacher, as well as the performance of the student, that determines the range of grades available (Wiliam, op. cit.).

Research found that the use of tiered levels of entry in the UK's GCSE examinations significantly interacts with gender in ways that differentially affect the range of grades available to boys and to girls (Stobart et al, 1992b; Elwood and Murphy, 2002). For example, in UK examinations that use the three tier model (mainly GCSE mathematics), more boys than girls are entered for the foundation tier with a maximum grade D, more girls are entered for the intermediate tier with its maximum grade B, and more boys are entered for the higher tier and obtain more A★ grades than do girls. Disaffection amongst students (notably boys) seemed to be increased in the foundation tier by the restricted grade ranges available, which led to more disaffected male students not being entered for the examination at all. The intermediate tier acted as a safety net where less confident students (notably girls) could be entered if they were anxious about failure and being unclassified on the day if they did not perform well. However, entry to this tier prevented students taking the subjects further to advanced study as often schools required grades from the higher tier to study a subject at advanced level. More confident students (notably boys) were entered for the higher tier and performed well. Entry for the higher tier was seen to improve motivation and so enhance performance.

Such differentiated schemes of entry were also found to interact significantly with teachers' stereotyped perceptions of male and female achievements to the extent that opportunities for success tend to be limited in different ways for boys and for girls. The decisions teachers made about which tier to enter students seemed to be based on affective factors (e.g. attitudes to the subject, perceived ability, confidence or anxiety within subjects) as well as cognitive factors, and thus served to limit the achievements of some boys and some girls unintentionally. Thus, even before students sit the examination, decisions are made that determine inequality of opportunity.

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 mathematics classes (which are synonymous with higher tier entry) are speed, pressure and competition; 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. The awareness of girls 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.

The evidence suggests that differentiated entry schemes interact significantly with teachers' perceptions of the ability of the students and what they are capable of achieving. 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 maintain a lower status route into which many boys and girls are consigned. It is suggested in this study that the different

levels of entry associated with JCE and LCE may well be operating in a similar fashion to that used in the UK and impacting negatively on opportunities to achieve.

Styles of examining

Research into gender differences in performance in UK examinations at the ages of 16 and 18 (Elwood and Comber, 1996; Murphy and Elwood, 1998) identified a connection between the ways in which examinations are structured and assessed and gendered preferences for ways of working, knowing and communicating (Gilligan, 1982). Evidence from the UK research suggests that the ways in which achievement is defined through examinations and the style of examining adopted by examiners can have a critical impact on performance and, hence, which students we perceive to be doing better in examinations at different stages of schooling.

Murphy and Elwood (1998) have suggested that there are certain styles of expression and communication expected in particular subject areas and at different stages of examinations. For example, ways of communicating and styles of expression that are valued in one subject in examinations at the age of 16 may not be valued as highly in examinations at the age of 18. Elwood (1999b) has suggested that examinations in the UK at the age of 16 (i.e. GCSEs) have a style of assessment that rewards those aspects of communication (narrative, discursive, use of own experience and personal process) and working (collaborative, research-based approaches) that are preferred by girls; a connected style of thinking and knowing would be advantageous in many subjects examined at age 16 in the GCSE and may account for the higher achievement of

girls at this stage. On the other hand, a preference for a separate style of communicating (concise, deductive) and working (non-collaboration, an adversarial approach) would seem to be advantageous in the majority of subjects examined at the age of 18 in the UK. This may explain the better performance of boys at this stage of examining and the reduction of gaps in performance at this stage of schooling; the analytical style of communication and expression is valued more by males than females.

Thus, when considering the Junior Certificate and Leaving Certificate examinations, even though, on the face of it these examination papers may be seen to be neutral, i.e. not favouring any one gender, the types of questions asked, the range of skills expected from the candidates in answering the questions, and the style of communication expected by the examiner, may all have an effect on how boys and girls are perceived to achieve by examiners.

The use of context in examination items

The use of context, that is, situating examination questions or items in 'real life' scenarios, can affect how students respond to, and perform on, assessment tasks. Context has been shown to affect performance by obscuring the task in dense, often irrelevant information which some students 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). Context also introduces an assumption about similar cultural and social experiences for all groups which will enable them to understand the context being 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; the situation is believable but the student has to suspend his/her common sense so as to answer the question correctly.

Boaler (1994), Cooper (1996) and Murphy (1995) all highlight 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 gender of the students, 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 student believes to be relevant to the task in hand. Depending on the domain and what is valued as achievement in it, the gendered perceptions of what is relevant will appear successful or unsuccessful (Murphy, 1995). The inclusion, therefore, of contextual variables provides a source of assessment invalidity if no account is to be taken of them in the assessor's view of the task and the marking of responses (Murphy, 1995).

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). The above research has shown that, 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 other hand, 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 the social and political values of examiners 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 more favourable to one group than another.

Murphy and Elwood (1998) consider that performance on certain content areas is related to notions of confidence and alienation. Certain 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. 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, faced with content which 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. Students may be appearing to be involved with the tasks set but actually have a very low level of cognitive engagement with them and, consequently, the effects of alienation go unchecked and lead to underachievement (Murphy and Elwood, 1998).

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 O level examination papers (1987, p.38) identified a variety of discrimination types in relation to examination papers: 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 predominantly 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 (2002) examination papers from the UK, however, show that many of these types of discrimination have been removed.

The way in which examiners mark the test and the mark schemes which accompany the test are also areas where bias can appear. Multiple-choice tests allow the assessor to become the marker and his/her values about what constitutes a right or wrong answer are 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 the names of candidates on examination scripts and the handwriting of candidates, both of which may lead to inferences about the sex of the candidate (Baird, 1997; Goddard and 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).

Summary

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. This study acknowledges that more factors are involved in understanding differential performance in the Junior Certificate and Leaving Certificate examinations than just the assessment techniques chosen to assess students' knowledge and skills. The perceptions and expectations of students and teachers about attainment and success at junior and senior cycle must also come into play when interpreting the differences observed. However, focusing in on the examinations themselves, and how they may contribute to differential performance in the certificate examinations, is the unique aspect of this study, which is the first of its kind to be carried out in Ireland. It is hoped that the focus and approach taken will contribute significantly to the debate on male and female achievement and the role that the certificate examinations play in defining this achievement.

The next two sections (sections 3 and 4) present the main analyses of the study. Section 3 is concerned with the analysis of the entry and performance data by gender in the JCE and LCE in 2000 and 2001. General patterns of entry and performance are presented first, followed by entry and results patterns in English, mathematics and physics (LCE) and science (JCE). These three subjects have been used to illustrate particular aspects of gender and achievement patterns in entry and performance. They are also subjects that have been the focus of extensive research. This research has been used to help support interpretations of gender-related patterns of performance in the JCE and LCE. The analysis of the examinations in these subjects in the JCE and LCE is presented in section 4.

SECTION 3

Patterns of performance in the Junior and Leaving Certificate examinations, 2000 and 2001

Patterns of performance in the Junior and Leaving Certificate examinations, 2000 and 2001

INTRODUCTION

Section 3 of this report outlines the analysis of the 2000 and 2001 examination data. The analysis takes a broad approach to looking at the data, but is particularly interested in looking at differential entry patterns across the three levels of the JCE and LCE[1]. This is because in other systems of examining where differential entry systems are in operation, such techniques have shown to provide inequality of opportunity for boys and girls to achieve at a similar level. A summary analysis is presented below.

3.1 Junior Certificate, 2000 and 2001

In analysing the entry and result patterns for JCE subjects across 2000 and 2001, some interesting patterns emerge[2]:

(i) Slightly more boys are entered for the JCE than girls. In 2000 and 2001, boys provided 51% of the JCE entries and girls provided 49%.

[1] The term 'entry' is used here as synonymous with 'take-up' but it also infers entry and completion of an examination in a particular subject. Often students can 'take-up' a subject yet they do not complete (or enter for) the examination at the end of the course of study.

[2] The data on which all entry and results figures at JCE and LCE are based in this report are subject entry figures.

(ii) There are differential entry patterns across the three levels of entry at Junior Certificate. Figure 1 (below) indicates that in 2001, more boys are entered for the foundation and ordinary levels of the examination and that more girls are entered for the higher level. This pattern was similar to that observed in 2000.

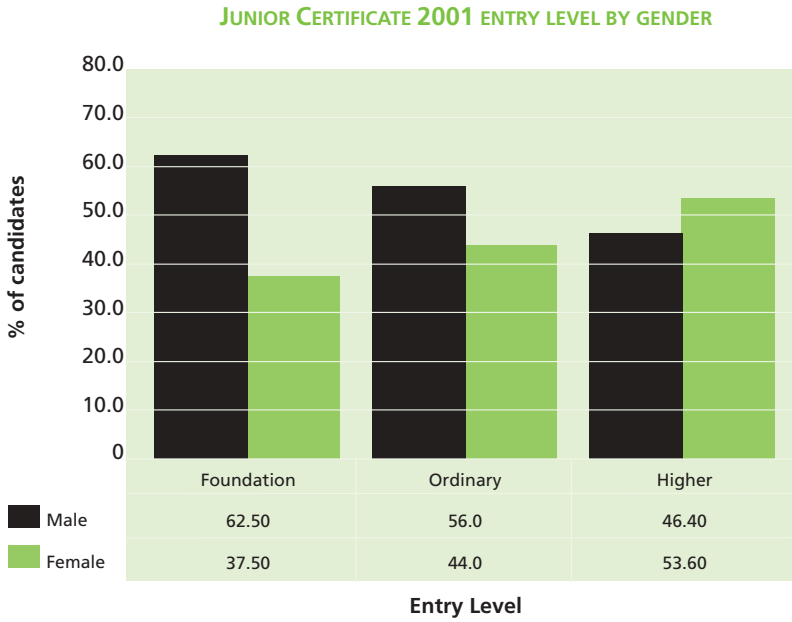

Figure 1

(iii) Girls finish the junior cycle better qualified than their male counterparts. Table 1, below, shows the differences in the proportions of boys and girls obtaining the top grades (A, B, C) in the JCE across the three levels of entry. A negative value indicates that girls are doing better than boys overall in the proportion of top grades obtained. For example, girls receive 5.2% more grades A-C in the higher level than boys.

Table 1: Differences in performance (grades A-C) at JCE of boys and girls by level - 2000 and 2001

Level	2000	2001
	%A-C (b-g)	%A-C (b-g)
Foundation	-10.4	-6.7
Ordinary	-6.6	-5.9
Higher	-7.4	-5.2

b=boys; g=girls

(iv) In mathematics and English, where there is almost universal take up at JCE, there were more boys entering for these subjects in 2000 and 2001 than girls. In 2000 and 2001, 50.1% of entries in mathematics were from boys as opposed to 49% from girls. These entry figures were reflected in English in 2000, with 51% and 49% of boys and girls entering for English respectively. However, in 2001 the entry figures reached 50:50 for boys and girls entering for English.

These facts are not unimportant as such differences in entry policy must bear weight in the interpretations of the results, especially if fewer girls are being entered for the JCE yet are doing better in comparison to boys in overall performance. These differences in entry may well reflect the proportion of boys and girls in the 15-year old cohort generally. However, it would seem that even though more boys than girls are being entered for, and completing, the JCE, higher proportions of them are being entered at the lower levels of the examination. This has major implications for those boys who wish to continue to the Leaving Certificate examinations. As Hannan, Smyth, McCullagh, O'Leary and McMahon (1996) have indicated from their study, the majority of schools in Ireland impose restrictions on the eligibility of individuals to take certain subjects at Leaving Certificate if they have not obtained at least a minimum of a grade C in that subject from the higher level in the JCE. The availability of a lower level of examination may also be interacting with perceptions teachers may have of boys' achievements, which in turn influences the decisions of teachers as to what level of entry of the examination boys should be assigned.

Tables 2 and 3 show entry and result patterns at ordinary and higher levels for the ten most popular subjects taken at JCE in 2001. What these figures show is that in only one of these subjects at ordinary level (geography) are boys substantially ahead of girls. In all the other nine subjects at ordinary level and all ten subjects at higher level, girls are either substantially ahead of boys in the proportion of top grades achieved or else the gap is very narrow between the two genders, especially in the more traditionally 'male' subjects. As a summary of the overall picture at JCE, the figures would seem to confirm the widespread perception that girls are doing better than

boys in examinations at this stage. The concern here should be the underachievement of boys relative to girls in the junior cycle of education and how the structure of the examination system may be interacting with the wider factors that influence male (and indeed, female) achievements in school.

We should interpret the results given in Tables 2 and 3 with reference to the entry figures. As we can see from these figures, boys make up the majority of entries in all ten subjects at ordinary level, whereas girls make up the majority of entries at higher level.

Table 2: Most popular subjects at JCE - entry and results by gender, 2001 (ordinary level)

Subjects	%Ent Boys	% Ent Girls	%A-C Boys	%A-C Girls	% Diff A-C (B-G)
Art, Craft and Design	46.8	53.2	66.4	76.1	-9.7
Business	48.4	51.6	75.1	81.7	-6.6
English	59.0	41.0	68.1	83.2	-15.1
French	55.2	44.8	49.1	59.5	-10.4
Geography	53.7	46.3	79.2	73.6	5.6
History	52.5	47.5	76.1	77.3	-1.2
Home Econ.	25.8	74.2	72.1	85.6	-13.5
Irish	54.3	45.7	64.1	78.3	-14.2
Mathematics	50.0	50.0	66.3	70.5	-4.2
Science	59.5	40.5	82.0	84.8	-2.8
Total All Subjects	**56.0**	**44.0**	**70.2**	**76.1**	**-5.9**

Table 3: Most popular subjects at JCE - entry and results by gender, 2001 (higher level)

Subjects	%Ent Boys	% Ent Girls	%A-C Boys	%A-C Girls	% Diff A-C (B-G)
Art, Craft and Design	33.1	66.9	74.7	85.4	-10.7
Business	44.3	55.7	82.2	83.2	-1.0
English	44.6	55.4	62.7	79.7	-17.0
French	41.5	58.5	64.8	72.8	-8.0
Geography	48.4	51.6	78.8	81.1	-2.3
History	47.9	52.1	68.6	70.4	-1.8
Home Econ.	7.2	92.8	85.1	94.8	-9.7
Irish	40.1	59.9	69.9	82.6	-12.7
Mathematics	48.5	51.5	75.7	78.4	-2.7
Science	48.6	51.4	74.0	78.6	-4.6
Total All Subjects	**46.4**	**53.6**	**74.4**	**79.6**	**-5.2**

At ordinary level (Table 2), even in those subjects that are more traditionally 'female', such as languages (French and Irish) and English, more boys are entered, yet girls perform better. This may indicate an underestimation of the abilities of these girls in these subjects; they have been entered for ordinary level, yet they perform substantially better than their male counterparts and may well have achieved adequately at higher level.

At higher level, these subjects attract a relatively high proportion of female entries: 58.5%, 59.9% and 55.4% respectively. In the case of French, this may well indicate a 'volunteer entry' from girls, that is they have chosen to do these subjects and, as a consequence, perform

well at them. In Irish and English, at both ordinary and higher levels, girls obtain between 12% and 17% more top grades than boys and in French girls obtain between 8% and 10% more A-C grades than boys. The size of these performance differences reflect the size of performance differences in these same subjects in other examination systems, especially in the UK's GCSE exams (Elwood, 1995; Elwood and Gipps, 1999).

In the more traditionally 'male' subjects of mathematics and science, there are very different entry and result patterns across the two levels. In mathematics at ordinary level, for example, there is equal entry between boys and girls, yet girls are still slightly ahead with 4.2% more top grades than boys. At higher level, slightly more girls are entered than boys, but the gap between the two genders is quite narrow (2.7% more A-C grades for girls). In science, more boys are entered for the ordinary level than girls, which would reflect stereotypical entry patterns in this subject. Slightly more girls are entering for the higher level than boys, which would reflect patterns in other examination systems that operate differential entry systems in science. However, girls are slightly outperforming boys at both levels by 2.8% top grades (ordinary level) and 4.6% top grades (higher level). These patterns of results also reflect those found in the 2000 JCE.

The subjects of history and geography are interesting to note at this point. At ordinary level more boys are entered for geography and tend to do well, outperforming their female counterparts by 5.6% of the top grades. However, this pattern is reversed at higher level; slightly more girls are entered than boys (51.6% versus 48.4%) and they tend to do well, although the gap between the genders is small. It is interesting to note that in history, which is traditionally seen as a

'female' subject, the gaps in performance at both levels are very small. Although more boys enter for this subject at ordinary level, and more girls at higher level, girls are only slightly ahead of boys at both levels: 1.2% and 1.8% higher grades at ordinary level and higher level respectively. This pattern of performance seems particular to the JCE, as in other examination systems at this stage girls would be performing better than boys in the range of top grades they achieve at this stage of schooling in history. This may well be accounted for by the provision of subjects in Irish schools and the 'compulsory' nature of geography and history in most schools. In other education systems, subjects such as history and geography would be part of a package of subjects which students can choose to take up for examination purposes.

This review of the entry and result patterns in the JCE has been seen to establish that there are different take-ups and outcomes by gender at this stage of examining. It has also shown that result patterns cannot be understood completely unless taken in conjunction with entry patterns. It would seem that the patterns of performance at the JCE are impacted upon by the different level of entry available. To talk about results patterns overall in the JCE would be to lose valuable information about differential patterns of entry. Girls are achieving well at this stage of schooling, but they are doing so as more of them are entered for the higher levels of the examination. The concern here would be the smaller proportions of boys entered for the higher level of the JCE and how this will impact on their achievements generally and opportunities for taking these achievements further.

3.2 Leaving certificate, 2000 and 2001

In analysing the entry and result patterns for LCE subjects across levels of entry for 2000 and 2001, again some interesting patterns emerge:

(i) More girls than boys are entered for the Leaving Certificate. In 2000 and 2001, girls made up 52.4 % of the total with boys making up 47.6%.

(ii) There are differential entry patterns across the three levels of entry (foundation, ordinary and higher) of the Leaving Certificate. Figure 2, below, shows these differential entry patterns for the LCE in 2001. More boys than girls were entered for the foundation level, almost equal numbers of boys and girls were entered for the ordinary level, and more girls than boys were entered for the higher level. Again, these patterns reflect those found in the LCE in 2000.

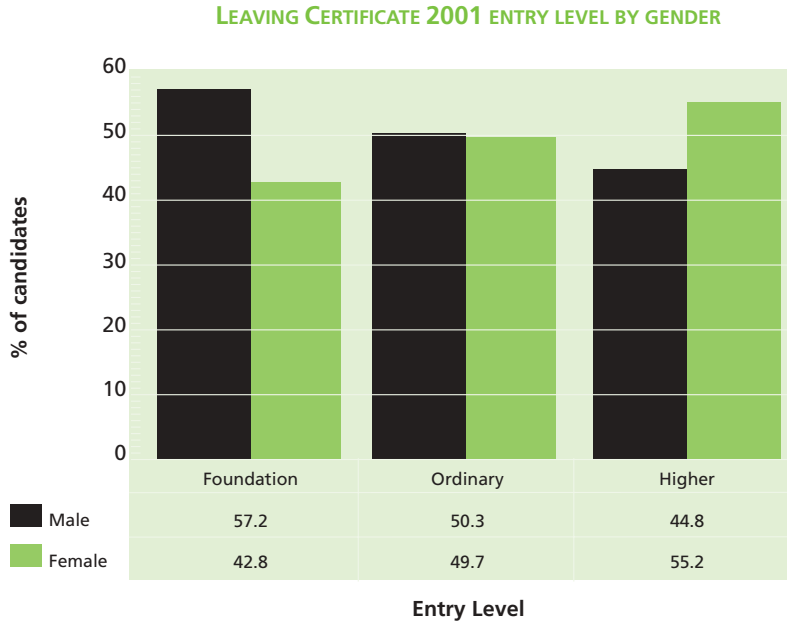

Figure 2

(iii) Given these differential entry figures, it is not surprising that girls leave schooling at the end of senior cycle better qualified than their male counterparts. Table 4, below, shows that, in both 2000 and 2001, girls achieved a higher proportion of the top grades at Leaving Certificate than boys (indicated by the negative values in each cell of the table). Again, the situation arises that, even though more boys than girls are entered for the foundation level and almost equal numbers are entered for the ordinary level, girls still outperform boys at these levels.

Table 4: Differences in performance (grades A-C) in the LCE of boys and girls by level - 2000 and 2001

Level	2000	2001
	%A-C (b-g)	%A-C (b-g)
Foundation	-7.4	-6.3
Ordinary	-4.4	-5.8
Higher	-3.8	-4.3

b=boys; g=girls

Again, these facts are not unimportant if what we are seeing is the impact of decisions made at JCE affecting entry patterns at LCE. Therefore, these performance figures are not unexpected, given the patterns of entry at JCE and the restrictions that some schools put on taking subjects at LCE based on level of entry and performance at JCE. However, the factor of choice also comes into play at the LCE. What is more evident at LCE is the aspect of 'minority' and 'majority' groupings, i.e. entry figures in subjects are imbalanced because of the gendered nature of choice for particular subjects. Tables 5 and 6, below, show the entry and results figures for the 13 most popular subjects at LCE at ordinary and higher level.

Table 5: Most popular subjects at LCE - entry and results by gender, 2001 (ordinary level)

Subjects	%Ent Boys	% Ent Girls	%A-C Boys	%A-C Girls	% Diff A-C (B-G)
Art	47.2	52.8	64.1	71.1	-7.0
Biology	36.3	63.7	44.3	52.2	-7.9
Business	45.7	54.3	76.1	78.4	-2.3
Chemistry	56.1	43.9	63.4	75.0	-11.6
English	54.6	45.4	64.0	76.5	-12.5
French	44.2	55.8	59.1	63.4	-4.3
Geography	56.7	43.3	73.2	72.2	1.0
History	64.9	35.1	67.8	63.3	4.5
Home Econ. (S+S)	20.6	79.4	49.8	64.1	-14.3
Irish	50.3	49.7	68.9	81.9	-13.0
Mathematics	45.9	54.1	58.9	65.0	-6.1
Physics	85.4	14.6	64.7	72.5	-7.8
Tech Drawing	95.6	4.4	69.2	63.6	5.6
Total All Subjects	**50.4**	**49.6**	**63.9**	**69.7**	**-5.8**

Table 6: Most popular subjects at LCE - entry and results by gender, 2001 (higher level)

Subjects	%Ent Boys	% Ent Girls	%A-C Boys	%A-C Girls	% Diff A-C (B-G)
Art	35.0	65.0	67.6	80.9	-13.3
Biology	29.5	70.5	66.7	69.8	-3.1
Business	43.8	56.2	65.6	70.0	-4.4
Chemistry	43.8	56.2	71.3	78.0	-6.7
English	42.1	57.9	71.2	78.6	-7.4
French	36.1	63.9	64.2	72.6	-8.4
Geography	50.7	49.3	66.6	71.9	-5.3
History	52.4	47.6	68.9	71.4	-2.5
Home Econ. (S+S)	12.9	87.1	52.1	66.5	-14.4
Irish	34.4	65.6	74.0	81.6	-7.6
Mathematics	53.4	46.6	78.2	83.0	-4.8
Physics	69.9	30.1	63.0	72.2	-9.2
Tech Drawing	92.2	7.8	75.0	73.2	1.8
Total All Subjects	**44.8**	**55.2**	**70.7**	**75.0**	**-4.3**

In both ordinary and higher levels of the examination girls performed better overall in the proportion of top grades (A, B, C) obtained. It would seem from these figures that the 'gender gap' in performance in favour of girls in the JCE has moved through to the LCE. However, these overall performance patterns hide very different entry and result patterns at the subject level and also at the level of entry. In tables 5 and 6, above, the entry ratios for males and females are relatively more extreme than they were for the JCE. So, for example, when single science subjects are introduced at LCE,

more stereotypical gendered patterns of entry emerge. Whereas in science at the JCE almost equal numbers of males and females entered for this subject at the higher level, at LCE 70% of the entry in biology are girls, 56% of the entry in chemistry are girls, and only 30% of the entry in physics are girls. In mathematics, almost 11,000 girls sat higher level mathematics at JCE, yet less than half that number (4,600) go on to take this subject at the higher level at LCE. In French, only 6,000 males go on to study this subject at the higher level in LCE when 11,000 of them had studied the subject at higher level at JCE.

These skewed entry patterns obviously reflect the personal choices of students. However, they must also reflect the availability of subjects in certain types of schools and how students are allocated to subjects and levels at LCE. All these factors will, however, interact with gender and how boys and girls choose, or are allocated to, particular subjects. Moreover, in relation to LCE results, the smaller groups of students who take subjects that are less traditional for their gender, are often the more able candidates who perform better than their male or female counterparts, or at least the gaps in performance are narrowed. Again, as at JCE, girls are ahead in the majority of subjects shown in Tables 5 and 6, above, yet the differences in performance are smaller and less consistent, especially at the higher level, than at JCE. The figures within Tables 5 and 6 show interesting patterns and suggest a more valid consideration of their impact must include reference to the populations who take LCE and the different levels of entry that are on offer. For example, in history and geography, more boys take these subjects at ordinary level and perform better than females, yet more boys than girls also take these subjects at higher level, yet girls perform better at this

stage. This pattern could reflect the underestimation of the abilities of boys in these subjects at ordinary level, but might also be more of an indication that girls who choose to do these subjects at higher level and do well are making positive choices in opting for these subjects at this level. Physics is an example of where a selective group of students show a positive choice in a particular subject and perform better than the majority group. In physics, at both levels, girls outperform boys in the proportion of top grades obtained, yet they only make up 15% of the entry in physics at ordinary level and 30% of the entry in physics at the higher level. The girls who choose to do physics are obviously a very able group of students. Also, mathematics at the higher level shows a positive choice for girls: they are only 46% of the entry at this level, yet they outperform their male counterparts.

This review of LCE entry and result patterns has also established that there are very different take-ups and outcomes by gender at LCE compared to those found at JCE. More gendered patterns of entry are found at LCE and this must have a bearing on the results, especially if students opt to remove themselves from particular subjects in large numbers, or decide to take the subject at a lower level at LCE, thus affecting their chances of taking this subject further in higher education.

This section of the report of the JCE and LCE results has highlighted the very complex natures of patterns of performance with which we are presented. The further analysis of these results will aim to enhance our understanding of these patterns of entry and performance across the different levels of entry and the two phases of education.

3.3 Patterns of entry and performance in English, mathematics and science

The following section of the report contains a brief examination of entry and result patterns for English, mathematics and science across the three levels of the JCE and LCE over the years 2000-2001. These subjects are presented here to provide context for the review of the examinations presented in section 4. They are also presented to illustrate that different patterns of entry and performance underpin different subjects which may not follow general patterns. This is important in deepening our understanding of subject-specific factors that may contribute to the outcomes observed.

JCE entry patterns in English, mathematics and science

Figures 3 and 4, below, show the entry patterns for English, mathematics and science for JCE across levels of entry for 2000 and 2001. Across the two years, more boys than girls are entered for English at foundation and ordinary levels and more girls are entered at higher level. This is in keeping with the general entry patterns for JCE across the two years (See figure 1, above). In mathematics JCE 2000 and 2001, more boys are entered at foundation level and equal proportions of girls and boys are entered at ordinary level. Slightly more girls are entered at higher level mathematics across the two years but the difference is small. Entry patterns in science for 2000 and 2001 are also similar to the general entry patterns for JCE, with more boys than girls being entered at ordinary level and more girls entered at higher level.

JUNIOR CERTIFICATE 2000 ENTRY LEVEL BY SUBJECT

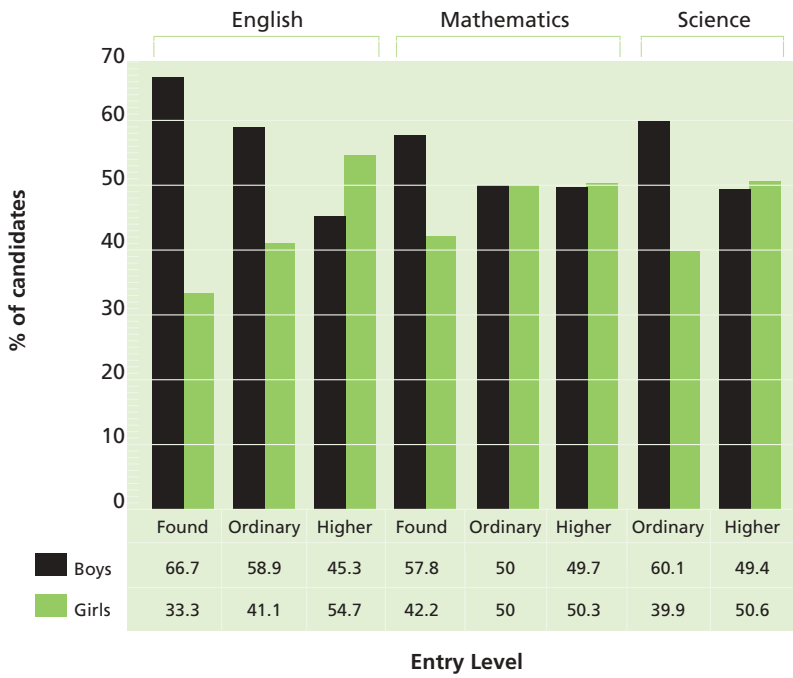

Figure 3

JUNIOR CERTIFICATE 2001 ENTRY LEVEL BY SUBJECT

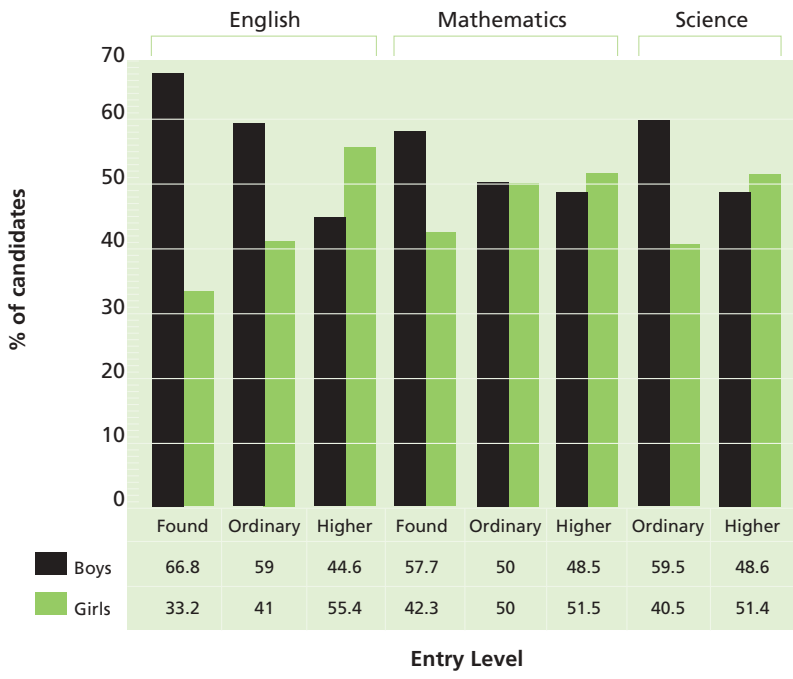

Figure 4

Result patterns for English, mathematics and science, JCE 2000 and 2001

Table 7 shows the differences in the proportions of boys and girls obtaining the top grades (A-C) in English, mathematics and science at ordinary and higher level for the JCE across the years 2000-2001. The figures indicate that, despite more boys being entered for English at ordinary level, more girls are achieving the top grades in 2000 and 2001. Similarly for mathematics, girls are outperforming boys at ordinary level across the two years, however the differences in performance are smaller than in English. Differences in performance at ordinary level science indicate that boys performed better in 2000. However, in 2001, despite more boys being entered, more girls achieved top grades. Girls continue to perform better than boys in English at higher level. However, this difference in performance has decreased across the two years. In higher level mathematics, more girls achieve top grades across the two years considered, however the differences are small. Likewise, girls perform better than boys in science at higher level. However, the difference in performance between boys and girls has decreased over the two years.

Table 7: JCE English, mathematics and science: entry and results by gender, 2001and 2000 (ordinary and higher level)

Subjects	Level	% Diff A-C (B-G) 2000	% Diff A-C (B-G) 2001
English	Ordinary	-14.8	-15.1
	Higher	-18.9	-17.0
Mathematics	Ordinary	-2.8	-2.7
	Higher	-1.9	-4.2
Science	Ordinary	0.1	-2.8
	Higher	-8.6	-4.6

LCE entry patterns in English, mathematics and physics

Figures 5 and 6, below, show the entry patterns for mathematics and physics for LCE across levels of entry for 2000 and 2001. Across the two years, more boys than girls are entered for English ordinary level and more girls are entered at English higher level. In mathematics, slightly more girls are entered at foundation level in 2000 and equal proportions of boys and girls are entered at foundation level mathematics in 2001. More girls are entered for ordinary level mathematics in 2000 and 2001, however, more boys are entered at higher level mathematics in 2000 and 2001. Entry level patterns for physics in 2000 and 2001 show that, across both levels, more boys than girls are entered for examinations.

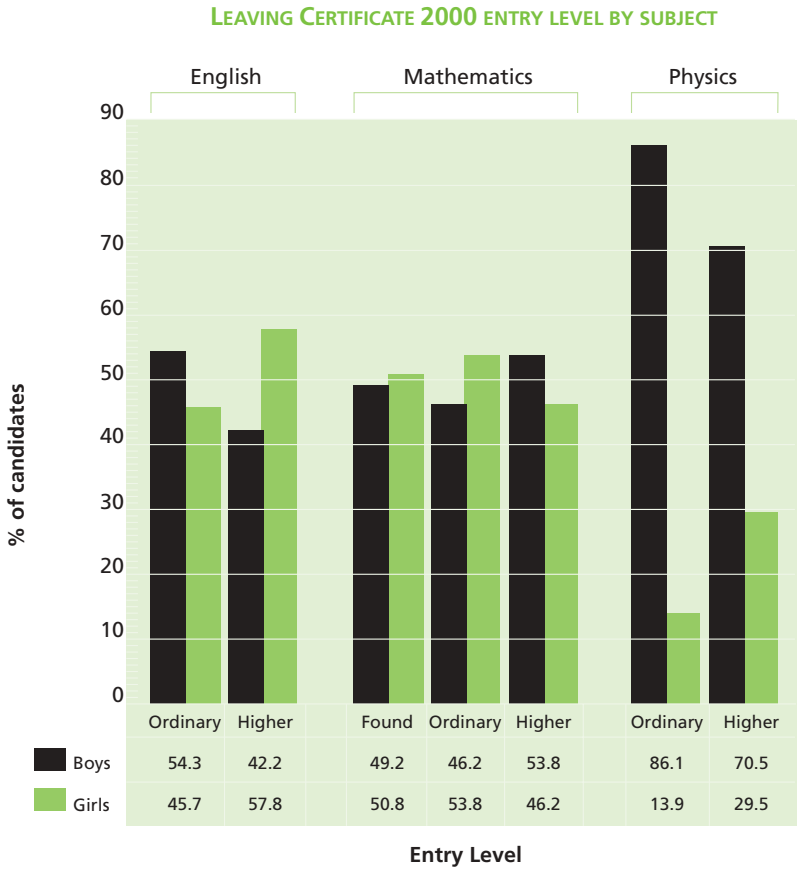

Figure 5

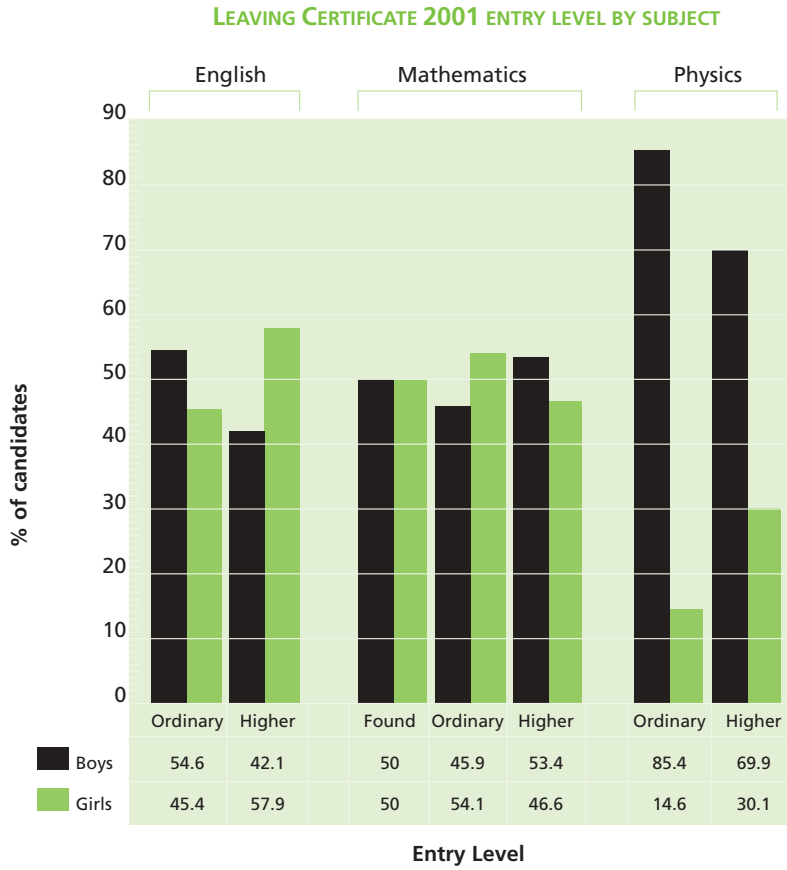

Figure 6

Result patterns in LCE English, mathematics and physics, 2000 and 2001

Table 8, below, shows the differences in the proportions of boys and girls achieving the top grades at LCE ordinary and higher level for the years 2000-2001. The table indicates that girls are doing better than boys in English ordinary level and this difference in performance is increasing over the two years. Equally, in mathematics, girls are doing better than boys and although the proportions are smaller than in English the difference is increasing across the two years considered. Performance of girls in physics ordinary level is superior to that of boys, despite more boys being

entered for the examination. The table also shows that, similar to LCE ordinary level, more girls are achieving top grades in English and this has increased over the two years. Girls are also achieving more top grades in mathematics at higher level and this difference has increased. Furthermore, girls perform better than boys in higher level physics in 2000 and 2001.

Table 8: LCE English, mathematics and physics: entry and results by gender, 2001and 2000 (ordinary and higher level)

Subjects	Level	% Diff A-C (B-G) 2001	% Diff A-C (B-G) 2001
English	Ordinary	-6.5	-7.4
	Higher	-10.3	-12.5
Mathematics	Ordinary	-4.3	-4.8
	Higher	-5.0	-6.1
Physics	Ordinary	-6.6	-7.8
	Higher	-4.9	-9.2

SUMMARY

Given what research from the UK has shown, the findings regarding differential entry patterns across the three levels (foundation, ordinary and higher) in the Junior and Leaving Certificate examinations must be cause for concern. In considering issues of the underachievement of boys at school, it is important to note that more boys than girls are entered for the lower tiers of the examination. It is not unlikely that tiered levels of entry at the JCE are interacting with boys' disaffection towards schooling more generally and their teachers' perceptions of their achievements leading them to enter more boys in the lower levels of the examination, thus restricting their achievements overall. This may well explain why fewer of them go on to enter the Leaving Certificate examinations.

The patterns of entry for girls in the Junior Certificate and Leaving Certificate are opposite to what would be expected, given patterns of entry in the UK. However, these overall patterns of entry tend to hide more significant patterns of differential entry at the subject level which do reflect those found in the UK examinations. An example of this would be in LCE higher level mathematics. Far fewer girls are entered at the higher level for mathematics at LCE than took the higher level in this subject at JCE. The availability of lower level examinations at both levels of examining may well be feeding into girls' anxieties about their success in subjects such as mathematics, as well as interacting with teachers' perceptions of girls' abilities at both levels of examining.

Thus, from these considerations of the differential levels of entry at JCE and LCE, it would seem that the consequences of a tiered system of examining at Junior Certificate and Leaving Certificate may well be interacting with students' and teachers' perceptions of ability and what students (both boys and girls) are capable of achieving. Differentiated examination syllabuses may well be interacting with the lack of confidence in their own abilities among 15 and 17 year old girls and may also be feeding back into the lack of motivation, interest and increased disaffection amongst 15 and 17 year old boys. Tiering maintains a lower status examination at both Junior Certificate and Leaving Certificate to which many boys and girls are being assigned. More detailed research into the impact of differential entry in the JCE and LCE must be considered as a priority if a fuller understanding of gender differences in achievement in the certificate examinations is to be achieved.

SECTION 4

Analysis of Junior Certificate and Leaving Certificate syllabuses and examination papers, 2000 and 2001

Analysis of Junior Certificate and Leaving Certificate syllabuses and examination papers, 2000 and 2001

Introduction

For the purpose of this research, three subjects were chosen for further investigation. The research team looked in detail at the Junior Certificate English, mathematics and science syllabuses and examination papers, and the Leaving Certificate English, mathematics and physics syllabuses and examination papers. These subjects were chosen as they could be used as a basis for comparison with other research that has looked at them in some detail. Also, there is a wealth of research into gender and achievement which is available to support interpretations and conclusions about why gender differences in these subjects occur in certificate examinations. Very different patterns of gender and performance are found in these particular subjects. These patterns provide a useful illustration of some of the issues that emerge when considering this complex area.

The analysis of the examination structures at JCE and LCE from 2000 and 2001 looked at: the philosophy behind the syllabuses; what they focus on; what they assess and the skills they require of students in order for them to be successful; the layout of papers; the representations of gender (where appropriate) within the items and questions, and what the questions are asking candidates to do. Such an analysis attempts to identify those characteristics embedded in syllabuses and examination papers that can contribute to the differences in performance observed. The syllabuses and examination

papers for the Junior Certificate and Leaving Certificate for 2000 and 2001 in English, mathematics and science/physics were analysed using a broad framework that had been developed in two particular research studies conducted in the UK. These studies were the 'Differential Performance in Examinations at 16+: English and Mathematics' project (Stobart, White, Elwood, Hayden and Mason, 1992) and the 'Gender Differences in Examinations at 18+' project (Elwood and Comber, 1996). The scope of the NCCA research did not allow for the review of the certificate examinations in as much detail as these previous research projects, but it did enable a broad review of the examinations in these subjects to be conducted. Such an approach was used, in part, to serve as a starting point for effective techniques of monitoring gender-related differences in performance to be introduced. The UK studies, as well as looking at the examinations for English, mathematics and physics, had also analysed student performance on examination papers and, therefore, were able to understand more fully how the demands made of students by the subjects, syllabuses and examination papers affected performance in the actual examinations. Analysis of performance on examination papers was not a focus of this research. However, the review of the examinations and syllabuses did allow for further investigation of how syllabus content is sampled on examination papers and to what extent the task types and response modes may be interacting with the gender of the student.

Three subject experts were asked to review the English, mathematics and physics/science syllabuses and examination papers for the two years identified. In reviewing this material they were asked to consider the areas illustrated in Figure 7, which acted as a broad framework for the review. The detailed review of the examinations in English, mathematics and physics/science are presented below.

Review of syllabuses and examination papers

- The syllabus: aims, objectives and philosophy. What are the main objectives of the syllabus and what is the main focus of the approach taken to the examination of the subject at both stages?
- How are these then linked to the examination papers? What content is sampled from the syllabus and are the examination papers representative of what is covered in the syllabus?
- Evaluate the layout of the papers, the types of question asked (modes of response, underlying skills asked for, etc.), the structure of the papers, representations of gender (where appropriate), use of contexts, use of authors (where appropriate).
- How are these then linked to any chief examiners' reports (where appropriate) on the examination?

Figure 7

4.1 English

For the purpose of this report, the Leaving Certificate for 2000 and 2001 is discussed in detail. The Junior Certificate is discussed in broader terms, but the issues identified at Leaving Certificate level can also be applied to English at Junior Certificate level. The 2000 and 2001 examinations are reviewed separately, as they are based on different syllabuses.

English: Leaving Certificate examination, 2000

Syllabus

The Leaving Certificate in 2000 was the last examination based on the old syllabus (a new syllabus for Leaving Certificate English was introduced into schools in 1999 and examined in 2001, see below).

The aims of the 2000 syllabus were to: '…pursue the fundamental aims of the Junior Certificate courses in English and to help equip students for life after school, whether at work or in higher education by: cultivating powers of communication through language; developing their judgement in relation to language, literature and life, and enriching students' experience of life through literature' (Leaving Certificate 2000, p.87). The syllabus states that the range of literature that candidates should study should be wide ranging, fully exploited, and should be based on a liberal approach. The wording at times is didactic and is not user-friendly, even, we would argue, to English teachers, for example: 'Literature is the great repository of language and ideas, the great exemplar of the infinite subtlety of meaning and expression of which language is capable in the hands of great masters' (Leaving Certificate Syllabus, 2000, p. 87).

There is, perhaps, an over use of the passive voice in the syllabus (e.g. 'should be demanded', 'should be encouraged', 'should be required', 'should be noted') which would seem to fail to address teachers or the senior students following the Leaving Certificate course in English, and creates a sense of a lack of flexibility in the teaching of English at this level. There is a sense that the enjoyment of studying English was missing from the discourse within this document. It is noted that this syllabus is no longer in operation and it is welcomed that the somewhat traditional and restrictive layout and presentation of Leaving Certificate English has been changed and updated (see below).

From the review of this syllabus, there is nothing to suggest that it would intentionally favour either one gender or the other. It is only by looking at how the syllabus is brought to life through the examination papers that we can begin to assess any impact it may have had on boys' and girls' performance. The analysis of the papers outlined below is presented in terms of: layout, the use of authors, the types of questions asked, and associated writing skills required.

Examination: ordinary level

Paper 1 (2 hours)	Prose composition/unprescribed prose
Paper 2 (3 hours)	Drama/poetry/fiction

Layout

In both of the 2000 Leaving Certificate ordinary level papers the layout was quite traditional. The reading involved in both papers was considerable and, in some parts, the text was quite dense (especially the unprescribed text). Directions were clear for candidates and the marks awarded for each question were clearly stated. There was no use of illustrations (unlike the 2001 papers, see below).

Use of authors

Authors of texts were predominantly dealt with in paper 2, as this paper was based on texts that students had studied in class. There was no attribution of author(s) to the unprescribed text used in paper 1. In paper 2, which covered texts in the genres of drama, poetry and fiction, the majority of the authors were male. In the drama section, all the writers were male: Shakespeare, Synge and Miller. In the poetry section, all poets sampled were male - Shakespeare, Wordsworth and Yeats. In the fiction section, the prescribed text was authored by a female (Austen) and candidates were also given free choice to consider a modern novel they had studied in class. There was no information on the range of novels and authors considered in this section.

Types of questions/writing skills required

In the prose composition section in paper 1, candidates were given a choice of 11 essays. Most of the titles that were offered would seem to be accessible to all candidates, with a range of types of writing requested, although there were a greater number of titles that would require personal response or opinion. This may favour girls by providing opportunities for responses to questions that may favour their strengths. The unprescribed prose in section two of paper 1 was based on Welsh musical expression and history of choirs. This was felt to be a piece that might favour boys, given its focus on rugby and its historical and social implications. The piece itself was deemed to be quite inaccessible to 17 year olds, because of its difficulty and subject matter. Criticisms of the piece centred around: factors of accessibility, the relevance of the content to young Irish students, bias of subject matter, and the difficulty of the 'humour' in the passage. This may well have been beyond what most 17 year olds could successfully analyse and this piece may well have caused problems for many students at this level.

The questions asked across the three sections of paper 2 (drama, poetry and fiction) presented some inconsistencies, which may have had an impact on how boys and girls chose to answer them. In the drama section, issues around comparability were raised with regard to the type of questions asked of each selected piece. The questions on *Hamlet* were restricted to character questions (although candidates could focus on male and female characters); the questions on *Death of a Salesman* provided a range of question choices (character, plot, theme) and in *Playboy of the Western World,* questions focused on characters (male only), genre or structure. Thus, depending on the text the candidates had studied, they were not all

provided with the same opportunity to show the same range of writing skills. Issues of comparability would also apply to those questions asked of the poetry and fiction. Candidates may well have been disadvantaged by having studied one particular poet or author instead of another. For example, it was considered that the questions on *Emma* were demanding for candidates, asking them to deal with issues such as character, presentation, contrasts, and assessment of mistakes made by central characters. Questions on the modern novel seemed slightly less demanding; candidates were asked to describe any type of incident and outline the effect of this incident on a selected character, or describe a relationship and outline its importance to the plot. Thus, lack of comparability of question type around each of the authors selected may well have presented unfair obstacles to candidates who were attempting to show their learning to good effect.

Examination: higher level

Paper 1 (2 hours)	Prose composition/unprescribed prose
Paper 2 (3 hours)	Drama/poetry/fiction

Layout

In both of the 2000 Leaving Certificate higher level papers the layout again seemed quite traditional. The reading involved in both papers again was considerable, even for higher level candidates. Directions were clear for candidates. However, no information was given on the paper to identify how many marks were allocated to each question. Again, there was no use of illustrations.

Use of authors

Again, authors of texts were predominantly dealt with in paper 2, as this paper was based on texts that students had studied in class. As with the ordinary level papers, there was no attribution of authors to

the unprescribed text used in paper 1. Paper 2 was again concerned with texts in the genres of drama, poetry and fiction, and, as with the ordinary level paper, the majority of the authors were male. In the drama section, all the writers were male: Shakespeare, Synge, Stoppard and Miller. In the poetry section all poets sampled were male: Donne, Keats, Hopkins and Yeats. In the fiction section, there were two prescribed texts, again one authored by a female (Austen) and the second authored by a male (Joyce). Candidates at this level were also given free choice to consider a modern novel they had studied in class. There was no evidence available to aid clarification on the range of novels considered in this section.

Types of questions/writing skills required

In the prose composition section in paper 1, candidates were given a choice of eight essays. The review of these titles suggested that the majority of them were quite complex and erudite, for example: 'history teaches us nothing', 'youth a time for optimism', 'the music video - a new art form?', and may not be similarly accessible to all candidates. The range of titles would seem to favour neither girls nor boys, but perhaps less accessible to girls more generally. Overall, the essay titles given would demand discursive responses, which is a style of writing that boys prefer to use. Five of the eight titles invited discursive responses or functional, speech writing. The other three could invite narrative as well as discursive responses. Thus, girls may be at more of a disadvantage with these titles given their accessibility and the writing demands requested.

The syllabus outlines that the unprescribed text for higher level candidates will normally focus on a 19th or 20th century writer of non-fiction and should test: comprehension of theme, development of thought, structure, argument, tone, attitudes, techniques, comparison, contrast, summary, and discussion. The unprescribed

prose in section two of paper 1 was based on Irish culture, art in the Catholic Church, and regal splendour. This would seem to be a very difficult text, requiring candidates to deal with difficult lexis, art jargon, religious vocabulary, sociological references, and figurative language. It would be seen to be a difficult passage for both boys and girls. No allocation of marks were given, so candidates may well have been unsure how much depth was required. The types of questions asked on the piece were also considered to be difficult and perhaps the type of sophisticated arguments and criticism that the questions demanded may not be totally suitable for candidates at this level.

The questions asked across the three sections of paper 2 (drama, poetry and fiction) were again thought to be quite demanding. The stimulus statements given for the drama texts seemed to demand high level skills, and issues around comparability of questions asked of each piece were again raised as problematic. The questions on *Hamlet, Playboy of the Western World* and *Rosencrantz and Guildenstern are Dead* were centred around thematic or technique issues only; the questions on *Death of a Salesman* offered a character question, but on male characters only. Issues of comparability would also apply to those questions asked about the poetry and fiction. Again, candidates may well have been disadvantaged by having studied one particular poet or author instead of another. For example, the Yeats' poem was associated with three questions and candidates were offered more scope to demonstrate particular writing strengths. However, with the other poets, candidates were restricted to one question only. Thus, questions were not comparing similar writing skills or learning across all three poets. In the fiction section there seemed little opportunity for candidates to show an authentic personal response, which is a key aspect of the syllabus. This lack of comparability may

well be interacting with the choices that boys and girls make in selecting questions to respond to. This would also extend to the choice of texts that schools make and how they are (perhaps) unconsciously disadvantaging their students, given the texts they choose and the range of questions available to them on examination papers.

English: Leaving Certificate examination, 2001

Syllabus

The examination for the 2001 Leaving Certificate was based on the new syllabus, which was introduced in to schools in 1999. There was quite a visible difference between the old and the new syllabus, especially in the style of layout, the language used, and the examination papers that tested the syllabus. One aspect of this syllabus which had changed quite distinctly was the length of time involved for completion of each of the two papers. At both ordinary and higher level, candidates were given 2 hours 50 minutes on paper 1 and three hours 20 minutes on paper 2. These times would seem to be quite long and candidates are given a considerable amount of tasks to complete in this time. This is only a general observation and was based on the allocation of time given to similar examinations from other jurisdictions, notably the UK. Time was not considered a point of issue in the Chief Examiner's report, but it may be a consideration when looking at performance across the two papers at both ordinary and higher levels.

The new syllabus actually acknowledges, in its introduction, that gender may be an issue in teaching and learning in English. It suggests that teachers should give the fullest recognition possible to the experiences of both sexes when thinking of choices of resources and materials to use as stimulus texts. The syllabus sets out that the new Leaving Certificate course is organised around two general domains: comprehending and composing, and that students will be actively and creatively engaged in using language within these two domains. The classification of language into five aspects (information, argument, persuasion, narration, and aesthetic use of language) would seem to be balanced in terms of the preferences of language in which boys and girls generally chose to communicate. Boys often prefer to communicate through using the language of information and/or argument, while girls prefer the aesthetic use of language and narration. Both genders are equally able to use the language of persuasion.

The syllabus states that the assessment of English will reflect a wide range of oral, written and visual context, which again would seem to interact positively with contexts with which both boys and girls choose to work in the classroom. Thus, the new English syllabus would seem to have already taken cognisance of issues around gender and has attempted to produce a syllabus that would appeal to both boys and girls, and to both teachers of boys and teachers of girls.

From the review of this syllabus there is nothing to suggest that it would intentionally favour either one gender or the other. It is only by looking at how the syllabus is brought to life through the papers that we can begin to assess its impact on boys' and girls' performance. Again, the review of the examination papers is presented around: layout, use of authors, types of questions asked, and writing skills demanded.

Examination: ordinary level

Paper 1 (2 hours 50 minutes)	Comprehending and composing
Paper 2 (3 hours 20 minutes)	Single text/comparative study/ unseen and prescribed poetry

Layout

There was a vast improvement in the layout and quality of the examination papers in 2001 generally. Glossy, coloured paper had replaced ordinary paper; there was use of colour within the papers generally; illustrations were used; there was a definite move to attribute work to particular authors; and both male and female representations were used in illustrations. As a general comment in relation to gender, it was noted with interest that the ordinary level papers were blue in colour (more boys take this level) and that higher level papers were pink in colour (more girls take this level). The colour of examination papers may or may not be significant when it comes to gender differences in performance. However, the use of stereotypical colours for examination papers would seem an area that should be reviewed.

Papers were well laid out, but directions for candidates were difficult to follow in places.

Use of authors

Attribution of authorship was given where appropriate in paper 1. There was a balance of pieces written by males and females across the comprehending section. In paper 2, however, only two out of the ten authors selected for the single text section were female (Brontë and Taylor). There was no evidence to confirm the range of authors used in the comparative section. The poet selected for the unseen poem was male and of the four poets selected for the

prescribed poetry, two were female (Adcock and Boland) and two were male (Heaney and Wilbur).

Types of questions/writing skills required

In the comprehending section of paper 1, although there seemed to be a balance in representations of males and females in the three questions given, the majority of the questions in response to the stimulus material demanded the types of writing skills that girls tend to be better at than boys. For example, question 1, which was the most popular text to be chosen by candidates, was a piece that focused on a female drama student. Questions aligned to this piece demanded more empathetic responses and writing from a girl's perspective. The other two questions, one humorous and focusing on a male character and the other more factual about inventions of the future, would have, on the surface perhaps, been more attractive to males. However, again, the types of questions asked demanded descriptive responses and/or personal opinion, the types of questions that tend to favour girls. It is acknowledged that candidates had to answer question A from one text and question B from another text. However, even given this rubric, the majority of questions asked about all three texts were types that, on the face of it, would seem to favour female candidates.

In the composing section of paper 1, candidates were given a choice of seven essay titles. Six of these titles required a personal, empathetic or narrative response. Only one of the essay titles called for functional writing, which tends to favour the preferences of boys. Males may well have been disadvantaged by this paper due to insufficient choices in the options offered.

In paper 2, issues of comparability of questions for each of the texts might well have an effect on the pattern of responses from boys and girls. With the unseen poem, although the author was male and the focus was on a male character, the questions again demanded an empathetic response about 'feelings', either the candidate's own feelings in response to the poem or the poet's feelings about the character in the poem. The Chief Examiner's report noted that candidates seemed to be able to write more effectively about the content of the poem than they were able to express their own feelings as readers of the poem.

Examination: higher level

Paper 1 (2 hours 50 minutes)	Comprehending and composing
Paper 2 (3 hours 20 minutes)	Single text/comparative study/ unseen and prescribed poetry

Layout

As mentioned above, there was a vast improvement in the layout of the 2001 Leaving Certificate English papers. Photographs were used in the higher level paper to illustrate the texts and, again, there were representations of males and females in the illustrations used. Both black and white and colour photos were used. Papers were well laid out but, again, directions for candidates were difficult to follow in places and not always clear.

Use of authors

Attribution of authorship was given where appropriate in paper 1. There was a balance of pieces written by males and females across the comprehending section. In paper 2, however, only one out of the six authors selected for the single text section was female (Brontë). There was no evidence to confirm the range of authors used in the

comparative section. The poet selected for the unseen poem was female and of the four poets selected for the prescribed poetry, only one was female (Bishop); the other three were male (Keats, Larkin and Longley).

Types of questions/writing skills required

In the comprehending section of paper 1, there was less of a balance in representations of males and females in the four questions given than there had been in ordinary level paper 1. Question 4 (a collage of images of Irish men and women) presented stereotypical images of men and women in various activities. These representations may or may not reflect how higher level candidates experience gender representations in Irish society, but it could be argued that such representations of men and women might elicit stereotypical responses from candidates as to the place of men and women in Irish society. Notwithstanding the representations of men and women in the stimulus pieces (both positive and negative), there seemed to be a balance in the types of questions being asked in both section A and section B. In the composing section of paper 1, candidates were given a choice of seven essay titles. Four of these titles required a personal, empathetic or narrative response, two required a functional response and one a discursive response. Males may well have been slightly more disadvantaged, with five of the seven essays more suited to female candidates.

In paper 2, issues of comparability of questions for each of the texts might well have an effect on the pattern of responses from boys and girls. The unseen poem was written by a female poet and focused on a female character (a princess). The questions again demanded an empathetic response about 'feelings' and an imaginative response about how the princess lived. This may well have put girls at an

advantage in this question, given the subject matter and the type of response required. The Chief Examiner's report noted that candidates seemed to be able to access this poem without much difficulty. It would be interesting, in relation to this study, to see the nature and types of response given by boys and girls to this particular question.

English: Junior Certificate examinations, 2000 and 2001

In both 2000 and 2001, candidates sitting ordinary and higher level English at Junior Certificate took two papers. Paper 1 tested candidates in four areas: reading, personal writing, functional writing and media studies. Paper 2 tested candidates in three areas: drama, poetry and fiction. Candidates who sat the foundation level sat one paper that tested them across six categories. Sections on reading, personal writing and functional writing were compulsory, and answers to three sections on fiction, poetry, drama or media studies were also required. The comments that follow focus on the ordinary and higher level papers only.

Ordinary and higher levels: 2000 and 2001

From the review of the ordinary level examination papers, it would seem that candidates have quite a substantial amount to do across the two papers to be successful. Candidates have to answer six questions in two and a half hours and the papers seem to be highly content based.

Questions would seem to be quite straightforward and show a gender balance in the range of writing skills demanded. The stimulus pieces (especially the compulsory pieces in the comprehension section) tended, on the whole, to be accessible to students at this level. It was noted that some of the questions might be enhanced by

the inclusion of bullet points to help candidates structure their answers. The Chief Examiner's report for 2000 for the ordinary level noted that candidates did not support their answers with specific references to the text. Bullet points which guided candidates to do this might illicit better structured answers from both boys and girls.

The papers were well laid out and there was a good use of visual material. In the personal writing sections of the papers, in both 2000 and 2001, there was a lot of variety of essay titles and a range of question types, which would appeal to both boys and girls. The directions to candidates presented at the top of the personal writing section were seen as helpful and would aid in providing well-structured responses. The functional writing sections also gave candidates a range of tasks and the bullet points in the question on the photography competition in 2001 ordinary level paper showed a good use structure to help and support candidates in their responses. It was felt that the media studies sections required candidates to read quite a substantial amount of material in the time limit given. In 2000, the Chief Examiner referred to the challenges that this section generally created for candidates. A repeat focus on photography in 2001 may have been slightly restrictive for candidates, given the limited range of questions that could be asked.

The use of male and female authors and poets was again considered an issue in the Junior Certificate papers. On the ordinary level papers there was a balance across the two years in relation to the poets selected, with a female poet being used in 2000 and a male poet in 2001. On the higher level papers, again a balance of poets was used across the two years. However, in both the ordinary and higher level papers across the two years, male authors were used in the fiction sections and the drama sections. The question types in

both the drama sections and the fiction sections were considered to offer a range of opportunities for both boys and girls to show their understanding of the texts considered. Questions of comparability between question types would again suggest that not all questions were of equal difficulty.

Summary

In conclusion, it was considered that the JCE papers were less problematic than the LCE papers in terms of the effect on performance for boys and girls. The JCE papers covered a wide range of genres and categories of the English syllabus, but were presented well and, in the main, supported structured responses from candidates. These factors would seem to be advantageous to both boys and girls. In the LCE English papers there are indications that, at both ordinary and higher levels, there is more of a focus on those skills that favour the abilities of girls. More questions ask for writing in the narrative, descriptive, imaginative domains than ask for functional or argumentative writing which is the domain of writing that boys prefer (these are also domains that are more difficult to do well). In the LCE literature paper, although there is a predominance of male authors selected for study, there are more questions that focus on empathetic interaction with characters in the text, a skill for which girls show a greater aptitude than boys (Stobart et al, 1992; Whyte, 1995).

4.2 Mathematics

Mathematics: Leaving Certificate 2000 and 2001

Syllabus

Mathematics is offered at Leaving Certificate at foundation, ordinary and higher Levels. The aims of the mathematics syllabus at Leaving Certificate focus around how mathematics can contribute to the personal development of students as well as preparing them for life and work. These aims are extended at the higher level of study to include preparation for tertiary study of mathematics and at ordinary level to include preparation for mathematical related subjects in this level of education. The syllabus suggests that mathematics education would contribute to the personal development of students through factors such as: helping them to acquire the mathematical knowledge, skills and understanding for personal fulfilment; developing creative talents and powers of communication, and enabling them to develop a positive attitude towards mathematics as an interesting and valuable subject of study. The syllabus goes on to suggest that mathematics education would help to provide students with mathematical knowledge, skills and understanding needed for life and work by: promoting their confidence and competence in using the mathematical knowledge and skills required for everyday life, work and leisure; equipping them for the study of other subjects in school, and preparing them for the further study of mathematics.

The Leaving Certificate syllabus in mathematics at higher and ordinary levels is split into 2 sections, the core plus options. At higher level the core consists of the following areas: algebra, geometry, trigonometry, sequence and series, functions and calculus, and discrete maths and statistics. At ordinary level the core is the

same as at higher level except for the inclusion of a section on arithmetic. The options at higher level are: further calculus and series, further probability and statistics, groups, and further geometry. The options at ordinary level are: further sequence and series, further geometry, plane vectors, and linear programming. The Leaving Certificate syllabus at foundation level covers the areas of: number systems, arithmetic, areas and volumes, algebra, statistics and probability, trigonometry, functions, and graphs and geometry.

There are two papers at each level, each with a maximum of 300 marks. At ordinary and higher levels, paper 1 consists of eight questions from which candidates are asked to choose six. Paper 2 consists of two sections, A and B. In section A, candidates are requested to chose five questions out of seven and in section B, candidates have to complete one question from four which cover the option sections of the syllabus. At foundation level, paper 1 has one compulsory question (Q1) with ten parts, and candidates are then asked to choose four questions from the remaining six questions. In paper 2, candidates have a choice of six questions from a total of eight.

The mathematics papers are reviewed below. All of the papers from the Leaving Certificate are reviewed together as they share a commonality in content covered and in how this content is presented and assessed at this level.

Foundation, ordinary and higher level mathematics papers: Leaving Certificate, 2000 and 2001

Analysis of content

From an analysis of the content areas sampled for the foundation, ordinary and higher level mathematics papers across the two years, it would seem that there is a systematic sampling of content from the areas of the syllabus, both core and options (at ordinary and higher levels). Paper 1 at ordinary and higher levels across both years examines arithmetic (ordinary level only), algebra, sequence and series, functions and calculus. Paper 2 at both levels examines geometry, trigonometry, discreet maths and statistics and the options applicable to that level (see above). Paper 1 at foundation level examines number systems, arithmetic, algebra. Paper 2 examines areas and volume, geometry, trigonometry and statistics and probability.

What is most striking about the review of content across all these papers is the very close alignment of the content detailed in the syllabus and what is assessed on the papers. For example, in paper 1 ordinary level in 2001, the first 3 questions examine aspects of algebra (factor theorem, simultaneous equations and complex numbers). What is examined in these three questions very closely reflects what is outlined as content to be covered in these three areas on the syllabus. Thus, while there is a good range of coverage of the syllabus content (almost 100%), there are 'no surprises' on the papers as to what is being asked by the examiner(s) within particular subsets of syllabus content year on year. It could be argued that this sets up a situation where the following of what has gone before (i.e., past papers) de facto becomes the curriculum and students are then 'drilled' in answering papers rather than engaging in mathematics in creative ways and meeting the aims of the syllabus as outlined above.

The notation and symbols that are used within the questions are quite traditional. Such notation and use of such symbols would seem to be particular to mathematics courses examined in Ireland. Such traditional notation would not be seen, for example, in GCSE or A level papers in the UK, nor in more modern textbooks. A substantial proportion of the content in the syllabus, and therefore what is examined, is pure mathematics. There is very little mechanics (or applied mathematics) covered, with slightly more statistics being covered within the core and the options.

Question type

There is a notable absence of items set in context or everyday 'real-life' situations, which is contrary to other types of mathematics examinations in other examination systems at this stage of schooling. There is perhaps an over-emphasis on abstraction and any context that may be used is usually a mathematical context which students would be familiar with from work carried out in the classroom. There is slightly more of this mathematical context used in paper 2 across all levels, and also in areas such as statistics and probability. The mathematics papers at all levels are very traditional in layout and form of questioning. In fact, there is a clear pattern of questioning which presents itself across the two years in all of the areas sampled from the syllabus. Very few pictures or diagrams are used (only mathematical diagrams) and students are not given the opportunity to complete their answers on the papers themselves; extra writing booklets are required. The very traditional questions and items may reflect quite closely those types of items that both boys and girls are exposed to in their school text books. This is only an assumption, as this research does not extend to reviewing the textbooks that students use in class. There may also be an issue around the choice

that is offered. While choices are not extensive for students across the three levels of examining, there are certain content areas that students can effectively 'ignore' and this is reinforced more specifically with the optional choices. It may well be that teachers are making decisions around what to concentrate on in preparation for these examinations, and that boys and girls might well be exposed to different areas of mathematics given their teachers' interpretation of the examination papers and their perceptions of boys' and girls' abilities at Leaving Certificate.

In the majority of questions that cover the core of the syllabus (mainly paper 1 in foundation, ordinary and higher levels), problem solving seems to be interpreted as applying procedures and giving examples to candidates to solve. This would again be a particular definition of 'problem solving'. Also, the way in which questions are structured year-on-year, especially those asked at ordinary level, would seem to reward the learning of rules, notation and the 'application' of these in familiar mathematical contexts. There is also a greater tendency for recall of formulae and procedures than the application of these in questions. It could be argued that students seem to be examined on discrete skills with mathematics, without having to apply these skills at any time, nor combine skills in order to obtain solutions to problems. There is a predictability in the type of question which shows itself across the two years, which is likely to influence how students are prepared for the examinations and how they are taught to answer particular questions from particular areas of the syllabus.

The appearance, style and layout of the questions tend to give an impression of complexity and would appear to be quite demanding. However, a more detailed look at questions suggests that they are

quite straightforward and would be accessible to those students who have prepared themselves well, who have learnt the rules and formulae associated with the syllabus, and familiarised themselves with the way in which such questions require students to respond and what is required from the examiner. The questions that examine the options in the higher and ordinary level papers would seem to be more demanding than those covering the core syllabus, are more imaginative and would require more thought and application of knowledge. However, as mentioned before, there may well be issues round comparability of questions from each of the options which impacts on what options teachers choose to focus.

Mathematics: Junior Certificate, 2000 and 2001

Syllabus

The underlying philosophy of the Junior Certificate syllabus in mathematics: 'points to mathematics as a human activity,…emphasising the practical experiences of the pupil and…uses rich contexts rather than collection of word problems' (Junior Cycle Mathematics Syllabus, 2000 & 2001, p. 30). The Junior Certificate examinations 2000 and 2001 were based on new syllabuses for each level of study introduced in 1990. The objectives of the syllabuses focused around factors such as: the acquisition of understanding of mathematical facts and concepts, understanding the logical structure of mathematics, and the nature of proof, applying mathematics to everyday life and developing attitudes that lead to appreciation, confidence, initiative, and independence.

The Junior Certificate syllabus at foundation, ordinary and higher levels is divided into three sections (1, 2 and 3). These sections are constructed for the convenience of teachers. The content of each

section approximates to one year's work, depending on the circumstances of the particular class. It was not a consideration of this study whether these sections are indeed helpful to teachers, but it would be an interesting dimension to further work if this claim was investigated. The syllabuses for foundation and ordinary level mathematics are subsections of that for higher level. The higher level syllabus covers the mathematical content areas of sets, relations and functions, number systems, algebra, trigonometry, statistics, areas and volumes and geometry. Ordinary and foundation level syllabuses cover similar areas of mathematics but in varying degrees of depth given the level of the examination.

Higher and ordinary level mathematics examination papers follow a similar structure. Papers 1 and 2 (both worth 300 marks) have a compulsory question (Q1), which has ten parts. Candidates are then requested to choose another four questions from the six that are given. The compulsory questions on paper 1, across the two years, are mostly testing arithmetic and numbers system content. The six optional questions on paper 1 across the two years cover: number systems, algebra, functions, sets and statistics. The questions on paper 2 for 2000 and 2001 cover: trigonometry, geometry, number systems, areas and volumes, and algebra. At foundation level there is one paper on which candidates have to attempt all questions (there is no choice). There are twenty questions, worth 15 marks each. The questions reflect the range of content across all three sections of the foundation syllabus.

The junior cycle mathematics papers are reviewed below. All the papers from the Junior Certificate are reviewed together as they share a commonality in content covered and in how this content is presented and assessed at this level.

Foundation, ordinary and higher mathematics level papers: Junior Certificate, 2000 and 2001

Analysis of content

The analysis of the content sampled at Junior Certificate level very much reflects that presented above for the Leaving Certificate examinations. At Junior Certificate, as with Leaving Certificate, there would appear to be a systematic sampling of content from all of the areas of the syllabus for foundation, ordinary and higher levels. Again, what is most striking about the review of content across all these papers is the very close alignment of the content detailed in the syllabus with what is assessed on the papers. As with the Leaving Certificate, the range of content sampled is similar from year-to-year and there is also predictability about what is tested on these examinations.

The notation and symbols that are used within the questions are very traditional compared to other examination systems testing 14/15 year old students. Such traditional notation was very much part of the old O level syllabuses but very far removed from what is tested in national curriculum tests in England at age 14 and also even GCSE at age 16. There is also a reliance on the assessment of pure mathematics, and very little assessment of applied mathematics, but slightly more statistics.

Question type

At this stage of examining (age 14/15) the absence of items set in context or everyday 'real-life' is even more notable. This situation is very much contrary to other types of mathematics examinations in other examination systems at this stage of schooling. There is an over-emphasis on abstraction that is rarely seen in other examination systems. However, the reliance on mathematical context only (except

for questions about money or statistical problems) would fit with higher level examination papers at 14 and 16 in the UK. The use of abstraction at foundation level is of particular interest as it is at this level in other examination systems where context would be more commonly used. It may be that the foundation level papers in the junior cycle may not fall foul of the reading demands that other exams at similar levels in other countries are victims of. The clear pattern of questioning which presented itself in the Leaving Certificate is also evident in the Junior Certificate across the two years reviewed. Very few pictures or diagrams are used (only mathematical diagrams) and students are not given the opportunity to complete their answers on the papers themselves; extra writing booklets are required. The comments discussed above in relation to traditional questions and items, and how these may reflect quite closely those types of items that both boys and girls are exposed to in their school text books, are pertinent here also. Again this is only an assumption, but would be worth investigating to see the links between what is covered in text books and what is covered in examinations.

The majority of questions at Junior Certificate across all three levels seem to focus more on the recall of formulae and procedures than the application of these to the problems posed. As at Leaving Certificate, it could be argued that students seem to be examined on discrete skills with mathematics, without having to apply these skills at any time, nor combine skills in order to obtain solutions to problems. There is also a predictability of the type of questions asked across the two years. This again is likely to influence how students are prepared for the examinations and how they are taught to answer particular questions from particular areas of the syllabus.

There is eloquence to the appearance, style and layout of the questions, which tends to give an impression of difficulty. However, as with the Leaving Certificate papers, a more detailed look at questions suggests that they are quite straightforward and would be accessible to those students who have prepared themselves well, who have learnt the rules and formulae associated with the syllabus, and familiarised themselves with the way in which such questions require students to respond and what is required from the examiner.

Summary

In reviewing both the JCE and LCE mathematics papers they do not seem to reflect developments in layout and presentation that would be commonly used in other educational systems with similar types of examinations. They are very traditional in layout and in form and use notation that is no longer used in other examinations of mathematics in other countries. The questions and items do however, very much reflect the syllabus from which they are developed. Yet there is a predictability about the papers which may well reward those candidates who are well prepared and who have familiarised themselves enough with how the examiners have chosen to examine mathematics at both Junior and Leaving Certificate. The predictability of the papers may well influence teachers to such an extent that a culture of 'past papers' may well be the 'curriculum' in mathematics classes throughout Ireland. Research that goes well beyond the brief of this project would be needed to provide evidence for such a statement but it would be of interest to know to what extent this is the case and also what role texts books play in preparing students for examinations.

From the review of mathematics papers, it could be argued that those who succeed in mathematics at Junior and Leaving Certificate are those students who are well prepared, organised and who have

learnt the rules and formulae that are needed to answer the majority of question correctly. The better performance of females in mathematics across both Junior and Leaving Certificate therefore, may well be explained by them being better prepared and organised; they are more familiar with the conventions and requirements of the mathematical topics covered in the syllabus, they have learnt the rules and formulae and can recall these as required to do so in the questions asked. Boys, on the other hand, are generally less well organised than girls and less well prepared for examinations, preferring to take risks on the day (Elwood and Comber, 1996). This approach may well be putting boys at a disadvantage in mathematics as they could be caught short on maths papers that require less risk taking and more recall of facts and rules learnt over the time of the course. It would seem that these examinations, thus, define achievement and success in mathematics at both Junior and Leaving Certificate. From reviewing the examination papers it would seem that a very narrow view of achievement in mathematics is promoted, one that does not sit comfortably with the eloquent aims and objectives outlined in the syllabuses on which the courses of mathematics in schools in Ireland are based.

4.3 Physics/science

Physics: Leaving Certificate, 2000 and 2001

Syllabus

Physics is offered at Leaving Certificate level at ordinary and higher levels. The syllabus is broken up in to six main sections: mechanics, heat, wave motion, light, electricity, and atomic physics. The physics syllabus for ordinary and higher levels is combined, with the extended content examined at higher level given in italics. The examination papers are presented in three sections. Section A is made up of multiple choice questions and short answer questions. Students are allowed some choice, but this is limited to choosing five out of the six parts to each of the four questions given. There is a total of 30 marks available for each question in this section. Section B offers candidates a choice of three questions, from which they are asked to select two. The questions are predominantly focused on practical physics experiments which candidates would have considered throughout their course. Each question is worth 41 marks. Section C offers candidates a choice of three questions from a total of six. Questions, again, are mainly based on practical physics experiments. Each question is worth 66 marks.

In analysing the physics papers, particular attention was paid to the range of topics sampled from the syllabus and how this sampling may or may not favour boys or girls. Previous research from the UK has shown that there are particular areas of physics content that may favour one group over another. For example, girls are more likely to do less well on questions that focus on electricity, mechanics and radioactivity. Girls have been shown to do better on questions that focus on light and wave motion. Girls are also more likely to do

better on those questions which use an everyday context in which to position the question and also on those questions that consider medical or health applications of physics concepts. It is interesting to note that there is very little context used in either the ordinary or higher level papers. Although questions with regard to the application of physics concepts to everyday situations are included, they are in the minority and have only a few marks allocated to them.

The papers analysed were the Leaving Certificate physics papers for ordinary and higher levels in 2000 and 2001. In the sections that follow, the ordinary level papers for 2000 and 2001 will be considered together as will the higher level papers for the same years.

Physics: ordinary level papers: 2000 and 2001

Analysis of content

From an analysis of the syllabus areas covered on the ordinary level physics papers from 2000 and 2001, it would seem that there is a good range of coverage from all six sections of the syllabus and that no single area of content was over represented in terms of the marks associated with it. However, it would seem that questions covering aspects of electricity and radioactivity did tend to occur more often than questions on other content areas across all three major sections of the examination paper. In section A (multiple choice and short answer questions) all six sections of the syllabus were covered. However, it is interesting to note that in both years question 4, the last question in section A, focused on electricity (2000) and radioactivity (2001), both areas that boys appear to do better on than girls. Sections B and C again tended to cover the range of physics topics. Section B, however, covered questions on electricity (electro chemical equivalent and resistance) and heat (Boyle's law and specific

latent heat) in both years, with other options in this section focusing on light (wavelength of monochromatic light) and mechanics (Newton's second law). In section C, candidates had to choose three out of six questions. In both years candidates had a choice of content areas with all six syllabus categories being covered across the six questions. However, again across both years, slightly more questions covered the topics of electricity and radioactivity, with three questions focusing on these areas in 2000 and in 2001. From this analysis of the content sampled in the 2000 and 2001 ordinary level papers, it would seem that there is perhaps slightly too much coverage of the electricity and radioactivity area of the syllabus. But these are large areas of the syllabus and such a sampling of content may well be justified in obtaining the widest possible coverage.

Question type

The most striking feature of the physics papers was the amount of recall that was demanded of candidates. Most of the questions, across all three sections of the papers, demanded recall of content from candidates. Candidates were asked to define terms, explain concepts, state certain facts, name particular apparatus and to draw and label experimental equipment from memory. There were also questions that demanded candidates to calculate particular values, draw graphs and interpret them or to provide proofs of certain formulae. All of the questions in section B, on both papers, required candidates to recall particular experiments that they had done (or watched) in class, and similar approaches were used in section C. There were very few questions that dealt with the application of physics concepts in sections B or C. If such questions were asked, they were usually at the end of a multiple-part question and were worth only a proportion of the marks available. Also, there was little use of

everyday contexts in framing and positioning problems to be solved. A few question-parts in section C of both the 2000 and the 2001 paper introduced an everyday context for the application of the physics concepts under focus, such as ice skaters (momentum), magnifying glass (refraction and reflection) and fireworks (light/sound).

Physics: higher level papers: 2000 and 2001

Analysis of content

From an analysis of the syllabus areas covered on the higher level physics papers from 2000 and 2001, it would again seem that there is a good range of coverage from all six sections of the syllabus and that no single area of content was over represented in terms of the marks associated with it. However, it would seem that, as with the ordinary level papers, questions covering aspects of electricity and radioactivity did tend to occur more often on the higher level papers than questions on other content areas across all three major sections of the examination paper. In section A (multiple choice and short answer questions) all six sections of the syllabus were covered. In both years, however, question 4, the last question in section A, focused on the areas of electricity and radioactivity, both areas in which boys appear to perform better than girls. Sections B and C again tended to cover the range of physics topics outlined in the syllabus. In 2000 and 2001, there were questions on section B relating to electricity (resistivity and Joules' Law respectively) and mechanics (coefficient of dynamic friction and momentum respectively). The other options considered wave motion (speed of sound, 2000) and heat (latent heat, 2001). In section C across both years, candidates had to choose three out of six questions. In both years candidates had a choice of content areas with all six syllabus

categories being covered across the six questions. However, again across both years, slightly more questions covered the topics of electricity and radioactivity with three questions focusing on these areas in 2000 and in 2001. From this analysis of the content sampled in the 2000 and 2001 higher level papers, it would seem that there is perhaps slightly too much coverage of the electricity and radioactivity area of the syllabus. However, as with the ordinary syllabus, these areas make up quite substantial aspects of the physics course and such a sampling of content may well be justified in obtaining the widest possible coverage of the syllabus.

Question type

As with the ordinary level papers, most of the questions on the higher level papers demanded the recall of knowledge from candidates across all sections of the papers. Again, candidates were asked to define terms, explain concepts, state certain facts, name particular apparatus and to draw and label experimental equipment from memory. There were also questions that demanded candidates to calculate particular values, draw graphs and interpret them, or to provide proofs of certain formulae. All of section B on both papers required candidates to recall particular experiments that they had done (or watched) in class and similar approaches are used in section C. There were hardly any questions that demanded the application of physics concepts in sections B or C. If such questions were asked, they usually followed the pattern of asking the candidate to offer another use or application of a particular physics concept, but these were not specifically linked to everyday applications. Such questions were also positioned at the end of a multiple-part question and were worth only a proportion of the marks available. In the higher level papers, there was even less use of everyday context than was found

in the ordinary level papers. Two question-parts out of all the questions asked across both papers in both years introduced an everyday context for the application of the physics concepts under focus. These were a girl at gym (mechanics), satellites (gravitation) and a domestic iron (electricity).

Summary

In reviewing the physics papers at LCE across both levels, the absence of items set in context or everyday 'real-life' situations is particularly interesting as this is contrary to other types of physics examinations in other jurisdictions at this stage of schooling. More boys are entered for physics than girls at both ordinary and higher levels, yet they perform less well. This is similar to other examination in physics at this age in other jurisdictions. For example, in the UK, although almost 80% of the entry for A level physics are boys, girls perform better overall. Explanations for these patterns of performance have tended to suggest that the small groups of girls who tend to do physics at advanced level are extremely able girls and therefore do better than their male counterparts. This may well be the case in Leaving Certificate physics. Given also that there is a high degree of recall required for this examination, candidates who are better prepared and organised are more likely to do well. Girls have been shown to be better prepared than boys when it comes to examinations and it may well be that this preparation is putting them at an advantage in the types of examinations they encounter in the Leaving Certificate.

Science: Junior Certificate, 2000 and 2001

Syllabus

Science is offered at Junior Certificate at ordinary and higher levels. The syllabus is broken up in to two main sections: core, plus extensions. The core assesses scientific knowledge, skills, concepts and attitudes to science deemed essential for all school leavers. Four themes are covered in the core: the human body, the non-living environment, the living environment, and energy. There are five extensions to the core which cover physics, chemistry, biology, applied science and local studies. The analysis of the papers presented below considers the core plus the four extensions of physics, chemistry, biology and applied science. Local studies is assessed through coursework and was not analysed for this study.

The examination papers are presented in five sections. Section A is made up of short answer questions based on the core syllabus. In the ordinary level papers candidates are allowed a degree of choice and have to choose 12 questions out of maximum of 15. In the higher level papers, section A is made up of three compulsory questions each with ten parts from which students have to choose eight. The following four sections of both the ordinary and higher level papers (B, C, D and E) cover the extension areas of the syllabus, notably physics, chemistry, biology and applied science respectively. Within sections, B, C and D, students have a choice of two questions from a maximum of three at ordinary level and one choice out of a maximum of two questions at higher level. In section E, students choose two questions from a maximum of six questions covering the six parts of the applied science area (earth science, horticulture, materials, food, electronics and energy conservation). This range of choice would indicate that the main sections of the syllabus are sampled across the examination papers and students have a degree of

choice within this. However, the issue of sampling within sections may well pose problems for students if particular elements of physics, chemistry, biology or applied science are covered in the questions given.

In analysing the science papers, particular attention was paid to the range of topics sampled from the syllabus and how this sampling may or may not favour boys or girls. A broader approach to looking at topic areas was taken than that applied to the Leaving Certificate papers (see above). This broader approach was determined by the nature of the papers themselves. As the Junior Certificate covers 'science' as a whole, it was not possible to look in as much detail across all the science topics as it was to look at specific areas of physics for the Leaving Certificate. Notwithstanding these limitations, the analysis of the Junior Certificate science papers has thrown up some interesting points with respect to issues around gender and performance across the range of syllabus content sampled, and the way in which it is tested at Junior Certificate level.

The papers that were analysed were the Junior Certificate papers for science at ordinary and higher levels in 2000 and 2001. In the sections that follow, the ordinary level papers for 2000 and 2001 will be considered together as will the higher level papers for the same years.

Science: Junior Certificate ordinary level papers, 2000 and 2001

Analysis of content

The analysis of the ordinary level 2000 and 2001 science papers indicated a fair range of coverage of the core syllabus in section A. The majority of questions tended to come from the areas of the non-living environment, the living environment and energy. There was only one question in 2000 on the human body, but three questions in this area in 2001. This analysis shows the difficulty of only looking at two consecutive years of examination papers. It would be more instructive for an analysis of the range of content sampled over time to look at more than two years of examinations. This would be helpful in seeing whether one or more areas of the syllabus were continually included where other areas of the core syllabus may not be. Across sections B, C and D there tended to be an adequate range of syllabus coverage across the two years, although again, as with the Leaving Certificate, electricity seems to be sampled slightly more often than other content areas. Section E covered all the areas of applied science, however similar areas of content seemed to be focused on across both years. For example, in the horticultural section, propagation and growing were focused on in both years, as were the uses of materials and labelling of clothes in the materials sections. It may be that these sections of the syllabus are difficult to examine in the way constructed by the examination papers (i.e. short answer questions) and therefore similar questions are asked year on year.

Question type

The predominant style of questioning on the Junior Certificate papers is the recall of facts. There is more use of illustrations and the papers, especially at ordinary level, look more user-friendly. However, candidates are mainly asked to recall knowledge and there is very little application of this knowledge being tested. Most of the questions, across all the sections of the papers, demanded recall of knowledge content from candidates. Candidates were asked to define terms, explain concepts, state certain facts, match scientific terms to everyday terms/uses, name particular apparatus, and to draw and label experimental equipment from memory. On the ordinary level papers there were very few questions that demanded candidates to calculate particular values, draw graphs or interpret data. Many of the questions in all the sections (both core and extensions) only required one-word answers or one sentence answers. Candidates were also asked to select from a range of answers given in the question, or to label the parts of pieces of apparatus that they were familiar with from the (school) laboratory. While the papers would tend to show a good range of the syllabus being sampled and tested, it is predominantly the content knowledge that is being tested and it is tested in such a way that candidates do not have to demonstrate a wider understanding of the concepts that they are dealing with.

The Junior Certificate papers at ordinary level are similar to those found in the UK for the assessment of Key Stage 3 (14 year olds) science. Criticisms of the KS3 tests have focused on the narrow way in which they test the science curriculum, relying on testing only content knowledge (ALT, 1999), as this is easier to test in a paper-and-pencil examination. It would seem from the analysis of the Junior Certificate examinations that they too fall into the category

of content-only tests. It could be argued, therefore, that they would be having quite significant impact on the science curriculum that is taught in Irish schools.

Science: Junior Certificate higher level papers, 2000 and 2001

Analysis of content

The analysis of the higher level 2000 and 2001 science papers very much reiterates what has been discussed above with regard to the ordinary level papers. There seemed to be a fair range of coverage of the core syllabus in section A. Again across sections B, C and D there tended to be an adequate range of syllabus coverage across the two years, although again, electricity seems to be sampled slightly more often than other content areas. As noted before, candidates at on the higher level papers had less choice than those who sat the ordinary papers and so this may affect even more the opportunities for boys and girls to show their science learning to good effect. Again, section E covered all the areas of applied science but similar areas of content seemed to be focused on across both years.

Question type

The predominant style of questioning on the Junior Certificate higher papers is again the recall of facts. There is less use of illustrations than found at ordinary level and the papers are less user-friendly. The layout of the higher papers is quite traditional and few illustrations are used. Candidates are required to answer in separate booklets and not on the question paper provided. Directions for candidates seem a little difficult to follow (especially around issues of choice of questions) and therefore may cause problems in understanding what is required. Again, candidates are mainly asked to recall knowledge and there is very little application of this knowledge being tested. Candidates were asked to: define terms, explain concepts, state certain facts, match scientific terms to

everyday terms/uses, name particular apparatus, and to draw and label experimental equipment from memory. On the higher level papers there were slightly more questions that demanded candidates to calculate particular values, draw graphs or interpret data. While the papers would tend to show a good range of the syllabus being sampled and tested, it is predominantly the content knowledge that is being tested and it is tested in such a way that candidates do not have to demonstrate a wider understanding of the concepts that they are dealing with.

Summary

The Junior Certificate papers at higher level are less similar to those found in the UK for the assessment of Key Stage 3 (14 year olds) science. They look more like the old O level papers and would be less user-friendly than the GCSE science papers currently used in the UK. Again, with the narrow way in which they test the science curriculum, relying on only testing content knowledge, it could be argued that they would have quite a significant (negative) impact on the science curriculum that is taught in Irish schools.

It could be argued that the candidate who is well prepared and organised will do very well in these science papers. The better performance of females may well be explained by them being better prepared and organised; they are more familiar with the conventions and requirements of the science topics covered in the syllabus, they have learnt the content that is focused on in the tests, and they can recall these as required to do so in the questions asked. Boys, on the other hand, are generally less well organised than girls and less well prepared for examinations, preferring to take risks on the day. This approach may well be putting boys at a disadvantage in science, as they could be caught short in papers that require less risk taking and more recall of facts and rules learnt over the time of the course.

SECTION 5

Are results at JCE and LCE typical of findings in different assessment systems?

Are results at JCE and LCE typical of findings in different assessment systems?

Introduction

Any conclusions about the contribution of the LCE and JCE to gender-related differences in performance must be related to findings based on similar students taking similar assessments in other countries. It is necessary to place JCE and LCE performance in the context of what is known about boys' and girls' performances in other assessment systems in order to evaluate the contribution that the JCE and LCE makes to the performance patterns between boys and girls observed in Ireland. Looking at these performances from a wider perspective helps us in attempting to find answers to the complex patterns observed.

The main difficulty with comparative data is in assessing the scale of the differences relative to those found at JCE and LCE. All that is possible is a rough and ready estimate of whether the JCE and LCE results fit the broad trends in performance patterns nationally and internationally, at the same ages and within different assessment systems. It is also only possible to look at subjects like English, mathematics and science, which tend to be universally taken by students in all other examination settings. It is not possible in this report to look at other subjects, as too many variables come into play to make comparisons valid or viable.

5.1 Gender differences in school performance: evidence from the UK

In terms of overall performance, the gendered patterns of performance found at JCE and LCE are broadly in line with GCSEs and A levels in the UK, which have similar structure and styles of examining. In the UK, GCSE and A level examinations are the main examinations taken at the ages of 16 and 18. More girls than boys are entered for these examinations and they generally outperform their male counterparts. At GCSE, girls achieve more A*-C grades (9% in 2002) than boys and this gap has been increasing since the examination was introduced in 1988. At A level, girls achieve 6.8% more A-C grades than males. More boys are classified as absent in these examinations and research has shown that girls of lower ability are more likely to be entered for examinations while boys of similar ability are not (Elwood, 1995).

In the UK, females have consistently outperformed males in English at GCSE (age 16). For example, Table 5.1 below, shows the differences in performance in English from 2000-2002 (JCGQ 2002). A minus figure indicates girls are doing better than boys in examination performance. The table highlights gender differences in the achievement of grades A*-C, with 14.9% more females achieving at least a grade C in 2002. This figure has decreased over the 3 years but differences in performance in English are still significant and show no sign of decreasing to any great extent.

Table 5.1: Differences in performance of boys and girls in English (grades A*-C) at GCSE

GCSE	2000	2001	2002
	% A*-C (b-g)	% A*-C (b-g)	% A*-C (b-g)
English	-15.6	-15.4	-14.9

b=boys; g=girls

The difference in performance in English at A level is less marked. Table 5.2 shows the differences in performance between boys and girls at A level from 2000-2002. In 2000, 0.1% more males achieved at least a grade C; the difference has increased in 2002, with 5% more females achieving at least a grade C.

Table 5.2: Differences in performance of boys and girls in English (grades A-C) at A level

A Level	2000	2001	2002
	% A-C (b-g)	% A-C (b-g)	% A-C (b-g)
English	0.1	-3.4	-5.0

b=boys; g=girls

In the UK, females have marginally outperformed males in mathematics at GCSE (age 16). Table 5.3, below, shows the differences in performance from 2000-2002 (JCGQ 2002). The table highlights that although females are performing better than males, the differences are small and have remained the same over the three years.

Table 5.3: Differences in performance of boys and girls in mathematics (grades A*-C) at GCSE

A Level	2000	2001	2002
	% A*-C (b-g)	% A*-C (b-g)	% A*-C (b-g)
Mathematics	-0.9	-0.9	-1.0

b=boys; g=girls

At A level the differences in performance are greater than at GCSE, with a higher percentage of females achieving at least a grade C in mathematics. Table 5.4 shows the differences in performance from 2000-2002 (JCGQ 2002). A note of caution here is that these figures are calculated from a number of syllabuses, each with their own patterns of performance. For example, in applied mathematics boys would out-perform girls at A level.

Table 5.4:Differences in performance of boys and girls in mathematics (grades A-C) at A level

A Level	2000	2001	2002
	% A-C (b-g)	% A-C (b-g)	% A-C (b-g)
Mathematics	-4.2	-5.5	-6.4

b=boys; g=girls

Differences in performance at GCSE in the UK for double award science continue to show girls ahead. Table 5.5, below, shows that a larger percentage of females achieved at least a grade C compared with males. Furthermore, the differences in performance have remained fairly static from 2000-2002

Table 5.5: Differences in performance of boys and girls in double award science (grades A*-C) at GCSE

A Level	2000	2001	2002
	% A*-C (b-g)	% A*-C (b-g)	% A*-C (b-g)
Double Award Science	-3.6	-2.5	-3.4

b=boys; g=girls

Differences in performance at A level show a similar pattern, with a higher percentage of females achieving at least a grade C in biology, chemistry and physics. Table 5.6 shows the difference in performance in the three science subjects. The table also highlights that in the case of physics the gap in performance between males and females is increasing.

The results from GCSE and A level from 2000-2002 indicate that females are outperforming males in English, mathematics and science in the UK. Furthermore, in terms of overall performance, these gendered patterns of performance found at GCSE and A level in the UK are similar to those found at JCE and LCE.

Table 5.6: Differences in performance of boys and girls in science (grades A-C) at A level

A Level	2000	2001	2002
	% A*-C (b-g)	% A*-C (b-g)	% A*-C (b-g)
Biology	-5.9	-5.3	-5.8
Chemistry	-5.5	-5.5	-5.4
Physics	-7.4	-9.9	-10.6

b=boys; g=girls

5.2 Gender differences in achievement: international perspectives

In considering gender-related differences in performance at the compulsory stage of schooling in other English speaking nations, findings from a number of large scale international and national studies were examined. The Third International Mathematics and Science Study (TIMSS 1999) was originally conducted in 1995 to provide a base from which researchers could better understand the performance of different educational systems and it is now part of a long term strategy in assessment in mathematics and science. The Programme for International Student assessment (PISA) (OECD, 2000) is a three-yearly survey of the knowledge and skills of 15-year-olds in the principal industrialised countries. It assesses how far students near the end of compulsory education have acquired the knowledge and skills that are essential for full participation in society. It presents evidence on student performance in reading, mathematical and scientific literacy. As well as reviewing the TIMSS and PISA studies, other cross national surveys are considered. The National Assessment of Educational Progress (NAEP) is one of the longest running surveys in the USA; the School Achievement Indicators Programme (SAIP) in Canada, and the National Report on Schooling in Australia, a programme recently commissioned by the Ministerial Council on Education, Employment Training and Youth Affairs (MCEETYA).

English

In English, girls have consistently outperformed boys in all the main aspects of the subject, especially reading and writing, across all assessment systems (White, 1995). The results highlighted from the JCE and LCE suggest that there is no compelling evidence that these examinations are operating in any way differently than other examinations of English. Many of the large-scale surveys support previous knowledge about gender differences in one's native language. Generally, differences tend to favour females at all ages and tend to decrease with age. In the Programme for International Student Assessment (PISA) in reading literacy (OECD 2000), females showed superior performance in all participating countries. Females, on average, perform better than males on the reflection and evaluation scale. On the interpreting texts scale and the retrieving information scale, females continue to do better but the gap in performance decreases. The report suggests that these differences may be accounted for in differences in self-reported reading interests, with males reading more factual and functional texts and females reading more narrative, descriptive texts.

The National Assessment of Educational Progress (NEAP) in the USA reported similar performance patterns in reading literacy. In examining the trends in reading performance from 1971-1999 the NAEP reported that average reading scores for 17 year old males and females had remained fairly constant. However, across the years 1971-1999 females average reading scores were higher than that of males. Average writing scores for 17 year old students were also higher for females (NAEP 1998).

Trends in performance indicate that gender differences in verbal ability have declined in the USA over the last 20 years (Linn 1992). 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, organising of ideas, and writing coherently. Research (Linn 1992) 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.

National assessments in reading and writing carried out in other English speaking nations consistently report females outperforming males at all levels. A national report on schooling in Australia (MCEETYA 2000) reported that national benchmark results in reading for years 3 (12 years) and 5 (15 years) found no measurable differences in achievement between males and females in year 3. However, they found evidence of differences in achievement in reading in year 5. In Canada, the School Achievement Indicators Programme (SAIP) assessed the performance of 13 and 16 year olds in reading and writing. The findings from the 1998 assessment show females at higher levels of performance than males. Assessment of writing also found gender differences in favour of females amongst the 13 and 16-year-old students. Research from New Zealand found that, with few exceptions, females across all three-population groups

(All students, Maori students and Pacific island students) outperformed males at all levels of assessment in language and literacy (Praat, 1999). Thus, the performance patterns found at JCE and LCE in English are broadly in line with other educational jurisdictions that use terminal examinations as a way of assessing students' achievement at the end of significant stages of schooling.

Mathematics

Many surveys (Beller and Gafni 1995; Johnston 1996) at an international and cross-national level in mathematics have confirmed previous knowledge about gender differences in performance. These differences suggest that, on average, males and females in the earlier stages of schooling perform similarly in mathematics but as age increases males generally outperform females, and by age 15/16 males achieve better performances in virtually all aspects of mathematics tested. In the Third International Mathematics and Science Study (TIMSS 1999), all countries on average showed a modest but significant difference favouring males in mathematics, although the situation varied considerably from country to country. On average, across all countries, 23% of females compared with 27% of males reached the upper quarter level and 49% of females compared with 51% of males reached the median level. These gender differences, although small, were statistically significant. In examining the trends in gender differences no country showed a significant increase in gender differences in mathematics performance.

In the USA, the National Assessment of Educational Progress (NEAP) reported on performance scores in mathematics at grades 4, 8 and 12 (NAEP 2000). Males, on average, scored higher than females in grades 8 and 12, however, in grade 4 there was no

significant difference between the average scores of males and females. For 9 and 13 year olds, score differences that favoured females in the 1970s shifted in favour of males in the 1990s. At age 17, the score difference favoured male students across the assessment years, although the gap was smaller in 1999 than it had been in 1973.

Evidence from Australia suggests that gender related performance patterns in mathematics are less clear. The national report on schooling in Australia (MCEETYA 2000) found no measurable differences in achievement in numeracy between males and females in year 3 and 5. An examination of trends 1987-1991(SSABSA, 1993) has suggested that female performance in mathematics has 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 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. The Canadian School Indicators Achievement Programme for mathematics (SIAP 2001) shows similar results. They reported slightly more 16 year old males achieved levels 3, 4 and 5 in 'content'. However, in the 'problem-solving' component there was little difference in performance between the male and female students.

Studies on gender differences in achievement in New Zealand show inconsistent results. In 1998, data from the School Entry Assessment (SEA) showed that females performed better than males. This was supported by the National Education Monitoring Project (NEMP, 1996-1998), which found that year 8 female students scored better

than their male counterparts on seven of 53 mathematics tasks and that males scored better in one out of the 53 tasks. Cross-sectional studies examining mathematics at school leaving age found males performed better than females. In the mathematics literacy section of TIMSS (1997), males outperformed females, regardless of whether students were undertaking mathematics subjects at school at the time of testing. In school certificate mathematics, higher proportions of males than females attained the top grade (A) but there was little gender difference in grades B and C. In summary, New Zealand research indicates that in early schooling there are no gender differences in mathematics achievement and where there are small differences, they favour females. However, in secondary school males outperform females in some areas of mathematics (Praat, 1999).

However, one factor that still tends to influence performance in mathematics is that in studies of attitudes to the subject, males still tend to be more confident than females of their mathematical ability (Boaler, 1998; Elwood and Comber, 1996). This difference in confidence levels interacts significantly with examination systems that offer different levels of entry. Girls are more likely to opt for a lower level of examination due to lack of confidence in their ability to succeed and thus restrict their chances of taking their mathematics further (Elwood and Murphy, 2000). Thus, again, the performance patterns found at JCE and LCE in mathematics are broadly similar to those found in other educational systems.

Science

Evidence from large-scale assessment programmes at both a cross national and international level is that males perform better than females in science. Evidence from the TIMSS study showed (1999) that, on average, the gender difference across all participating countries was significantly in favour of males. The distribution of achievement also favoured males, with 29% of males compared with 21% of females reaching the upper quarter level. However, in all countries, science achievement for females had increased significantly from 1995-1999 and the international average for males remained fairly static.

In the USA, the NAEP (NAEP 2000) assessed science performance of students in grades 4, 8 and 12. The findings demonstrated that males had a higher average score than females at grades 4 and 8 but the two groups had similar scores in grade 12. An examination of trends in science performance 1970-1999 found that males continued to outperform females, although average scores in 1999 are lower than those in the first assessment in 1977.

Assessment of science performance by the School Achievement Indicators Programme in Canada (SAIP 1999) found no significant difference in achievement between males and females at most levels. Assessment of practical tasks also found no significant difference in achievement in 16 year olds. However, at 13 significantly more females than males perform at the higher levels. Similar findings have been reported in Australian outcomes from the PISA studies (2000). The assessment found no significant difference in mean achievement in scientific literacy between males and females. Females were stronger in biology and scientific investigation whereas males were

stronger in physics/chemistry and understanding of concepts. In New Zealand, findings from the TIMSS (1999) study found that males outperform females in scientific literacy; however, results from school certificate science show equal proportions of males and females achieving top grades. Furthermore, females outperform males in all science subjects in 6th form certificate (Praat, 1999).

Summary

What this section has highlighted is that the trends in performance observed in the JCE and LCE are not unique, nor are they a particular problem of the Irish educational system. What is evident is that any understanding of differential performance in the Junior Certificate and Leaving Certificate examination system must include a detailed investigation of the assessment techniques and instruments that are used to assess subjects and how these are likely to interact with the gender of the candidates. This is what this present study, in very broad terms, attempted to do with the JCE and the LCE.

SECTION 6

Conclusion

Conclusion

This report has considered the themes and patterns that emerged from the investigation into gender and achievement in the JCE and LCE examinations in 2000 and 2001. While the main focus of the research has been on the examinations themselves, the systems used and techniques chosen to assess students, it must be remembered that the examinations themselves are only one factor that can explain the patterns of performance observed amongst boys and girls. This is a complex area of investigation and it is hoped that this report has highlighted this point further. We must acknowledge that there are multiple factors that contribute to differential performance such as: teaching and learning in classrooms, school organisation and culture, teacher expectations, and perceptions of students learning. Indeed, we also need to consider that we have only looked at gender and that social class, and its interaction with gender and race, continues to have a major significant impact on academic achievement (Epstein, Elwood, Hey and Maw, 1998).

Main findings

This investigation has considered the evidence with regard to gender and achievement in the JCE and LCE. In doing so it has identified a number of factors that may well contribute to the differential performance observed.

General findings

In summary, the general findings of this review indicate that

- there are differential entry patterns across the three levels of entry at Junior Certificate. More boys are entered for the foundation and ordinary levels of the JCE and more girls are entered for the higher level. This pattern was similar to that observed in 2000
- girls also finish the junior cycle better qualified than their male counterparts in the proportion of A-C grades that they obtain
- there are differential entry patterns across the three levels of entry (foundation, ordinary and higher) of the Leaving Certificate. More boys than girls were entered for the foundation level, almost equal numbers of boys and girls were entered for the ordinary level, and more girls than boys were entered for the higher level. Again, these patterns reflect those found in the LCE in 2000
- given these differential entry figures, it is not surprising that girls leave schooling at the end of senior cycle better qualified than their male counterparts
- what we may be witnessing with these results is the impact of decisions made at JCE affecting entry patterns at LCE
- skewed entry patterns obviously reflect the personal choices of students. However, they must also reflect the availability of subjects in certain types of schools and how students are allocated to subjects and levels at LCE. All these factors will, however, interact with gender and how boys and girls choose, or are allocated to, particular subjects

- there are very different take-ups and outcomes by gender at LCE compared to those found at JCE. More gendered patterns of entry are found at LCE and this must have a bearing on the results, especially if students opt to remove themselves from particular subjects in large numbers, or decide to take the subject at a lower level at LCE, thus affecting their chances of taking this subject further in higher education

- the pattern of performance seen in the JCE and LCE is not unique to these examinations but reflects patterns found in other systems and in other developed countries.

English examinations

- In Leaving Certificate English examinations there are indications that, at both levels (ordinary and higher), there is more of a focus on those skills for which girls show greater aptitude. More questions ask for writing in the narrative, descriptive, imaginative domains than ask for functional or argumentative writing, which is the domain of writing that boys prefer (it is also the domain in which it is more difficult to perform well). In the area of English literature, although there is a predominance of male authors selected for study, there are more questions that focus on empathetic interaction with characters in the text, a skill for which girls show a greater aptitude than boys.

- The Junior Certificate papers were less problematic in terms of effect on performance for boys and girls. The papers covered a wider range of genres and categories of the English syllabus, were presented well and, in the main, supported structured responses from candidates. These factors would seem to be advantageous to both boys and girls.

Mathematics examinations

- The JCE and LCE mathematics papers do not seem to reflect developments in layout and presentation that would be commonly used in other educational systems with similar types of examinations.

- The questions and items do, however, very much reflect the syllabus from which they are developed. Yet there is a predictability about the papers which may well reward those candidates who are well prepared and who have familiarised themselves enough with how the examiners have chosen to examine mathematics at both Junior and Leaving Certificate.

- The superior performance of girls in mathematics across both Junior and Leaving Certificate may well be explained by the fact that they are better prepared and organised; they are more familiar with the conventions and requirements of the mathematical topics covered in the syllabus, they have learnt the rules and formulae and can recall these as required by the questions asked. Boys, on the other hand, are generally less well organised than girls and less well prepared for examinations, preferring to take risks on the day.

- It would seem from the review that a very narrow view of achievement in mathematics is promoted by these examinations, and it is one that does not sit comfortably with the aims and objectives outlined in the syllabuses on which the courses of mathematics in schools in Ireland are based.

Physics examinations at LCE

- More boys are entered for physics than girls at LCE at both ordinary and higher levels, yet do less well. This is similar to other examinations in physics at this age in other jurisdictions. Explanations for these patterns of performance have tended to suggest that the small groups of girls who tend to do physics at advanced level are extremely able girls, and therefore perform better than their male counterparts. This may well be the case in Leaving Certificate physics.

- In reviewing the physics papers at LCE across both levels, the absence of items set in context or everyday 'real-life' situations is particularly interesting, as this is contrary to other types of physics examinations in other jurisdictions at this stage of schooling.

- There is a high degree of recall required for the LCE examination in physics. Girls have been shown to be better prepared than boys when it comes to examinations, and it may well be that this preparation is putting them at an advantage in the physics examination at Leaving Certificate.

Science examinations at JCE

- The Junior Certificate papers at higher level are less similar to other examination papers for this age in other jurisdictions. With the narrow way in which science is tested at JCE, relying on only testing content knowledge, it could be argued that these examinations could be having quite a significant (negative) impact on the science curriculum that is taught in Irish schools.

- The superior performance of females on the science papers may well be explained by them being better prepared and organised; they are more familiar with the conventions and requirements of the science topics covered in the syllabus, they have learnt the content that is focused on in the tests, and they can recall these as required to do so in the questions asked. Boys, on the other hand, are generally less well organised than girls and less well prepared for examinations, preferring to take risks on the day. The approach taken in science examinations may well be putting boys at a disadvantage, as they could be caught short on science papers that require less risk taking and more recall of facts and rules learnt over the time of the course.

Areas for further research

- There are some clear areas where research is needed if we are to have a fuller picture of gender and achievement in the Leaving and Junior Certificate examinations and in relation to assessment more generally. The following is a list of those areas that could be the focus of further research:

- This study has only looked at gender and achievement. There is an urgent need to investigate the impact of other variables such as race and class on achievement. Moreover, research into the interaction of race, class and gender, and how this affects the performance of students in schools, is well overdue.

- Much of the research conducted into gender and achievement in examinations and assessment is cross-sectional in nature and tends to ignore the voice of the student. Further research is needed that takes a longitudinal look at the impact of examination structures and techniques on performance and how students themselves

experience the examination system and the gendered nature of this experience.

- This project would have been enhanced by the availability of the responses of students to examination items. Further research is needed that looks at student responses to items on examination papers and how this links with the expectations of examiners and their definitions of success.

- Further research is needed into the decision making process around level of entry at JCE and LCE. How teachers make decisions, and how these decisions interact with students' perceptions of their own abilities, needs to be explored. The influence of how school-level policies about availability of subjects and 'take-up' of subjects interact with the level of entry needs further investigation.

- The development of examinations, the material that is chosen to be assessed and how this is assessed are value-laden activities; examinations are not socially neutral. Further research is needed on the role of gender in influencing how examiners choose to examine subjects. Who is making the value judgements about what is included and how it is examined? This needs to be investigated. There is a general lack of research around examiners and how they make their judgements per se. To understand the gendered nature of these judgements would add substantially to our understanding of how examinations impact on the performances of boys and girls in examinations.

- Further research is needed into the link between the material that is examined and the textbooks used in schools. Such research would be informative in understanding whether a culture of 'teaching to the test' exists in Irish schools and how this affects the achievements of both boys and girls.

- The NCCA and the DES may wish to investigate making examination data more publicly available in different formats. Summary data by gender would be helpful for schools who wanted to monitor gender and performance in their own institutions more generally.

- The NCCA and the DES may wish to consider reviewing particular aspects of the examination system. For example, they may wish to consider: the annual publication of Chief Examiners' reports for all examinations and subjects; whether different levels of entry continue to provide equality of opportunity and the value to students and schools of foundation level; the use of context in examinations papers; layout of examination papers and directions given to students; length of time allocated to examinations (especially in Junior Certificate English); the gender make-up of examiner teams, and the introduction of coursework into the examination system as a whole.

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