Gender Issues – Raising the Attainment of Boys in Design and Technology

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Abstract
This paper examines the context of boys' performance in design and technology, a subject which has evolved from a traditionally male-dominated subject to one where girls are achieving higher levels of examination success than boys at all levels. By examining the extent of girls' superiority over boys in design and technology, and the changing role of boys and males in society, the many reasons for the notional underachievement of boys can be explored.

From the literary review and school-based study that took place, assessment arises as the essential mechanism in defining underachievement. This paper concludes with the proposal that before labelling any group as underachievers, the system that defines underachievement must be fully investigated.

Keywords
underachievement, assessment, labelling, boys, failures, gender

Introduction
The short history of design and technology has been closely linked with gender issues in response to differential participation of girls and the changing examination success of girls and boys. Harding identified that "all three antecedents of Technology have been sex differentiated in the past. They have been the most strongly gendered of all curriculum areas" (1997: 20). The subject of design and technology has, however, continued to evolve from what were predominantly male-dominated activities to its current position; it continues to exist uncomfortably alongside the 1944 Educational Act philosophy of 'equality of opportunity'.

Many initiatives were introduced during the 1980s which have some connection with the continuing gendered evolution of design and technology. These included the Technical Vocational Educational Initiative (TVEI), Women into Science and Engineering (WISE), Girls and Technology Education (GATE) and Girls into Science and Technology (GIST). Each maintained a gender and equal opportunities philosophy. These projects were primarily designed to encourage access and participation of girls into the traditionally male-dominated subjects of science and technology, with the object of increasing female participation in the secondary phase, undergraduate level courses and subsequently career choices in these areas.

The success of these interventionist programmes was variable. However, the outcomes of government legislation (Education Reform Act, 1988) in establishing General Certificate of School Education (GCSE), Ofsted and National Curriculum technology have all had a much more profound effect on increasing female participation and success in the subject.

With the establishment of compulsory design and technology at Key Stages 1, 2, 3 and 4 in 1994 and 1996, the outcomes have manifested girls' participation in design and technology into complete dominance of the subject as measured by end of key stage teacher assessments and GCSE examinations. This pattern of success in design and technology is now replicated in virtually all GCSE subjects and has led to serious concerns within schools, with boys being labelled as 'underachievers' (Ofsted, 1997:9).

Politically, educationally and through the publication of 'league tables', the subject of boys' perceived underachievement has become a major concern, and many equal opportunity and gender issues that were on the agenda for the 'girl intervention programmes' are now paradoxically being re-examined from a boys' perspective. Biological, psychological, and sociological factors need to be examined. In addition, the changing nature of the subject matter, out of school experience, expectations, the changing role of the male in society and the nature of teaching, learning and assessment have to be re-examined.

The context of the design and technology gender gap

One conventional method of measuring school and pupil performance at GCSE level has been to count the number of students achieving five or more A* to C grades at GCSE in public examinations. This measure is used to inform the public, schools and politicians, via 'league tables', of the relative success of schools. Since this system was adopted in the late 1980s (which coincided with the introduction of GCSE), there has always been a gap in performance outcome in favour of girls over boys. However, what is now noticeable is that the gap is widening. Furthermore in design and technology, with schools legally obliged to offer the subject to all pupils in England at Key Stages 3 and 4, the gap is increasing significantly in favour of girls.

Prior to the Education Reform Act (1988), there was a completely different pattern of assessment. Examination was in two tiers – Certificate of Secondary Education (CSE) and General Certificate of Education (GCE) O Level. What is now recognised as design and technology was made up of a diverse range of individual subjects. Participation was clearly divided by the sexes and comparison of attainment was difficult.

The extent of the gender subject division at the start of the 1980s can be seen by examining Figure 1 (source: Girls And Technology Education (GATE) project at Chelsea College, 1981), which illustrates the clear sex divide in subject participation at CSE level.

Figure 1: The GATE project CSE subject breakdown.

The percentage distribution of boys and girls in CSE (all modes) entries (1980)

Boys (%)	(%) Girls		Total Entries
0	100	Needlework	38,594
9	91	Domestic subjects	128,299
18	82	Commercial subjects	94,539
30	70	Biology	193,027
36	64	French	147,446
50	50	English	588,381
51	49	Art	163,597
96	4		95,983
98	2		61,213
99	1		59,702

From Figure 1, it can be seen that those subjects which were to contribute to the new design and technology (metalwork, woodwork, technical drawing, needlework, and domestic subjects) occupy the extremes of the table. The CSE examination was specifically for lower ability pupils and the higher number of entries for these subjects at this level reflects the low academic status that these subjects had. The GCE table (*see Figure 2*) indicates a lower number of entries for the more demanding examination. In addition, the difference in academic expectations of teachers does not appear to transcend the gender issue. There remained a clear sex division at the higher GCE O level.

Figure 2: The GATE project GCE subject breakdown.

The percentage distribution of boys and girls in GCE 'O' Level entries (1980)

BOYS (%)	(%) Girls		Total Entries
0	100	Needlework	18,594
3	97	Domestic subjects	52,696
27	73	Sociology	46,210
42	58	Eng. Literature	250,493
46	56	Art	121,200
46	54	Eng. Lang.	500,564
49	51	History	134,977
96	4		95,983
97	3		9,208

	Woodwork	99	1		15,182
	Metalwork	99	1		13,015

> “All three antecedents of technology have been sex differentiated in the past… Entries at 'O' and 'A' Level in Engineering Science, Electronics and Modular Technology in the 1980s were overwhelmingly from boys, until the TVEI programme required that efforts should be made to avoid sex-stereotyping where these subjects were included in the TVEI programme. Statistics for 1992 showed only 2.7% of CSE and 1.6% of 'O' Level Woodwork entrants were girls, for Metalwork the figures were 1.2% and 0.9% and for Technical Drawing 5.1% and 5.3%.”
> (Harding, 1997:20)

Through the establishment of a common system of examining GCSE and the introduction of National Curriculum technology (later followed by design and technology in 1995), the formal legislation for addressing equal participation was put in place. Participation of girls increased significantly at all key stages.

The GCSE course (1988) was designed to tap a wider range of skills and attainment whilst employing a wider range of teaching styles, skills and assessment techniques. There was an increasing emphasis to be placed upon the application of knowledge through the enhanced role of coursework, and a movement away from memorising facts in response to "concerns about the validity of the context of terminal examination assessment" (Gipps, 1994: 217).

> “Cresswell (1990) analysed the results from the 1989 AEB GCSE examinations in English, mathematics and science... A clear pattern emerged from the data: girls' average coursework marks were higher than boys' in every case. In mathematics and combined science boys' marks on the other (non-coursework) components were, on average, higher than girls' marks; in English the girls' average written paper marks remained higher than the boys' average marks, although the difference was less for the coursework.
> (Arnot, 1998:37)

A consistent pattern of success for girls began to emerge during the early 1990s, although initially through the tiered examination approach (ironically a reason for moving away from the previous system). Girls were generally being entered for the middle (safer ground) tier and were consequently restricted by an attainment ceiling. "The researchers were particularly concerned about the potential underestimation of girls' ability evidenced by their overrepresentation in the intermediate tier" (Gipps, 1994: 224). It could therefore be argued that girls' increased success at GCSE is due to teachers gaining confidence in the placing of pupils in the correct tiers and that girls'

progress in the past has merely been restricted by the lack of equal opportunities in schools. If this is true, then perhaps we are now seeing a more accurately reflective pattern of performance by both sexes.

The establishment of Ofsted and the legislative requirements of a four-year 'quality assurance' inspection cycle have monitored equal opportunities and further increased accountability. Schools and departments are expected to have equal opportunities policies in action.

> “There is an increasing consciousness of differences in the educational performance of boys and girls, but in one third of schools the monitoring of progress of boys and girls is weak. Where differences of performance are identified, this information is not adequately used to review practice and inform such planning.”
> (Ofsted, 1996:8)

The inspection service, although recognising the higher standards of achievement of girls, does little to advise on how to respond to this changing performance, and merely uses it as another indicator to quantify a department's achievements or weaknesses.

> “In both key stages, more girls than boys achieve higher standards when working with resistant materials, textiles and food, although the boys tend to do better with systems and control activities.”
> (Ofsted, 1996: 10)

The 1996 report was compounded by the 1997 Ofsted report, which reviewed inspections from 1993 onwards.

> “Girls have increasingly made better progress and achieved higher levels of attainment than boys in all areas of D&T except systems and control. In general, girls manage their work more effectively, meet deadlines and take greater care over the quality of presentation. They frequently write at greater length, but not necessarily more analytically or creatively than boys. Few D&T departments analyse the reasons for such differences in performance, and so they have no strategies for raising standards overall.”
> (Ofsted, 1997: 138)

Ofsted Chief Inspector Chris Woodhead further commented on the overall issue of boys' performance "...the failure of boys and in particular white working class boys is one of the most disturbing problems we face within the whole education system" (1994). It is interesting that Woodhead clearly sees the issue as 'the failure of boys' and not the success of girls or as a consequence of the interventionist programmes of the 1980s.

The Ofsted role in quality assessment can be considered as deriving information from subjective observations as the criteria for examining standards in education are not sufficiently articulated or quantifiable. National Curriculum and GCSE assessments do, however, provide a quantifiable and measured outcome through testing and assessment at the end of Key Stage 3 and Key Stage 4. The National Curriculum arrangements for design and technology at Key Stage 3 in 1997 and 1998 were based upon teacher assessment. Figure 3 highlights the gap in performance based upon National Curriculum criteria over Key Stage 3.

Figure 3: Teacher assessment for National Curriculum design and technology, 1997.

Subject	Assessment	%5 and above	Girls	Boys
Design and technology	Teacher assessment	56%	64%	49%

As the teacher assessments are based upon assessments over a three-year period focused on projects created by teachers, questions arise as to whether teacher assessments are biased, or whether the make-up of teachers, Focused Practical Tasks (FPTs), Design and Make Assignments (DMAs) and Identification, Disassembly, Evaluation of Artefacts (IDEAs) are gender biased? In addition, is the National Curriculum gender biased/balanced?

The Consortium for Assessment and Testing in Schools suggested that "boys appear to be slightly under-predicted in TA (teacher assessment)" (CATS, 1991:57). This has a significant impact on boys' attainment, as there has been a movement away from Standard Attainment Tests (SATs) which tended to appeal more to boys' abilities: "…it was acknowledged that some of the SAT's key features rendered the assessment tasks more accessible, and therefore more fair" (Gipps, 1994:208).

The implication is that the National Curriculum assessment evolved from a system based upon teacher assessment and formal SATs. Unfortunately, due to the difficulties in administering the testing, the SATs were dropped (with the exception of mathematics, English and science). Subsequently teacher assessments remained, which generally favour girls. Although this is not sufficient to explain the considerable gap in performance at Key Stage 3, it must be considered as an important factor and must be examined before further groups of boys are labelled as failures and underachievers.

If the 1997 cohorts' progress is monitored through to the 1999 GCSE results (*see Figure 4*), it can be seen that the gap in attainment remains consistent. In addition, the issue of a stereotypical gender division by entry (as in 1980) is still prevalent (*see Figure 5*).

Figure 4: 1999 % A-C GCSE results for design and technology.

Boys	**Girls**	**Difference**
43%	58%	+/- 15%

Figure 5: 1999 (1997 National Curriculum cohort) design and technology by gender entry and subject residuals.

Design and technology subject	Entry	Overall residual	**Boys entry (%)**	Boys residual	**Girls entry (%)**	Girls residual
Electronic products	17,051	-0.32	**91**	-0.31	**9**	-0.36
Engineering	3,885	-0.29	**90**	-0.25	**10**	-0.67
Systems and control	14,768	-0.41	**88**	-0.41	**12**	-0.42
Resistant materials	105,540	0.04	**76**	0.05	**24**	-0.01
Graphic products	88,582	-0.22	**58**	-0.31	**42**	-0.11
Design and technology	3,265	0.11	**51**	0.02	**49**	0.22
Food technology	101,115	0.14	**26**	-0.16	**74**	0.24
Textiles technology	41,122	0.10	**5**	-0.28	**95**	0.12

Figure 5 illustrates that the subject may not have been successful in addressing gendered perceptions within the subject. There is clearly a subject division by gender within design and technology (notably food, textiles, electronics, systems and control, and resistant materials).

Conclusion

Literally millions of pounds have been spent on design and technology within the last decade, updating and resourcing workshops and laboratories. This has been part of the essential growth of the subject. However, comparatively little has been spent on researching the teaching and assessment processes within the subject.

This lack of research has meant that the debate about boys underachieving, assessment issues and legislative effects irrespective of gender has operated at a low level.

From this paper arise essential questions which those involved in the subject must be prepared to tackle if the subject is to continue to evolve in order to establish a subject which has equality at its core.

- Is the current gender gap in design and technology a function of an approach that is not well founded, and how desirable is it to have such a gap?
- Do National Curriculum teacher assessments need to be standardised to ensure greater accuracy of the data produced and, if so, how can this be achieved?
- Are more flexible approaches in the assessment of design and technology needed to avoid gender bias? If so, what form would these be in?
- Is design and technological capability currently assessed by the National Curriculum and GCSE?
- How should schools analyse the data collected from National Curriculum assessments, and how should this information be reported? In addition, how should the information be used to inform teaching methods?
- How do new educational reforms (for example Literacy Hour, National Curriculum) impact upon the progress of particular groups of pupils?
- Is the use of extended projects in design and technology the most effective way of gathering evidence for assessing ability, and does this method favour particular groups of pupils?
- Do self-fulfilling prophecies established through the labelling process at Key Stage 3 impact upon and transcend GCSE achievement?
- Is the existing gender entry pattern within design and technology focus areas desirable?

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