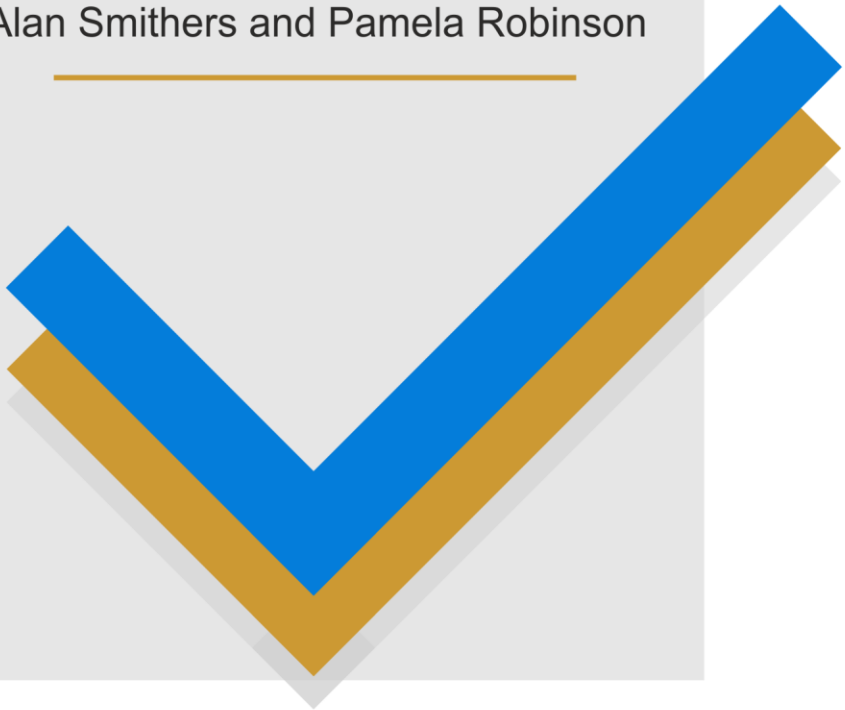
THE ENGINEERING COUNCIL

TECHNOLOGY TEACHERS

Alan Smithers and Pamela Robinson



GETTING IT RIGHT

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Foreword

This report is the third of a trilogy published by The Engineering Council on technology in schools. The first report published in May 1992, Technology in the National Curriculum, gave an analysis of the development of technology as a school subject. The second, Technology at A-level, looked at progression from the national curriculum to technology in higher education.

After the first report was published the Secretary of State for Education ordered a review of the subject following representations by The Engineering Council. Subsequently, there have been a number of proposals and consultations on technology in the national curriculum. This is an indication of the difficulty that has been experienced in creating a subject labelled 'technology' with a measure of consensus over what it actually is.

This third report examines what is happening in schools as the subject evolves, the views of teachers on the subject developments, and recruitment to technology teaching. It makes important recommendations for action to strengthen the teaching of the subject.

The authors, Professor Alan Smithers and Dr Pamela Robinson of the Centre for Education and Employment Research, University of Manchester, have again produced an important contribution to the on-going debate over the development of school technology.

I strongly commend the report to Government, the School Curriculum and Assessment Authority, the National Council for Vocational Qualifications and others.

Denis E Filer CBE TD FEng
Director General, The Engineering Council

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Introduction

1. It has proved very difficult to create technology as a national curriculum subject. The proposals published by the School Curriculum and Assessment Authority (SCAA)[1] in May 1994 are the fifth attempt in six years. There was first the report of Lady Parkes' Working Group[2] in June 1989 whose proposals were revised (notably by stripping out most of the content to leave the subject without a specified knowledge-base) by the then National Curriculum Council[3] in November 1989, to become the basis of the existing Statutory Order. Following severe criticisms[4], national curriculum technology has been revised successively by Her Majesty's School Inspectors[5] in December 1992, a much changed National Curriculum Council[6] in September 1993, and most recently by SCAA as part of Sir Ron Dearing's overall review.

2. Why so many false starts? Framing even familiar subjects like English in national curriculum terms has not been easy, but with technology it has been doubly difficult because there has been no consensus as to what it actually is. Indeed, it is difficult to know what to call it. The national curriculum subject is labelled 'technology' to embrace both 'design and technology' and 'information technology' - for which SCAA has now produced separate proposals. In recent listings 'technology' appears variously as 'technology', 'design and technology' or 'craft, design and technology (CDT)'. For simplicity we shall mainly use the generic term 'technology'.

3. Technology in everyday language usually means 'improving or inventing things through the application of science', but, in schools, technology became associated with craft as part of a sixties-movement to make workshop skills seem more exciting[7]. There has thus been a tension, which persists to this day, between the claims of a subject which is seen to be about honing up practical skills and developing personal qualities such as precision, perseverance and patience, and one which is about applying, designing and creating.

4. What the subject can be is of course inextricably bound up with who is available to teach it. If it is to be essentially about high quality making then it will need to draw on teachers who have traditionally staffed the craft departments of our schools, but if it is to be primarily about the application of science and link up with technology in higher education then it will need to attract a new breed of technology teacher. But we are not starting with a blank sheet of paper and changes cannot be made overnight.

5. At present we are training about 2,050 technology teachers a year of whom about 1,320 are core[8], but we need over 25,000[9] to staff our secondary schools, to say nothing of primary schools. Thus even if we were able to decide today what technology is to be, if it were radically different from what it is now, it would take two decades to re-staff just secondary schools, even if all the trainees took up posts as technology teachers, and what would happen in the meantime? In thinking about the future of the subject it thus becomes important to ask who are the technology teachers now. Not only are they those currently available to teach the subject, but it is they who will be a powerful influence in the consultation on Sir Ron Dearing's proposals.

Who are the Technology Teachers?

6. It is by no means clear who to count as a technology teacher. The evolving nature of the subject has caused considerable difficulties to those who would compile the statistics. The annual teacher recruitment surveys[10] from the Department for Education (DFE) now treat technology as an amalgam of design and technology, home economics, business studies and computing; and the latest target figures[11] are also framed on this basis. However, the Graduate Teacher Training Registry[12], the admissions body for postgraduate teacher training courses, identifies the subjects separately, with even a distinction between CDT and technology which is included among the science subjects. (The Guide for Applicants 1994 further gives a science subject code to some technology courses and a CDT code to others.)

7. This ambiguity also emerges in the classification used by the GCSE and GCE Boards[13]. Technology is one of the 32 main categories, but there is also a GCSE Technology among the sciences. The DFE vacancy survey[14] continues to list CDT, home economics/needlework, art/light craft, commercial and business studies, and computer studies separately; and the Secondary School Staffing Survey 1992[15] has individual entries for craft, CDT, information technology, 'other technology', home economics, and business studies. In all this, art and design, one of the subjects Lady Parkes was originally asked to consider as part of technology seems to have been left to one side.

8. Technology is therefore not yet a well-established category for classifying teachers and to discover who the technology teachers currently are it seemed best to take a direct approach. In a questionnaire survey of a sample of 349 schools representative of the 3,488 maintained secondary schools[16] in England and Wales (see Appendix A, page 20), we asked the heads of technology departments to list their members of staff. They provided details on, including themselves, 2,981 teachers, 1,954 full-time and 1,027 part-time[17] On average, this works out at 5.6 full-time and 2.9 part-time per school. There were also 31 vacancies - less than 0.1 per school. With the inclusion of home economics, about half the technology teachers were men, 1,542 (51.7 per cent), and half, 1,439 (48.3 per cent) women, with a larger proportion of men (55.9 per cent) among the full-time teachers.

9. The teachers came from a wide variety of backgrounds and offered a diverse array of specialisms. These are displayed in Chart 1. Just over half the full-time teachers (53.2 per cent) were from CDT, nearly a third (32.5 per cent) from home economics, with the rest evenly spread between art and design (4.9 per cent), business studies (4.8 per cent) and information technology (4.7 per cent). Much of the technology teaching in these three areas seems to be covered by teachers dividing their time between departments.

10. The roots of national curriculum technology are evident in the particular specialisms. The most commonly cited areas of expertise among those from CDT backgrounds were resistant materials (deriving from the old woodwork and metalwork courses), and graphics which has emerged from technical drawing. Control systems and design and realisation were also frequently listed. Among those from a home economics background the specialisms were mainly food or textiles. But the technology teachers, as reported to us, were a very diverse group encompassing everything from silversmithing to keyboard skills. Among the 'other' category were science, maths,

English, music and history teachers, as well as those with expertise in special needs, multicultural education and learning support.

Chart 1: Technology Teachers

Specialism	% Full-Time (N=1954)[1]	% Part-Time (N=1020)[2]
CDT		
Resistant Materials	17.3	7.1
Graphics	11.6	7.5
Control Systems	9.2	6.3
Design and Realisation	7.7	3.3
Design and Communication	0.9	0.2
Engineering	0.7	0.5
Mechanisms	0.6	0.5
Structures	0.3	0.1
Pneumatics	0.3	0.2
Motor Vehicle Studies	0.3	0.4
General	4.3	1.5
All CDT	53.2	27.6
Home Economics		
Food/Catering	19.1	17.1
Textiles	11.6	14.4
Child Care	1.1	1.4
General	0.7	0.9
All Home Economics	32.5	33.8
Art and Design		
Painting	1.5	2.8
Ceramics/Pottery	0.9	1.7
3D Design	0.7	1.0
Photography	0.3	0.2
Printing	0.2	0.2
Jewellery	0.2	0.1
General	1.1	2.9
All Art and Design	4.9	8.9
Business Studies		
Keyboard Skills/Office Practice	0.7	1.3
Marketing/Commerce	0.3	0.5
Accounting	0.3	0.3
Economics	0.1	1.3
General	3.4	8.5
All Business Studies	4.8	11.7
Information Technology		
Computing	0.7	0.3
Information Systems/Databases	0.3	1.1
Programming/Networks	0.2	2.3
General	3.5	10.7
All Information Technology	4.7	14.4
Other	0.2	3.4

1. Includes three heads of department, two with science qualifications, who co-ordinate technology but do not teach it.
2. 7 missing cases.

11. There were vacancies in 24 of the schools, 31 in all, 20 full-time and ten part-time and one either. Eleven of the schools (45.8 per cent) were looking for replacements in CDT and four in home economics (16.7 per cent). In considering their likely future needs, 216 schools specified preferences. Of these, 101 (46.8 per cent) mentioned CDT and a further 67 (31.0 per cent) 'general technology expertise'. Twenty-three said they would be looking for information technology (10.7 per cent). Only 16 (7.4 per cent) were wanting home economics, seven (3.2 per cent) art and design, and

none business studies. This gives some indication of the likely future direction of technology.

What is Taught?

12. The compartmentalization of technology into the five areas of CDT, home economics, art and design, business studies and information technology derives from the remit given to Lady Parkes' working group and embodied in the existing Technology Order. The balance of staff between those areas reflects the interpretation in schools. Chart 2 shows what is being taught at present in the name of technology. The backbone of the subject in operation is clearly CDT and home economics which are taught as part of technology in respectively 99.7 per cent and 94.3 per cent of the 349 schools in the sample. Just one girls' school did not offer CDT, and only 20 schools, 19 of which were boys' schools, did not provide home economics. Information technology (71.9 per cent), art and design (51.6 per cent) and business studies (45.6 per cent) were also taught in various combinations with CDT and home economics as part of technology, but they were also often taught elsewhere on the timetable. Only just over a fifth of schools (22.6 per cent) included all five as part of technology.

Chart 2: Subject Areas Taught as Part of Technology

CDT	Home Economics	Information Technology	Art and Design	Business Studies	Schools N	Schools %
x	x	x	x	x	79	22.6
x	x	x	x		55	15.7
x	x	x		x	52	14.9
x	x	x			51	14.6
x	x				46	13.2
x	x		x		26	7.4
x	x			x	10	2.9
x	x		x	x	9	2.6
x		x	x	x	6	1.7
x		x			5	1.4
99.7[1]	94.3	71.9	51.6	45.6	339[2]	97.0

1. Per cent of schools offering subject area as part of technology.
2. Ten schools offered various other combinations.

13. About two-thirds of the schools (68.4 per cent) devoted 5-10 per cent of curriculum time in Years 7-11 to technology with just under a quarter (22.5 per cent) giving 10-15 per cent.» Most of the rest (7.2 per cent) gave it even more although seven schools (2.0 per cent) appeared to be teaching technology for less than five per cent of the time. The comprehensives without sixth forms and the secondary moderns generally devoted more time to technology than did the comprehensives with sixth forms, which in turn gave it more time than the grammar schools.

GCSE and A/AS Examinations

14. The heterogeneity of technology also emerges in the examinations for which the pupils were being prepared. Chart 3 shows that the technology departments in the sample entered GCSE candidates for six of the 32 subject categories used by the Examining Boards -Technology, Home Economics, Art and Design, Business Studies, Computer Studies and Science (electronics). The GCSE technology

examination most frequently offered was CDT: Design and Realisation (213 schools) followed by CDT: Design and Technology (183), CDT: Design and Communication (173), CDT: Technology (159) and Home Economics: Food (132). Only 30.0 per cent of the schools had over 90 per cent of their GCSE pupils taking an exam in technology defined in these terms, and in one in five fewer than 30.0 per cent were entered.

Chart 3: GCSE Examinations

Title[1]	N	%[2]
CDT (Technology)	159	45.6
CDT (Design)	29	8.3
CDT (Design and Communications)	173	49.6
CDT (Design and Realisation)	213	66.2
CDT (Design and Technology)	183	52.4
CDT (Building Studies)	1	0.3
Control Technology	1	0.3
Engineering Studies	3	0.9
Graphics	8	2.3
Motor Vehicle Studies	7	2.0
Home Economics	15	4.3
Home Economics (Child Development)	45	12.9
Home Economics (Food)	132	37.8
Home Economics (Textiles)	55	15.8
Home Economics (Home & Family)	6	1.7
Art & Design	22	6.3
Business Studies	47	13.5
Computer Studies	9	2.6
Information Technology	23	6.6
Information Studies	9	2.6
Electronics	8	2.3

1. Based on categories of *Inter-Group Statistics 1993* compiled by the Joint Council for the GCSE.
2. Per cent of schools in sample (N=349) offering the exam.

15. Two hundred and one of the schools had a sixth form of which 147 (73.1 per cent) offered A-levels and 24 (11.9 per cent) AS examinations in the technology area. Chart 4 shows that most of the A-level entries were in CDT: Design and Technology (125), a new and wide-ranging category recently adopted by the GCE Examining Boards, followed by Graphics (20) and Home Economics (12). Textiles is available both as a home economics and an art and design examination; graphics as both a technology and an art and design examination.

16. *Inter-Board Statistics* show that in 1993 there were 22,678 A-level entries in Business Studies and 21,183 in Art and Design compared with 10,934 in all areas of Technology suggesting that in many schools these must comprise separate departments in the sixth-form. At GCSE there were 114,335 entries in Business Studies and 213,920 in Art and Design compared with the 204,715 in all areas of Technology, indicating that at this level too these subjects are treated separately from technology. Entries for Computer Studies at 69,704 are also out of proportion to the number of computing staff identified in the technology departments. The pattern of examination entries tends therefore to reinforce the picture of technology in schools

as consisting mainly of a mix of CDT and home economics, with a leavening of various combinations of art and design, business studies and information technology, which are also frequently taught elsewhere.

Chart 4: A/AS Examinations

Title[1]	A-Level[2]		AS-Level[2]	
	N	%[4]	N	%[4]
CDT (Design)	7	3.5	1	0.5
CDT (Design & Technology)	125	62.2	15	7.5
Graphics	20	10.0	-	-
Home Economics	12	6.0	1	0.5
Home Economics (Food)	10	5.0	-	-
Home Economics (Textiles)	9	4.5	3	1.5
Home Economics (Home & Family)	4	2.0	1	0.5
Art & Design	5	2.5	-	-
Art & Design (Graphics)	1	0.5	1	0.5
Art & Design (Photography)	1	0.5	-	-
Art & Design (Textiles)	3	1.5	-	-
Business Studies	4	2.0	1	0.5
Computer Studies	3	1.5	-	-
Electronics	1	0.5	2	1.0

1. Based on categories of Inter-Board Statistics Summer 1993 compiled by the GCE Boards.
2. 147 schools offer 205 syllabuses in technology.
3. 22 schools offer 25 syllabuses; in two further schools ASs were on offer but there were no takers.
4. Per cent of 201 schools in sample with sixth forms.

Heads of Department

17. The heads of technology departments were also asked to describe themselves. Their characteristics are shown in Chart 5. Three-quarters (74.8 per cent) were men, with four-fifths (82.0 per cent) having CDT as their main area of expertise. Eighty-eight of the heads of department were women with more than two-thirds (71.6 per cent) coming from home economics. A fifth of the female heads of department ran technology in girls' schools, most were in mixed schools, but one was even in charge in a boys' school. Most of the heads of department were full-time in technology though 5 .4 per cent were part-time; three, including two science teachers, co-ordinated the departments without actually teaching in them. Nearly half the men (46.0 per cent) and over a third of the Women (38.6 per cent) had had employment experience other than teaching. For men this was mainly in manufacturing industry (61.7 per cent), but for the women it was very varied, including nursing, running a wholefood shop and office work.

18. The qualifications of the heads of department are shown in Chart 6. Those with formal qualifications in the technology area, 323 (92.6 per cent), were mainly qualified through a teachers' certificate (41.5 per cent), BEd (28.2 per cent) or a BSc/BA/BPhil (18.0 per cent). The graduates were more likely to be in grammar schools. Twenty-six of the heads of technology departments had no qualifications in technology, even interpreted broadly, but some did, however, have qualifications in sciences/mathematics. Forty-two teachers with a qualification in technology held, in addition, a higher one in another field, often education or management.

Chart 5: Heads of Department

Characteristics	Male (N=261)		Female (N=88)	
	N	%	N	%
Area of Expertise				
CDT	214	82.0	11	12.5
Home Economics	2	0.8	63	71.6
Art and Design	22	8.4	8	9.1
Business Studies	nil	nil	1	1.1
IT	9	3.5	3	3.4
Science/Geography	14	5.4	2	2.3
Type of School				
Single sex, boys	25	9.6	1	1.1
Single sex, girls	7	2.7	18	20.5
Co-ed	229	87.7	69	78.4
Type of Post				
Full-time	251	96.2	79	89.8
Part-time	10	3.8	9	10.2
Years Teaching				
10 or less	25	9.6	14	15.9
11 – 20	132	50.6	43	48.9
21 or more	104	39.9	31	35.2
Employment Experience				
Yes	120	46.0	34	38.6
No	141	54.0	54	61.4

19. Whether or not the head of department is a graduate can make a difference In our sample there Were 25 schools taking part in the Technology Schools Initiative[18], but the only feature which distinguished them from the other schools (they had however only recently been designated) was the proportion of heads of departments with first degrees - 43.0 per cent in TSI schools against 19.0 per cent in the rest.

Chart 6: Heads of Departments' Qualifications

Highest Qualification	Technology		Any Subject	
	N	%	N	%
PhD	-	-	2	0.6
MSc/MA	9	2.6	22	6.3
MEd	-	-	5	1.4
BSc/BA/BPhil	58	16.6	81	23.2
BEd	91	26.1	93	26.6
PGCE	14	4.0	10	2.9
HND/HNC	17	4.9	11	3.2
Teachers' Certificate	134	38.4	125	35.8
None	26	7.4	-	-
Total	349	100.0	349	100.0

Views on the Nature of Technology

20. The subject background of the heads of department evidently colours their views on what they think should be in technology.

Chart 7: Heads of Departments' Views on National Curriculum Technology

Area of Expertise	Per Cent Wanting More:						
	Materials	Mechanisms	Structures	Textiles	Food	Business	IT
CDT (N=212)	57.9	22.3	17.9	27.8	21.1	3.3	10.8
Home Economics (N=60)	33.9	5.1	5.2	54.1	67.7	6.7	10.5
Art & Design (N=28)	46.4	3.6	14.3	37.9	48.3	7.1	3.7
IT (N=11)	36.4	45.5	36.4	18.2	27.3	20.0	36.4
Science/Geography[1] (N=14)	28.6	21.4	21.4	28.6	42.9	15.4	25.0
All (N=325)[2]	50.6	18.3	16.1	33.3	33.2	5.3	11.6

1. Includes one head of department with business-studies expertise.
2. 24 missing cases.

Chart 8: Selected Comments from Heads of Departments

The move to a broad curriculum lacking in depth is very worrying. There seems to be an under valuation of making things, with an emphasis on graphic design of uncertain practical value but very impressive appearance - pretty pictures. Technology has come to mean the world, the universe and everything. It may be, but needs more concise definition if it is to be taught and assessed.

Male in Co-ed Comp to 18 with CDT Teachers' Certificate[1]

The orders must be clearly focused and targeted on the development of core skills and knowledge in designing, working with resistant materials, control systems - electronics and mechanisms, and IT skills used specifically to support design and making tasks.

Male in Co-ed Comp to 18 with CDT Teachers' Certificate[1]

Equal Opportunity needs to be addressed. Technology for all is very male biased, the needs of female pupils need to be addressed, as do issues of technology which affect everyone. More emphasis on food technology, preparation, food safety and storage, and consumerism.

Female in Co-ed Comp to 18 with BEd (Home Economics)

As an art and design teacher who manages a technology faculty, I have tried to introduce a more aesthetic/design based ethos into the programmes of study at KS3/4. I believe in the notion of the designer/craftsperson/artist, and encourage our students to bring skills from different subject areas in order to realise their ideas. One thing which the national curriculum has at last begun to get rid of is the soulless making of formula artefacts.

Male in Co-ed Comp to 16 with BA (Art & Design)

We are not, in the national curriculum at least, in the business of producing, for example, engineers or bricklayers. That training is for industry to arrange or for college vocational courses. We are in the business of teaching practical and problem-solving skills which give an understanding of how scientific principles can be used in practical situations for personal advancement and as a wealth-creating mechanism.

Female in Girls' Comp to 18 with BEd (Economics)

I think the grouping together of four different subjects is unworkable. I would like to see national curriculum technology encompassing just CDT/graphics, with a business element. I would like home economics (food & textiles) to be a separate entity - if Dearing's proposals are accepted and the national curriculum is considerably slimmed down. This would put an end to the contrivance which has been going on for four years to make food fit national curriculum criteria and get rid of the boring food technology which means students are doing less practical work and less 'cooking'.

Female in Co-ed Secondary Modern with BEd (Home Economics)

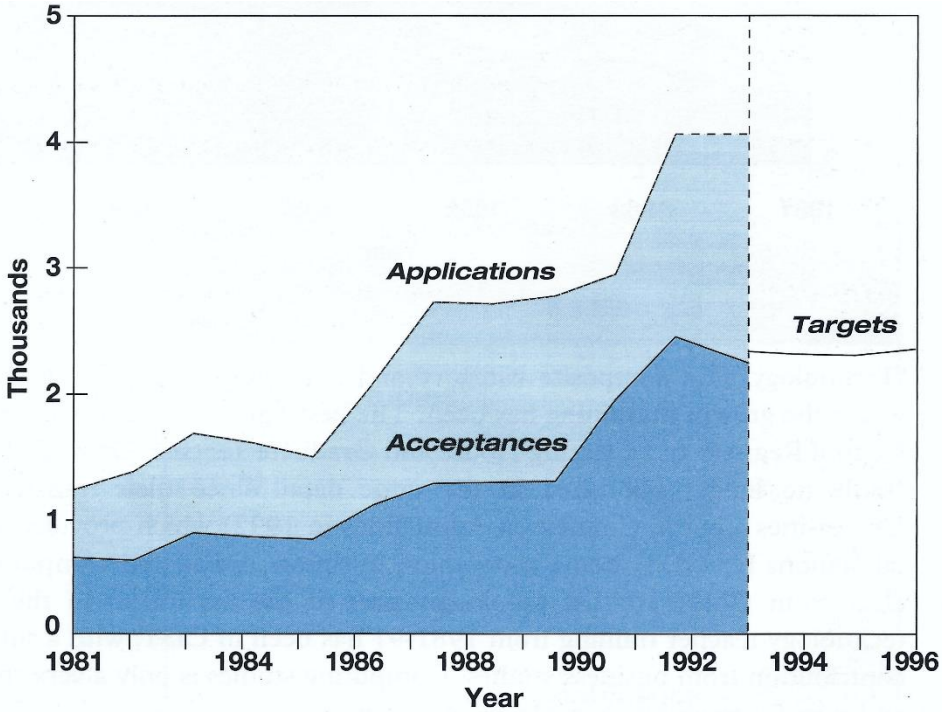
1. There were very many comments like these from male heads of departments from CDT backgrounds.

21. In considering the September 1993 proposals of the National Curriculum Council, which have formed the basis of SCAA's recent proposals, those heads from CDT backgrounds tended to think there should be more on materials (57.9 per cent) and those from home economics more on food (67.7 per cent) and textiles (54.1 per cent). The full analysis, given in Chart 7, shows the considerable difficulty any consultation will have in reaching a consensus on what technology should be. A selection of the detailed comments of heads of department is presented in Chart 8. So long as technology represents the best chance of retaining a slot on the timetable for teachers in a wide variety of fields, technology will be different things to different people. Only by ensuring that subjects like home economics, valuable in themselves, continue to have a secure place will it be possible to defuse the emotion and objectively consider what technology should be.

Recruitment to Technology Teaching

22. Recruitment to technology teaching aided by measures[19] such as the introduction of a bursary in 1986 and special courses (a shortened BEd course for those qualified in technology but not holding a degree, and a lengthened PGCE course for those holding a degree but not qualified in technology) has boomed in the last decade. Chart 9 shows that applications have quadrupled since 1981 and acceptances have more than doubled. In fact, acceptances were so running ahead of targets that they have been reined in with the aim, as given by the DFE to the Teachers' Pay Review Body[20] in 1994, of an intake of about 2,300 per year from 1993 to 1996.

Chart 9: Technology Teacher Training

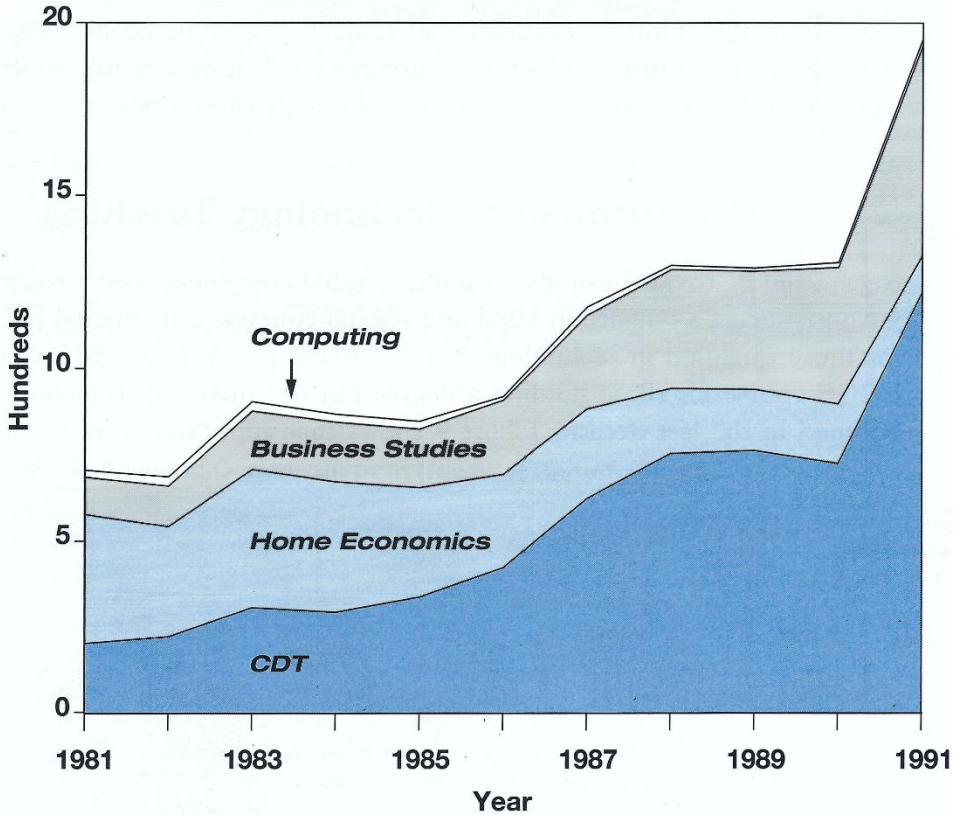


Sources: Annual reports of CRCH and GTTR; *Survey of Recruitment to Initial Teacher Training*, DFE: *School Teachers' Review Body Third Report 1994*.

23. But setting targets in this area is especially complicated since business studies or computing teacher trainees, for example, could be going on to teach in those departments in schools rather than in technology. The targets are, in any case, only for secondary education, since there is an overall target, not subject specific, for

primary schools. Teachers trained for secondary education will also be likely to 'leak' into independent schools and the new Colleges Sector which includes the sixth-form colleges.

Chart 10: Technology Acceptances by Subject

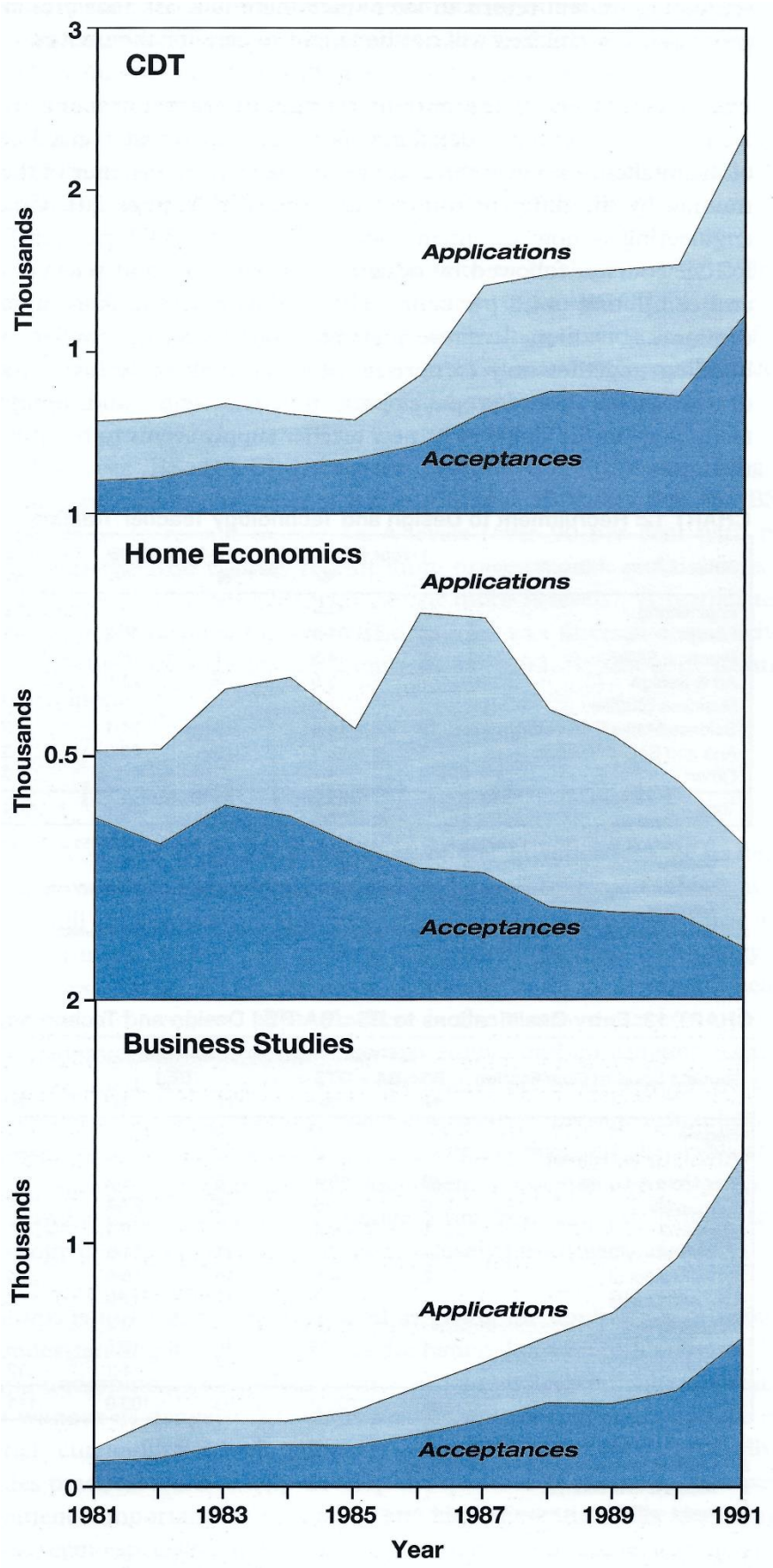


Source: Annual reports of CRCH and GTTR.

24. 'Technology' is a composite category and it is interesting to look at exactly where the growth in training has been. The best figures available were from the Central Register and Clearing House and Graduate Teacher Training Registry[21] (sadly no longer published in the same detail since their transfer to the Universities Central Council on Admissions in 1992) which provided separate tabulations for CDT, home economics, business studies and computing. It is clear from Chart 10 that the major part of the expansion in the area of technology teacher training from 1981-91 has been in CDT, with a substantial contribution from business studies. Computing studies is only a very thin slice, and home economics seems to be in decline.

25. These trends are brought out even more strikingly if we consider the areas separately as in Chart l 1. Acceptances for both CDT and business studies more than doubled between 1981 and 1991, with applications running well ahead of acceptances. But acceptances for home economics have declined to about half during that period and although applications were buoyant to 1987 they too have fallen sharply. Some of the design and technology courses now include food as an option, but the apparent decline of home economics *per se* is something we will return to later since there is a risk that present and future generations of children will not be taught to care for themselves.

Chart 11: Recruitment to Component Subjects



Source: Annual reports of CRCH and GTTR.

26. The backgrounds of the current recruits to teacher training in design and technology are set out in detail in Charts l2 and 13, based on a detailed analysis of the intakes of a one in three sample of the institutions, nine of the 28, offering training by the different routes (see Appendix A, page 20). Chart 12 shows engineering is now the main source of recruits (34.4 per cent) to one-year PGCE courses, followed by design (23.4 per cent) and science, mathematics and computing (14.8 per cent). The various practical skills of catering/home economics, textiles, furniture making, model making, jewellery making, and building, together only comprised 14.8 per cent. In terms of the distinction drawn earlier between developing practical skills and applying science, technology in the shape of its new teacher supply seems to be swinging towards the latter.

Chart 12: Recruitment to Design and Technology Teacher Training[1], 1993

Subject Area of Qualification	1-Year PGCE		2-Year PGCE		2-Year BEd	
	N	%	N	%	N	%
Engineering	44	34.4	-	-	35	33.7
Design	30	23.4	5	26.3	20	19.2
Practical Skills[2]	19	14.8	1	5.3	19	18.3
Art & Design	7	5.5	4	21.0	2	1.9
Business Studies	2	1.6	-	-	7	6.7
Science/Maths/Computing	19	14.8	4	21.1	9	8.7
Arts and Social Science	3	2.3	5	26.3	3	2.9
Other[3]	4	3.1	-	-	9	8.7
Total	128	100.0	19	100.0	104	100.0

1. Total intake of 1326 - 486 on 1-year PGCE, 29 on 2-year PGCE, 136 on 3/4-year BSc/BA + QTS, 250 on 3/4-year BEd and 425 on 2-year BEd.
2. Includes catering/home economics, furniture making, textiles, model making, silversmithing, jewellery making, building studies, and agriculture.
3. Includes surveying, naval architecture, radiography, chiropody, local government, PE and OU (unnamed).

Chart 13: Entry Qualifications to BSc/BA/BEd Design and Technology, 1993

Highest Level of Qualification	3/4-Year BSc/BA + QTS		3/4-Year BEd		2-Year BEd	
	N	%	N	%	N	%
Degree	-	-	-	-	5	4.5
BTEC[1] Higher National	-	-	-	-	82	73.9
3 or More A-Levels	38	86.4	6	6.3	-	-
2 A-Levels	2	4.5	26	27.4	-	-
1 A-Level	1	2.3	5	5.3	-	-
1 A-Level + VQ/OU[2]	-	-	11	11.6	-	-
BTEC[3] National	2	4.5	16	16.8	4	3.6
City and Guilds	-	-	17	17.9	8	7.2
O-Levels	-	-	3	3.2	-	-
Access	1	2.3	10	10.5	-	-
Other[4]	-	-	1	1.1	12	10.8
Total	44	100.0	95	100.0	111	100.0

1. Includes HNC/D or equivalent Diploma.
2. Vocational qualifications or Open University units.
3. Includes ONC/D, BEC/TEC.
4. Various certificates or at least one year higher education.

27. This is supported by the backgrounds of the recruits to the two-year BEd courses designed for those qualified in technology but lacking a degree. Again (Chart 12),

they were mainly from engineering (33.7 per cent) and design (19.2 per cent), with 18.3 per cent qualified in our category of 'practical skills'. Chart 13 shows that these two-year BEd courses are recruiting mainly students with BTEC Higher Nationals (73.9 per cent) and other vocational qualifications (10.8 per cent). There is also a smattering of degrees, certificates, and higher education experience.

28. Chart 12 shows, however, that recruitment to technology teacher training is having to cast its net widely. In addition to the two-year PGCE for those with a degree but lacking good qualifications in technology, a wide variety of 'other qualifications' are accepted for the one-year PGCE and two-year BEd courses including surveying, naval architecture, radiography and chiropody.

29. Three/four-year BSc/BA/BEd courses provide for those requiring both technology education and teacher training. Chart 13 shows that the BSc/BA courses appear to recruit mainly on A-levels (over 90 per cent with two or more), while the BEd courses recruit more on vocational qualifications (43.3 per cent, against 33.7 per cent with two or more A-levels). A further ten per cent of the entry to three/four-year BEd courses was through access schemes. Taken together the four routes admitted, in 1993, 1,326 core technology teacher trainees.

Implications and Recommendations

30. We have seen that from the perspective of the qualifications of its teachers national curriculum technology continues to be a portmanteau subject, with the teachers still being easier to identify in terms of CDT, home economics, art and design, business studies and information technology than technology itself. Among these areas, CDT tends to dominate both in terms of heads of department and teachers, although there is also a strong representation from home economics. Art and design, business studies and information technology seem peripheral with their bases elsewhere. This is supported by the qualifications of those in training which also seem to presage a significant shift away from the old making skills towards engineering and the application of science. National curriculum technology seems therefore to have given 'craft, design and technology' a further nudge away from its craft origins towards technology in its every day sense of being closely linked with science.

31. While this is to be generally welcomed as giving the application of knowledge and understanding its proper place in the national curriculum and establishing a sound underpinning to applied science and technology in higher education, it is not without its dangers. As well as a pathway to higher education we need a national curriculum which supports vocational education generally and provides practical work to help develop the qualities of precision, perseverance and patience important for success of any kind. Essential skills like being able to cook seem especially vulnerable. So keen have some home economists been to present themselves as technologists, and thereby comply with the design rhetoric, that the simple idea of teaching children to prepare good nutritional food to eat and stay alive is in danger of being lost. The present recruitment patterns for teachers show that, in spite of the freedom that the new curriculum framework allows schools, home economics is seriously at risk.

32. Sir Ron Dearing's proposals for technology, currently out for consultation, take the view that design and technology is about "combining designing and making skills with knowledge and understanding, in order to design and make products[22]. It sets out programmes of study for the key stages based on assignments, skills, and

knowledge and understanding. The proposals seem to go a long way towards identifying the central concerns of a subject which has for long remained elusive, but there is still ambiguity about food. This is to be studied at Key Stages 1 and 2, but it is optional at Key Stages 3 and 4.

33. Reactions to the proposed new technology curriculum and the way it is implemented will be filtered through the existing teacher workforce. As we have seen, they come from diverse backgrounds and have varied views on what technology should be. In practice, it seems that technology is becoming mainly a successor to craft, design and technology with increasing input from engineering. Home economics it is hoped will flourish in the time freed up from the national curriculum.

34. Making changes in education takes a long time. Even if there had been a wish to create national curriculum technology as a totally new subject it would have had to work through and with the teachers available. Training both for existing staff and new recruits is possible, but that in itself depends on who is available to provide it (and the teacher training institutions are staffed from among the teachers). New supply can change the nature of teacher stock only slowly. Technology in secondary schools will therefore be embodied, for the time being at least, in the diverse array of teachers described in this study. But at last it seems there is, in SCAA's proposals, a clear statement of what technology is intended to be and, if accepted, this could be the basis for recruiting and re-training the teachers required to carry technology into the future.

35. We therefore make the following recommendations

- SCAA's proposals for national curriculum technology, suitably modified in the light of consultation, be used as a blue print for specifying the requirement for teachers.
- We work progressively towards adopting the simpler label 'technology' for what is now called design and technology since technology implies design in the way that science implies investigation.
- The technology teacher training target for Key Stages 3 and 4 be specified in terms of the core subject and separate from overlapping subjects such as home economics, business studies, computing, and art and design.
- A target be similarly specified in core terms for primary schools to ensure good technology education at Key Stages 1 and 2.
- There should be a continuing supply of home economics teachers *per se*, not just technology teachers with a food option, to ensure that the vital skills of home economics are not lost from the curriculum.
- With the new arrangements for teacher training, the accreditation of training schools should be clearly related to technology as it is becoming rather than as it was.
- We capitalise on the experience of engineers wanting to become teachers but retaining teaching effectiveness as the key selection criterion.
- A clear policy be established for training teachers for the 16-19 age group bearing in mind that this embraces both the schools and colleges sectors, and GCE and GNVQ A-levels.

Appendix: Sample and Methods

i. The accuracy of the information in this report depends crucially on the representativeness of the sample of schools and the authenticity of the responses to the questionnaire.

ii. The sample of existing technology teachers was arrived at by sending a questionnaire to heads of technology departments in a random one in five sample of maintained secondary schools listed in The Education Authorities Directory[23] 1993. (Sixth-form colleges were not included since on 1 April 1993 they became part of the new 'Colleges Sector' of education.) The response rate was good, 62.8 per cent, but, for ease of handling and understanding, a one in ten quota sample was constructed using school type and regional distribution as the organising variables. Once the parameters had been set, inclusion of schools in the sample was randomly determined. The success in achieving the quotas can be seen in Charts A1 and A2.

Chart A1: School Type

School Type	Sample		England & Wales[2]	
	N	%	N	%
Comprehensive to 16	141	40.4	1384	39.7
Comprehensive to 18	175	50.1	1738	49.8
Grammar	16	4.6	157	4.5
Secondary Modern	14	4.0	172	4.9
Other[1]	3	0.9	37	1.1
Total	349	100.0	3488	100.0

1. Technical and bilateral schools.
2. From *Statistics of Education, 1992*, DFE and *Statistics of Education in Wales: Schools, No5 1991*, Welsh Office.

Chart A2: Regional Distribution of Schools

Region	Sample		England & Wales[1]	
	N	%	N	%
Greater London	40	11.5	410	11.8
East Anglia	14	4.0	133	3.8
East Midlands	32	9.2	320	9.2
North	22	6.3	214	6.1
North West	44	12.6	457	13.1
South East	70	20.1	698	20.0
South West	31	8.9	308	8.8
West Midlands	39	11.2	388	11.1
Yorkshire & Humberside	34	9.7	330	9.5
Wales	23	6.6	230	6.6
Total	349	100.0	3488	100.0

1. From *Statistics of Education, 1992*, DFE and *Statistics of Education in Wales: Schools, No5 1991*, Welsh Office.

iii. The representativeness of the sample in terms of whether the school is single-sex or co-educational, and the size of the intake can be seen in Charts A3 and A4. There is a very slight over-emphasis on large schools and boys' schools. Two hundred and one of the schools in the sample had sixth forms, 57.6 per cent, compared with 58.1 per cent for England and Wales as a whole (2,025 out of 3,488). Twenty-five of the schools (7.2 per cent) were participating in the Technology Schools Initiative compared with the 222 schools overall (6.4 per cent). Forty-three (12.3 per cent)

were grant-maintained compared with the national figure of 454 (13.0 per cent) at the time.

Chart A3: Single Sex or Co-educational

Type of School		Sample N	Sample %	England & Wales[1] N	England & Wales[1] %
Single Sex	Boys	26[2]	7.4	218	6.3
	Girls	25[3]	7.2	248	7.1
Co-ed		298	85.4	3022	86.6
Total		349	100.0	3488	100.0

1. From Statistics of Education, 1992, DFE and Statistics of Education in Wales: Schools, N05 1991, Welsh Office.
2. Five with girls in the sixth form.
3. Two with boys in the sixth form.

Chart A4: Schools' Size of Intake

Number of Pupils	Sample N	Sample %	England & Wales[1] N	England & Wales[1] %
500 or less	33	9.5	479	13.7
501 – 800	115	33.2	1319	37.8
801 – 1000	81	23.4	809	23.2
1001 – 1200	55	15.9	516	14.8
1201 – 2000	62	17.9	363	10.4
2001 or more	-	-	2	0.1
Total	346[2]	100.0	3488	100.0

1. From Statistics of Education, 1992, DFE and Statistics of Education in Wales: Schools, N05 1991, Welsh Office.
2. Three schools did not provide this information.

iv. The heads-of-department questionnaire (copy available on request from the authors) was kept as brief as possible. It covered basic school details such as school type, numbers of pupils and the timetable; departmental details like how many periods were available for technology, and the examinations offered; teacher details like how many and of what sex they were, whether full-time or part-time, areas of expertise and specialisms, and any vacancies; views on the nature of technology; and personal details like area of expertise, length of teaching, other employment experience, and qualifications. The questionnaire was assembled through interviews with heads of technology departments and piloted in 25 schools in June 1993 with the help of The Engineering Council's Neighbourhood Engineers Scheme[24]. With minor modifications the questionnaire went out to schools in October 1993 and was completed in the period October to November 1993. The large and rapid response is indicative of the considerable interest in, and uncertainty about, national curriculum technology at the present time.

v. The qualifications of new recruits to design and technology teaching were obtained from the training institutions. A random sample of one third of the 28 institutions offering training was approached and asked to provide a detailed breakdown of the 1993 entrants to the whole range of their design and technology teacher training courses. One institution did not respond and was randomly replaced. Of the nine institutions, eight were offering 1-year PGCE courses, one a 2-year PGCE course, three 3/4-year BSc/BA/BEd courses leading to QTS, and three 2-year BEd courses.

Notes

1. School Curriculum and Assessment Authority (1994). Desig*n and Technology in the National Curriculum. Draft Proposals*. May 1994. London: SCAA.

2. *National Curriculum, Design and Technology for Ages 5 to 16*. Proposals of the Secretary of State for Education and Science and the Secretary of State for Wales. June 1989. London: DES and the Welsh Office.

3. National Curriculum Council. *Consultation Report on Technology*. November 1989. York: NCC.

4. Her Majesty's School Inspectors (1992). *Technology - Key Stages 1, 2 and 3: A Report by HMI on the First Year 1990-91*. London: HMSO; Smithers, A. and Robinson, P. (1992). *Technology in the National Curriculum*. London: The Engineering Council; National Curriculum Council (1992). *National Curriculum Technology: The Case for Revising the Order*. Advice to the Secretary of State for Education, May 1992, York: NCC.

5. Office for Standards in Education (1992). *Technology for Ages 5 to 16 (1992).* Proposals to the Secretary of State for Education and the Secretary of State for Wales. December 1992. London: DFE.

6. National Curriculum Council (1993). *Technology Programmes of Study and Attainment Targets: Recommendations of the National Curriculum Council*. September 1993. York: NCC.

7. Penfold, J. (1988). *Craft, Design and Technology: Past, Present and Future*. Stoke: Trentham Books.

8. Survey of Recruitment to Initial Teacher Training (1993). *Main Results and Final Report*. Autumn 1993. London: DFE, Analytical Services Branch. 1,326 design and technology teacher trainees are listed together with 572.5 in business studies, 92 in home economics and 66 in computing giving a 'technology' total of 2,056.5.

9. Statistical Bulletin 24/93 (*Teachers' Qualifications and Deployment in Maintained Secondary Schools in England, 1992*. December, 1993. London: DFE) indicates that there are 50,300 full-time secondary teachers in the general area of technology (CDT, craft, information technology, 'other technology', home economics, and business studies) but there is multiple counting since teachers are entered once against each subject they teach. Overall, teachers of all subjects come out at 401,500 against the full-time secondary teacher population of 175,800. The figure we have provided derives from our survey and was obtained by counting full-time teachers once, part-time teachers 0.5, and including vacancies on the same basis. It covers Wales as well as England. At about half the double-counted DEE figure it seems to be of the right order.

10. *Annual Survey of Recruitment to Initial Teacher Training*. London: DFE, Analytical Services Branch.

11. Gardiner, J. (1994). *School Teachers' Review Body Third Report 1994*. Table 30, page 78, London: HMSO. Cm 2466.

12. Graduate Teacher Training Registry (1992). *Annual Statistical Report Autumn 1992 Entry*. Cheltenham: GTTR.

13. Joint Council for the General Certificate of Secondary Education (1993). *Inter-Group Statistics Summer 1993*. Surrey: Southern Examining Group; GCE Inter-Board Statistics (1993). *Advanced Level Examinations.* Surrey: Associated Examining Board.

14. Statistical Bulletin 23/93. *Teachers in Service and Teacher Vacancies in England in January 1993*. November 1993. London: DFE.

15. Statistical Bulletin 24/93. Te*achers' Qualifications and Deployment in Maintained Secondary Schools in England 1992*. December 1993. London: DFE.

16. Sample includes only secondary schools because primary school teachers are not, as yet, identified by subject though the logic of the national curriculum is that it would be appropriate to do so, at least in terms of setting training targets. Sixth-form colleges not included since from 1 April 1993 they became part of the new 'Colleges Sector' of education.

17. The 1,027 part-time teachers consisted of 700 who held full-time posts but taught technology part-time, 250 part-timers who taught only technology, and 77 part-timers who taught other things as well.

18. Office for Standards in Education (1994). *The Technology Schools Initiative 1992-1993*. March 1994. London: Ofsted.

19. TASC (Teaching as a Career). *Trainee Teacher Bursary Schemes*. London: DES; TASC *Guide to Initial Teacher Training Degree Courses (BEd or BA/BSc + QTS) and Special Courses (Short BEd, Part-time PGCE and Subject Conversion PGCE) 1994 Entry*. London: DFE.

20. Gardiner, J. (1994). *School Teachers' Review Body Third Report 1994*. London: HMSO, Cm 2466.

21. Central Register and Clearing House and Graduate Teacher Training Registry. *Annual Reports*. London: CRCH. CRCH and GTTR transferred to the Universities Central Council on Admissions (itself now changed) in 1992 with CRCH absorbed and GTTR retaining a separate identity. Statistics however are no longer available in the same form.

22. In bold at the beginning of each key stage programme of study.

23. *The Education Authorities Directory and Annual Report 1993*. Surrey: The School Government Publishing Co.

24. A network of engineers organised by The Engineering Council in 16 regions in England and Wales (plus three in Scotland and Northern Ireland) to provide support for schools.

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