Appendix 1 - List of schools contacted for pilot trials of questionnaire:

Shenfield High School, Alexander Lane, Shenfield, Brentwood, Essex, CM15 8RY.

St. Martin's School, Hanging Hill Lane, Brentwood, Essex, CM13 2HG.

Brentwood County High School, Shenfield Common, Brentwood, Essex, CM14 4JF.

Palmer's Sixth Form College, Chadwell Road, Grays, Thurrock, Essex, RM17 5TD.

Davenant Foundation School, Chester Road, Loughton, Essex, IG10 2LD.

The Hedley Walter School, Sawyer's Hall Lane, Brentwood, Essex, CM15 9DA.

Chelmsford County High School for Girls, Broomfield Road, Chelmsford, Essex, CM1 1RW.

Colchester County High School for Girls, Norman Way, Colchester, Essex, CO3 3US.

Anglo-European School, Willow Green, Ingatestone, Essex, CM4 0DJ.

King Edward VI Grammar School, Broomfield Road, Chelmsford, Essex, CM1 3SX.

Appendix 2 - The Writing's On The Wall

Here is the transcription of the spoken word on the video film *The Writing's on the Wall*.

Preamble

In this country, the relationship between Schools and the Community at Work has for long been a controversial one and it remains so. The current surge in activity between these two areas of our national life is here seen in a longer perspective.

At this juncture, the question is: Should not the needs of commerce and industry be directly reflected in the curriculum - and not be an after thought, a bolted-on extra?

1. 'Going to school. For today's youngsters an every day experience they take for granted. Only rarely does the question arise - What's it all for?'

2. 'Yet at this old primary school in Devon, there's clear evidence that the connection between work in the classroom, and what goes on in the outside world was, in days gone by at least, very well understood.'

3. 'Look at this tablet built into the very fabric of the school. It's a version of the old **3R's** idea. Being near the coast, it was in the old days a pound to a penny that many of the pupils at the school would work in trades, industries or professions connected with the sea.'

4. 'Hence the inscription, not reading writing and 'rithmetic, but writing, arithmetic and **navigation**, demonstrating that our ancestors, at least in this area, had a very clear idea of the purpose of education.'

5. 'Most importantly, the three elements went together to help to produce people with a good all round education, with the ability to gauge, to make general judgments, to estimate as well as measure.'

6. 'To see which way the wind blows is a colloquial phrase with it's roots in banking. This decorated wind vane dial is in the court room of the Bank of England, connected to an actual wind vane high above the building. It was used by bankers to help estimate the arrival time of ships in the Port of London.'

7. 'In those days of lengthy and precarious ocean travel, such estimates would determine the fluctuations in currencies. The same skills, the ability to read a situation, to estimate and judge remain just as important to bankers today.'

8. 'In this hectic dealing room, for example, handling foreign securities. Here where a newcomer to banking needs to be able to gauge a customer's needs, or here in a less frantic situation where the manager is assessing a client's application for a loan.'

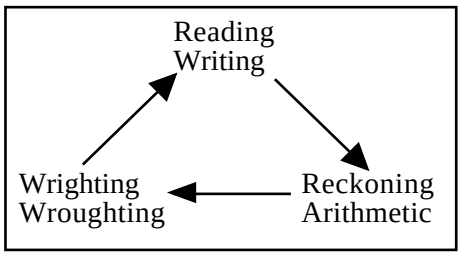
9. 'It was here in the City of London, the very heart of the banking industry, that the phrase the **3R's** was first heard. And it's ironic that the man who coined the phrase 'the 3R's', saw no difficulty in so doing because he **couldn't spell**, and so didn't know that of reading, writing and what he called **rithmetic**, only one begins with the letter **'R'**.

10. 'Sir William Curtis, member of parliament for the City of London and Lord Mayor of London in 1795, inherited the family firm in Wapping, and made a fortune selling ships biscuits. A close friend of George IV, he was a pitiably bad public speaker.'

11. 'Satirists and cartoonists had a field day with this figure of fun. At one City dinner, this atrocious speller proposed a toast to the three **'C's,** Cox, who was the Lord Justice of the day, the King and Curtis himself.'

12. 'At another, he talked about education for the poor and about the 3R's. As luck would have it, Sir William's off the cuff rendering of the 3R's stuck, which is a pity because the original version is said to be quite different.'

13. 'There was **reading** and **writing**, that was No. 1; **reckoning** and **arithmetic**, and **wrighting** and **wroughting**. **Reading, writing** and **arithmetic** speak for themselves. So let's look at the others.'



14. '**Reckoning** is interesting because it includes the wider process of estimation. **Wrighting** means 'making' as in Cartwright, Wheelwright, Shipwright and many more. While **wroughting** means 'to beat or fashion metal.'

15. 'But there is more to it than that. Ideas like **reckoning** and **wroughting** have wider implications. These dealers are reckoning in the widest sense by judging and estimating. Then wroughting by creatively applying their judgment, turning it into practical action.'

16. 'So it seems that what's missing in our latter day account of the **3R's**, is the **crucial question of what education is for?'**

17. 'As the inscription in Devon suggests, in earlier times, we really did have a clear idea of the connection between school and the world of work. Quite possibly, it was this perception that helped Britain to become the birthplace of modern industry.'

18. 'We were so inventive and so successful that by 1851, the year of the Great Exhibition, we were able to celebrate our world leadership in industry. It was a great triumph for British manufacturers who won most of the awards in all classes of exhibits.'

19. 'It must have been now in the early years of the second half of the 19th century that things started to go wrong. In the Paris exhibition of 1867, British manufacturers were shocked at the few awards they won. Competition was hotting up.'

20. 'Sir Lyon Playfair, an influential figure in mid Victorian society, had for some time campaigned to put an end to what he called **the unnatural divorce between thinker and craftsman.** In a letter to the Society of Arts he said - I have just returned from Paris where I acted as Juror in one of the classes of the exhibition.' I am sorry to say that with very few exceptions, a singular accordance of opinion prevailed that our country has made little progress in industry since 1862.'

21. 'Deficient representation in some of the industries might have accounted for this judgment against us, but when we find that out of 90 classes, there are scarcely a dozen in which pre-eminence is unhesitatingly awarded to us, this plea must be abandoned.'

22. 'The one cause upon which there was most unanimity of conviction is that France, Prussia, Austria, Belgium and Switzerland possess good systems of industrial education for the masters and managers of the factories and workshops, and that **England possesses none**.' Sir Lyon's unease was shared by others.'

23. John Penfold Brunel University - 'Because of the public disquiet with our loss of manufacturing markets in the latter decades of the 19th century, a Royal Commission on technical instruction was set-up. It first went to France and it was so impressed with what they saw there that it came back and wrote an interim report. They found in Parisian schools that actual trade teaching of a rudimentary kind was combined with a common elementary instruction.'

24. 'During the 1880's, both politicians and industrialists lobbied for change. So encouraged by the popular mood, the London School Board started a scheme at the Beethoven Street School in north west London, where John Chenowarth, the school caretaker, began woodwork classes in a shed in a corner of the playground.'

25. 'The idea spread and the London School Board records shows that as a direct result of this experiment, the number of boys receiving instruction in manual training rose from a mere 4,340 in 1893, to over 55,000 in 1903. It was a step in the right direction, but for some people just a drop in the ocean.'

26. 'The slow moving world of government and industry was about to be challenged. Spearheading that challenge was group of outstandingly articulate and dynamic persuasive women. In contrast to the industrialists, their concern was not limited to improving the quality of the nation's potential skilled workforce. They rested their case on the educational value of manual instruction as part of the general education of all children, girls as well as boys.'

27. 'The improbable source of their inspiration was Sweden. At the time an almost totally unindustrialised country. Yet within a decade, the Swedish system of educational handwork, known as 'sloyd', had leapt into prominence.'

28. John Penfold, Brunel University - 'This was a remarkable episode in the history of English education in the 1880's and 1890's, hundreds of English teachers, many of them women, went to Sweden for a six week training course where they were taught wood-working skills basically. And when they returned to this country, they wrote articles, they even wrote to *The Times* , and they actually taught English children woodwork.'

29. 'Punch magazine was very much in tune with the mood of the times. In this cartoon headed *The school master of the future, and the sooner we get him the better,* the British workman is heard to tell the school master, while the pupil stands with head bowed - Bother your ologies and ometries, let me teach them something useful.'

30. 'But this new mood to recapture a balance didn't stick. If anything the position worsened. The Bryce Commission, foreshadowing the Education Act of 1902, declared itself apprehensive less the old type of grammar type of education might be too far replaced by technical and scientific education. **Attitudes like this set the scene for many years of decline.**'

31. 'The reality of our decline, coupled with two world wars that brought us close to bankruptcy is too familiar a story to repeat. It's enough to admit that since the beginning of the century, Britain's once massive share of world trade has shrunk alarmingly. Productivity has fallen, along with our ability to compete, and the words MADE IN BRITAIN have a curiously unfamiliar ring.'

32. 'The recently published House of Lords report on overseas trade says it all.'

33. Lord Boardman, Chairman National Westminster Bank - 'Our conclusions were based on our concern at the erosion of British manufacturing, and British industries' share of world trade, and the impact that was having on our economy. And we looked for the reasons for this, and there are a number - oil, exchange rate, union attitudes, employment practices and the like, and we addressed all of those. We made some very firm recommendations of things which government should be doing, or doing more than they are at the moment. We made recommendations as to what employers might be doing, particularly in the field of marketing for example. We made recommenda-tions with regard to unions and the practices which have been outdated, I believe, and not correct for the present climate. **And above all we made recommendations as to how the public should look at industry and public attitudes. And it is there, I believe, the attitude of the public towards industry and manu-facturing that lies the key towards our greater prosperity in the future.'**

34. 'And yet, amid the stark realities, there are hopeful signs. Concentration on pure education has enabled us to retain our reputation for innovation. At these laboratories (Fulmer Research Institute), they have a track record in research and development to rival the best from anywhere in the world. Here's a scanning acoustic microscope, so sensitive that it can detect the most minute of faults in a critical component such as jet engine turbine blades, and silicon chips. An innovative method of forming plastic by spraying rather than moulding. And a new process of forming metal to a precise final shape. Clear evidence that we can still come up with good ideas.'

35. 'But it's what happens next that worries many people. The trouble is that exporting ideas is not enough to enable Britain to pay her way, but exporting products, things that we've actually made will help to secure our future. **We must restore our manufacturing ability to recapture a sense of pride in industry.'**

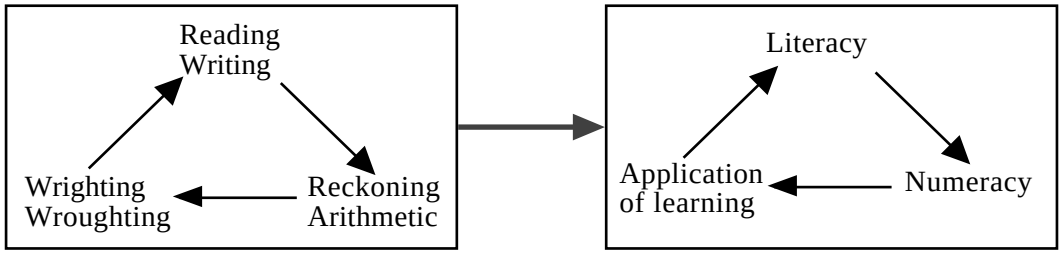
36. **'More than ever, industry and the commercial world are going to depend on people with a sense of realism, balance, confidence and responsibility.'**

37. 'It was a determination to retain a firm hold on reality that prompted James Callaghan's famous speech at Ruskin College [Oxford] a decade ago, when he criticised the role of Britain's educational system to our working lives.'

38. Lord Callaghan - 'I was concerned because I was told that a lot of people leaving school didn't have the basic tools to do the jobs that were necessary in industry. That seemed to me to be bad, and also that there was some deficiency in the teaching of science and mathematics. I believe it has improved a very great deal. There have been a lot of changes made, and standards have increased as indeed they need to do. But we need more resources. When I learn that there are still some of our best 'A' level candidates unable to get into university, that seems to be horrific. And then as regards others, I'm told we are among the worst trained working force in Europe. Now these things are very, very bad. So we need more resources, we need better understanding between industry and schools to do two things. **To both live a fulfilled life when the young people leave school and to do a job. Not one or the other, but both. That's the task for you.'**

39. If we neglect this task, Britain will become a backwater in a fiercely competitive world. All of us owe it to these youngsters to restore the common sense attitudes we once so firmly believed in.'

40. **'The message is clear enough - The Writing's On The Wall.'**



Note:

Education is wider than training. What has become our understanding of the **3R's** is simply basic training: the older version includes also the development of **capability** as well as other **abilities**.

But isn't this what education is all about?

The video was written and directed by Duncan Hazeldean, produced on behalf of Banking Information Services in connection with the initiative *1986* Industry Year. This initiative was launched to increase public awareness of our dependence on Industry.

Note: Transcription of the spoken word was by Stan Owers in 1993.

Appendix 3 - Discovery of elements in chronological order:

Element	Year	Element	Year	Element	Year
Carbon	pre-history	Rhodium	1803	Neodymium	1885
Sulfur	pre-history	Palladium	1803	Germanium	1886
Copper	*c.* 5000 BC	Osmium	1803	Fluorine	1886
Silver	*c.* 3000 BC	Iridium	1803	Dysprosium	1886
Gold	*c.* 3000 BC	Cerium	1803	Argon	1894
Iron	*c.* 2500 BC	Potassium	1807	Helium	1895
Tin	*c.* 2500 BC	Sodium	1807	Krypton	1898
Antimony	*c.* 1600 BC	Boron	1808	Neon	1898
Mercury	*c.* 1500 BC	Calcium	1808	Xenon	1898
Lead	*c.* 1000 BC	Strontium	1808	Polonium	1898
Arsenic	*c.* 1250	Ruthenium	1808	Radium	1898
Zinc*	pre 1500	Barium	1808	Actinium	1899
Bismuth	*c.* 1500	Iodine	1811	Radon	1900
Phosphorous	1669	Thorium	1815	Europium	1901
Platinum	pre 1700	Lithium	1817	Lutetium	1907
Cobalt	1735	Selinium	1817	Protactinium	1917
Nickel	1751	Cadmium	1817	Hafnium	1923
Magnesium	1755	Silicon	1824	Rhenium	1925
Hydrogen	1766	Aluminium	1825	Technetium	1937
Nitrogen	1772	Bromine	1826	Francium	1939
Oxygen	1774	Lanthanum	1839	Neptunium	1940
Chlorine	1774	Erbium	1842	Astatine	1940
Manganese	1774	Terbium	1843	Plutonium	1940
Chromium	1780	Caesium	1860	Americium	1944
Molybdenum	1781	Rubidium	1861	Curium	1944
Tellurium	1783	Thallium	1861	Promethium	1945
Tungsten	1783	Indium	1863	Berkelium	1949
Zirconium	1789	Gallium	1875	Californium	1950
Uranium	1789	Holmium	1878	Einsteinium	1952
Titanium	1791	Ytterbium	1878	Fermium	1952
Yttrium	1794	Scandium	1879	Mendelevium	1955
Beryllium	1797	Samarium	1879	Nobelium	1958
Vanadium	1801	Thulium	1879	Lawrencium	1961
Niobium	1801	Gadolinium	1880		
Tantalum	1802	Praseodymium	1885		

*Zinc was known as the copper–zinc alloy, brass, around 20 BC.

Note: After Emsley (1989:227)

Appendix 4 - Industry Year 1986: 'Thanks to Industry'

Notes and transcription of the spoken word from the video film 'Industry Year 1986'.

The following notes appear on the cover of a video film produced for "Industry Year" by the RSA.

The designation of 1986 as INDUSTRY YEAR was announced by The Royal Society for the Encouragement of Arts, Manufactures and Commerce (RSA) in April 1984. In the words of its President, HRH The Duke of Edinburgh:

> *Industry is by far the most important activity in our national life. This is a fact, and it can do no good at all to give it a bad reputation or call it a rat race. This programme is intended to re-awaken appreciation and understanding of what industry is all about and that that can only be to the benefit of all the people of Britain*

For 1986, the slogan **Thanks to Industry** was intended as a challenge to a society which is insufficiently aware that almost everything we do depends on industrial activity, and which shows little appreciation of such activity. The initiative 'Industry Year 1986' was promoted by an organisation known as 'Industry Matters' and set-up within the RSA.

The video lasts about 8 minutes. A transcript of the text is reproduced in the following pages, since it is an excellent summary of the UK's industrial, and hence economic, decline and what needs to be done.

The RSA and 'Industry Matters' at 8 John Adam Street, London, WC2 6EZ, have very kindly agreed to the use of the video as a resource, and also the reproduction of the text.

Note: The speaker is Mr Brian Redhead.

Text of video film 'Thanks to Industry' produced for 'Industry Year 1986'

1. 1986 is Industry Year in Britain.

2. So what! Every year is Industry Year in Britain. Has been since 1786 or even earlier. The evidence is all around us.

3. But so too is the evidence that industry in Britain is not what it once was.

4. That the first industrial nation in the world has become an also-ran!

5. And 1986 is the year to ask what went wrong, and more important what are we going to do about it?

6. Because let us not pretend, without industry we are nothing.

7. There is no shortage of explanations of why we have fallen behind.

8. Because everybody blames everybody else!

9. The unions are told it is their fault for being opposed to change and for putting too high a price on it.

10. Management is told it is to blame for being afraid of change and for regarding promotion as a reward, not a challenge.

11. The moneylenders are accused of failing to invest in change, in favour of easier speculation.

12. The politicians accuse each other of hasty and ill-judged change.

13. And Education is blamed for having little or no interest in industry, changed or unchanged.

14. There is truth in all those accusations, but they are the symptoms, not the cause, of Britain's industrial decline.

15. The truth goes back much further and extends much farther.

16. Precisely because we were the first industrial nation, we got set in our ways - we did it first so we assumed that we did it best.

17. Custom and practice became the watchwords of British industry.

18. The only problem was that other people were doing it better, and we didn't even seem to notice.

19. Although industry gave us an empire and made Britain for a while the most powerful nation on earth, we took the rewards while disparaging the means.

20. For those in high places industry was something to be neither seen nor heard.

21. It was not a calling for a gentleman!

22. Better by far to be a land owner, a member of a learned profession, an officer of the Crown, but not, pray not, in industry!

23. We even devised an education system which chose not only to ignore industry but to steer its ablest pupils well away from it.

24. This cultural disparagement of industry, this snobbery, is the root cause of Britain's industrial decline!

25. It is a failure to take industry seriously.

26. And yet we cannot do without industry!

27. It is not true that we can slide gracefully into a post-industrial society. Whatever that might be.

28. Not with our population, not with our expectations.

29. A school for every child, a hospital for every patient, a job for every citizen and all the adornments of civilised living.

30. Nor is it true that the days of manufacturing are over.

31. People want more and more things. It is only the methods of manufacture which change.

32. And that is what we must be doing.

33. It is not as if we don't know how, we are a most ingenious people.

34. Some Japanese researchers recently looked for the origin of the 100 most successful post-war industries, and they discovered that the ideas for more than half of them came from Britain.

35. So what are we going to do, or more precisely what must we do if we are not to fall further behind?

36. Answer - take it seriously. Recognise as a nation that industry is the most important activity in our national life.

37. Where else do you think the money comes from?

38. Most ordinary people know that. [I don't think they do—Stan Owers]

39. It is at the top and in the beginning that the recognition will have to dawn.

40. The great and the good who assume or achieve pre-eminence in our country will have to recapture the industrial spirit.

41. The education system will have to ensure that no one can emerge from it ignorant of the importance of industry.

42. And in industry itself, we shall have to make a better job of work.

43. And that means we shall have to make a better use of people.

44. The same technology is now available throughout the world.

45. Success in the market goes to the work force that can use the technology to the best advantage.

46. The best quality products can only be delivered by a work force committed to their manufacture.

47. Rapid and continuous change can only be achieved by a work force that is eager to learn.

48. And you cannot achieve any of those - competence at work, commitment to quality, contribution to change - by ordering people about or by drawing-up battle lines in the workplace.

49. When them and us are at daggers drawn, the customer is forgotten and the competitor thrives.

50. With briefing groups and quality circles, with new working agreements and employee involvement, with Computer Aided Design (CAD) and Computer Aided Manufacture (CAM), the best companies in Britain are showing the way.

51. And if the nation wants to get its hands on the wealth that industry alone can create, it too must shed its ignorance and its prejudices.

52. It must learn to value industry and those who work in it.

53. THAT MUST BE THE LESSON OF 1986 AND EVER AFTER!

Appendix 5 - Anecdotal evidence:

Introduction

Once the idea of the anti-business/anti-industry sentiments have been comprehended and accepted, the prejudices are easy to recognise. These prejudices are endemic in our society, so the bulk of our population would not be able to spot such damaging sentiments. Worse still, it would see nothing wrong with such comments when they have been pointed out.

In isolation, many of the anecdotes are not remarkable; this serves to shroud the prejudice endemic in our society. However, when they are considered collectively, a picture of societal prejudice and ignorance towards industry, trade, business, profit, engineering, and wealth creation emerges from almost every walk of life, including education. **In the opinion of the author, it is this societal prejudice that has caused Britain to choose the path to ultimate national poverty.** Here are the examples:

1. To be a captain of industry in Germany, France, Switzerland or the USA has some social standing among the professions. The entrepreneur in Britain, unlike many of his or her counterparts abroad, remains the poor relation of the professional classes.… *The Times*, Friday October 5th 1984.

2. There is, believe it or not, still prejudice against success in trade and business. We are light years away from being a true meritocracy—Rt Hon Tony Blair, MP, as Leader of the Opposition, *The Times* July 17 1995.

3. When I told my mother-in-law I had been appointed Secretary of State for Trade and Industry, she said - 'but you are going to become associated with trade.' I told her I was proud to be associated with trade and industry—Peter Lilley, CBI conference, Southampton, Autumn 1991.

4. When I signed the register at my wedding, the vicar said, don't put 'Engineer'; it looks as if you are a locomotive driver. Mr. Peter Thurnham MP for Bolton North-East during a debate on Engineering in the House of Commons 11th March 1988.

5. In September 1991, Mrs. Thatcher asked: 'Mr. Morita, do you have any advice to give to our country?' So I said: 'Mrs. Thatcher, please change your society's concept to make people respect engineers as they do solicitors or chartered accountants … that's my advice.' The First UK Innovation Lecture delivered by Akio Morita, Chairman of Sony Corporation, organised by the DTI on 6th February 1992.

6. *The Times* Tuesday 26 January 1993, reported 'A new supplement to the *Dictionary of National Biography* acknowledges the sins of earlier omissions.' The article goes on: 'The original *DNB* neglected business men, and there was also a lack of engineers.'

7. One country, two cultures - A few years ago, *Nigel Hawkes* writes, the *Times Higher Education Supplement* ran an interesting article which quoted the views of leading academics and writers on 'ten essential texts for the educated person.' There were no science books among them. *The Times* March 18 1994.

8. 'Challenge for Britain is to transform performance.' 'BRITONS must achieve a cultural adjustment embracing every aspect of society if industry is to be truly competitive… . Although companies must improve their performance, science, education and government must also change attitudes to prevent Britain's slide down the world competitiveness league… . It is in truth about culture' - the Rt Hon Michael Heseltine MP, President of the Board of Trade - *The Times* November 16 1993.

9. When Herbert Hoover visited Europe and told a lady he was an engineer, she replied, 'Why, I thought you were a gentleman!' '… engineering had been a career traditionally shunned by the upper classes'—Floorman (1996:9).

10. '… my father disinherited me because I became an engineer, an occupation totally unfitting for a gentleman. I do not regret my choice, although I had to leave England to follow it in peace.' Paul D Hobson, *Professional Engineering*, 3 September 1997.

11. 'The gentlemanly ethos of Thomas Arnold's 19th Century Rugby infused education in both the maintained and independent sectors. For many years, even the RSA[1] betrayed its origins and purpose with its letterhead dignifying ARTS in upper case, relegating Manufactures and Commerce to lower'—Chandler (1998:38).

12. 'Gentlemen educated at Oxford and Cambridge', he said, 'learnt to quote Horace and despise science which dirtied your hands. Nonconformists, who were educated at dissenting academies, learnt modern subjects and produced the inventors who created the Industrial Revolution. The split between the cultured amateurs who rule us and the dirty-handed scientists who have the ideas, still lingers in the English educational and political systems with unfortunate results. Dr. J Woodhead Galloway, Head of Public Relations, Cancer Research Campaign, writing in the *New Scientist* 28 April 1990 on 'Working-class honours: the not-so glittering prizes.'

13. "Pinkish toffs like Ian [Gilmour] and Charlie [Morrison], having suffered, for 10 years, submission to their social inferior, see in Michael [Heseltine] an arriviste, certainly, who can't shoot straight and in Jopling's damning phrase 'bought all his own furniture', but who at any rate seeks the cachet. All the nouves in the party think he is the real thing"—from *Alan Clark on …* in *The Guardian September 8 1999* after the death of Alan Clark, former historian and Conservative MP for Kensington and Chelsea, on September 5.

[1] Royal Society for the encouragement of Arts, Manufactures and Commerce

14. On the use of computers – 'There was also an avowed lack of interest by civil servants. At one famous meeting at the Ministry of Supply in 1956 on how computers could be used in government, a senior civil servant overruled his colleagues - who were voting to adopt them in government - claiming that they were not relevant.'

    Many people claim that the same problem exists even today: 'Engineers were viewed as dirty people with spanners, says one. And computers were often seen as remote behemoths, useful only for scientific purposes.' *The Times INTERFACE* June 17 1998.

15. 'You call yourself an Engineer, but I never see any dirt under your finger nails'—an Industrial Accountant to the company Chief Engineer and a professional engineer.

16. 'I was born in 1903, and well remember much concerning the First World War. One of the interesting statements at the time was that the Kaiser expected to win the war on the technical merits of his armaments over ours, because the best brains in Germany went into engineering whereas our best brains went into Law, Services etc., as an engineer had no hope of social recognition. It does seem extraordinary that in 1992, the same dogma with respect to an engineer still exists - and it does.' The former managing director of Evershed & Vignoles Ltd, (Instrument Makers) and a Fellow of the Institution of Electrical Engineers.
    [For those tempted to say but we won the wars, the industrial might of the USA was a very significant factor, and this was one of the reasons why Sir Winston Churchill was pleased the USA was brought into the Second World war—read *The Struggle for Europe* by Chester Wilmott.]

17. 'There must be media recognition. ....There are many exciting opportunities for the media in promoting creative activity in engineering, which are not being taken up. Let us consider, for example, the MacRobert award - Britain's premier engineering prize. When it was awarded recently there was virtually no publicity, apart from a tiny report a few centimetres square, in *The Times* and apparently that occurred only because of a personal appeal to the vice-chairman of Times Newspapers Ltd. We need a renaissance in this country in our attitudes to engineering and science. The media has a large responsibility and could do a lot more good....' Mr. Patrick Thompson MP for Norwich, North—debate on Engineering in the House of Commons 11th March 1988.

18. '... I believe we should not only encourage more young people to pursue engineering studies, but we must also - on the corporate level - advance young technologists through the managerial ranks. Manufacturing and high technology corporations must be led by those who understand not just business but technology as well. Just as you wouldn't have a rugby coach who never played the game, how can someone who doesn't understand the workings of technology take the reins of a manufacturing operation? How could that kind of person make the correct, intuitive judgments regarding R&D budgets, factory automation and the unseen potential of new technology?' The First UK Innovation Lecture by Akio Morita, Chairman of Sony Corporation, 6th February 1992,

organised by the DTI.

19. Sir Denis Rooke, an engineer and former chairman of British Gas, said that 'the cultural bias against industry which has long pervaded Britain is not only outdated, it represents a positive danger to the quality of our future life. Calling for a "deep cultural change" in attitudes, Sir Denis said that there was nothing second-class about creating the wealth needed to finance improvement in social provision.' *The Times* August 27 1991.

20. Sue Arnold writing in *The Observer* Sunday 14 February 1993 - 'Why is it, I asked Mr [Takio] Fujii, [general manager Toshiba Europe] later, that the Japanese are so much better at product development than anyone else? He said that in Japan engineers had a complete education, not just engineering but product development, marketing and managing as well. But most important of all, they enjoyed a much higher social status than engineers in Britain, who are considered inferior to scientists and doctors.

    It's quite true. Engineers are under-rated here. [Sue Arnold].

21. '… we needed to stay at the leading edge of technology if we were to achieve for this country what it expects of itself and what we wish to see achieved. In years gone past, over generations, we have been less good than some of our main competitors at getting enough of the best young people into engineering. And the reason … is one I feel deeply about myself and have touched upon on many occasions. It is that instinct embedded deep in our culture that previously tended to disdain industry and give more kudos to classical education than to technological education'—Rt Hon John Major, Prime Minister, *Newsletter* of The Engineering Council, November 1991.

22. In 1991, the enormity of the problems facing our society were well summarised by a former Secretary of State for Trade & Industry, and a former Secretary of State for Education. Speaking on a BBC Radio 4 programme called 'Analysis - From clogs to clogs' [note the title] April 1991, Keith Joseph stated:

    > I'll tell you what, the same story has got to be told to every vintage, every annual cohort of boys and girls leaving school that all their wishes for a civilised society will depend upon their generation creating the jobs and the earning power through being inter-nationally, profitably competitive. The story will never cease to be necessary. One day perhaps it will become, as it were, universally understood from the mother's womb.

Anecdotal evidence from education

By the nature of the educational role, it is inevitable that the views and opinions of teachers will be sought, indeed teachers are powerful opinion leaders. But have teachers ever understood the role of industry or the role of professional engineers as technological practitioners vital to our society in the process of enhancing productivity and capability?

As with the majority of the population, teachers are trapped within the value judgments that have been handed down to our society, and especially within their profession. For the minority of people in tune with the value judgments responsible for our industrial and economic decline, there will be few surprises in the following:

23. Official recognition – The following foreword appears in a directory of organisations on School/Industry Links published by *Industry Matters*:

    The Industry Year 1986 campaign laid the foundation for a positive change in the anti-industrial attitudes which can still be found in our society …

    Signed jointly by Kenneth Baker, Lord Young and Peter Walker as Secretaries of State for Education and Science, Trade and Industry, and for Wales respectively. [In reality the *anti-industrial attitudes* have to be comprehended before change can take place].

24. 'That's what happens to you if you don't get good O-levels.' Said by a teacher after a tour of a reputable metal-forging company. Using the prospect of working in industry as a threat to encourage greater scholarly achievement by pupils is commonplace with secondary school pupils, but also infant school-children. Thus social stigma is attached to working in industry and especially 'manufacturing'. Industry is also deprived of a representative proportion of the country's intellectual resources.

25. In April 1991, the headteacher of a comprehensive school for girls said 'working in industry does not represent an intellectual challenge', and 'therefore she would not encourage her science pupils to take an interest in industry.' The headteacher had a degree in Science.

26. In *The Times*, Tuesday May 21 1991, under the headline - 'Lilley [Secretary of State for Trade and Industry] meets his model for innovative success', reference was made to Professor Kumar Bhattacharya and his Department of Manufacturing Systems Engineering, at Warwick University. The article goes on - 'His success prompts occasional envy, however. "Well, I know he's good at what he does", says one former Warwick academic, "But he's not *really* an academic, is he?"'

27. 'Lilley urges cultural revolution.' He said: 'What is needed is a revolution in attitudes towards … change. A sort of cultural revolution, which will transform the educational and social bias against business and against practical skills'—Rt Hon Peter Lilley MP, Secretary of State for Trade & Industry, *The Times* May 22 1991.

28. 'The British obsession with the academic was more than a subject of passing concern. It has been responsible for much of our economic decline because it helped to turn industry into a dirty word.' Mr Brian Nicholson, Chairman, Manpower Services Commission, talking to careers teachers. *The Times*, Saturday July 5 1986.

29. 'If he is going to be an engineer he doesn't need English'. Said by a headteacher to a parent when the son had failed his English O–level.

30. 'My headteacher was only interested in you if you wanted to become a civil servant. Because I wanted to go into industry and become a professional engineer, I was an outcast.'

31. 'We are not in the business of producing fodder for factories'—frequently heard from primary and secondary school teachers.

32. 'One of my teachers told me I was too intelligent to become an engineer.'

33. 'In the staff common room, my greatest utility is as a resource for putting up shelves'- disillusioned Head of Technology in a secondary school, 1996.

34. 'For my A-levels, I wanted to do Engineering Drawing and Technical subjects. My teachers were horrified and told me '… you will be joining all the E-stream pupils. They wanted me to do Classical or Humanities subjects which were regarded as respectable. I did what I wanted to do, and some of the teachers never spoke to me again in my time at that school.'
    Note: This person went on to become a Professor.

35. 'As a teacher, my training and interest was in English, but my Headteacher has given me responsibility for delivering technology. I know nothing about technology.' A secondary school teacher, and Post Graduate Research Degree Student—March 1999.

36. 'Academic scientists still tended to regard industry with distaste, regarding it as oil-stained and unsuitable for intellectuals. Industrial scientists were resigned to working in huts behind mammoth process plants.' From 'Benn's radical step' by Chris Partridge, page XII *Times Supplement* on Science Parks, Wednesday October 5 1994.

37. 'They have nothing like it in Germany or France'—a Teacher Placement Organiser commenting on the existence of the Teacher Placement Service and the many school/industry link initiatives which operate in the UK. [In other words, there was no perception that these initiatives were necessary to try and correct a long-standing cultural deficiency in our society which goes back much more than a century. But such remarks are entirely consistent with our 'anti-industry culture'.]

38. A group of ethnic parents protested about their children being pushed towards a City Technical College because they were being 'directed towards second class careers' in the UK. Reported in a tabloid May 1989. And people who should know better can be extremely disappointing in their responses. For example, when told of this report, a Teacher Placement Service Network Manager stated 'but you must have sympathy with

the parents. They are so anxious for their children to join the professions.' But what is also damning about this report is that parents from an ethnic background have quickly learned the 'values' of our society, including the anti-industry culture.

39. Alun Raymond Howell was educated at Swansea Grammar School, where he won an open scholarship in mathematics to Gonville and Caius College, Cambridge. He incurred the wrath of his headteacher by electing to read for the Mechanical Sciences Tripos. Reported in the obituary columns of *The Times* June 2nd 1988. [This is significant also because Howell developed axial-flow compressors as the alternative to the less efficient centrifugal compressors used by Sir Frank Whittle. All jet engines now incorporate axial-flow compressors, and Howell's work of more than 45 years ago is still a standard reference.]

40. 'My girls are not going to get their hands dirty'—the headteacher of a girls school on the occasion of an Enterprise exhibition at her school.

41. 'As a 6th Former, I decided that I wanted to become an apprentice at the Ford Motor Company. My teachers were totally opposed to my plans, but I went ahead anyway.' This man eventually became director of manufacturing with responsibility for some 13 000 people.

42. 'I felt as out of place as a **northern chemist**'. A son of Prince Ferdinand von Bismarck speaking of his experiences at Oxford—see 'Heirs to a Dual Identity', *The Times Saturday Review* February 23 1991.

43. 'So you are trying to get an Industrialist in Residence [former manager and professional engineer seconded to secondary schools by a multi-national manufacturing company]. We had one and he got us desks and filing cabinets'—One head teacher to another.

44. 'Go and fill the drinks machine please'—A senior member of secondary school staff to an Industrialist in Residence (and a qualified engineer) seconded for two years by an international manufacturing company.

45. 'What does your son want to do?'—a Headteacher to a parent in 1992. 'He wants to take a degree in Mining Engineering.' 'Oh dear! There's no money in engineering.' [Note: The Engineering Council's 1992 survey showed that engineers' earnings across the board had risen by around 6.5% in real terms since 1989, to an overall median of £28 500, and that 90% earn over £20 000 per year; also over half of all Chartered Engineers in the private sector in Britain have a company car].

46. 'We are not putting on a course in manufacturing GNVQ's; there is no point, we have no manufacturing industry'—a college spokesperson engaged in the development and provision of GNVQ courses. [This can only be described as appalling ignorance].

47. 'When work experience was first introduced, we used to send out the baddies'—former deputy head teacher.
    Note: If how we sustain ourselves as a society was held in some social esteem, as it should be, then to go out on 'work experience' would be similarly held in some form of social esteem, and such vacancies would be subject to competition.

48. 'I would like to go to a teaching job overseas for the experience of working in a less than perfect education system'—teacher in his mid-thirties in 1996.
    Note: This is just another indicator of the huge cultural gap that exists between the philosophy of education and the real world, but which nevertheless funds education. As adults we know the importance of an income to set-up home, but as a society we have not been taught to understand that personal model in the national context.

49. In January 1987, I was seconded as a business counsellor to The Essex Young Enterprise Centre (EYEC), helping young people to become established in their own businesses. The EYEC was established with the involvement of the LEA, and groups of teachers and pupils were encouraged to visit the EYEC. These group visits followed the pattern of an 'informed tour' conducted by the EYEC manager or myself, usually finishing with a question and answer session. It became evident that many teachers found provocation in the concepts of profit and wealth creation. This was a regular occurrence, and a cultural problem—Stan Owers.

50. An Education/Business Adviser (EBA) and a former teacher was participating in the delivery of a 'Learning with Industry' module at a teacher training college. At one point the EBA said: 'Managers in industry are not interested in safety. Only union leaders are interested in safety.' This is just not true. Products such as cars have stringent safety legal design requirements to satisfy—see page 81. Furthermore, these design requirements are subject to type approval or homologation legislation. Vehicles cannot be sold without type approval. Both EBAs and teachers should be taught about manufacturing industry, and given some idea of the legislative requirements.

51. 'My son has been involved with TVEI and he likes it, but you can't fool the kids, they know that those qualifications are not as good as A-levels'—Chairman of Board of Governors at a secondary school, and an accountant in a multi-national manufacturing company, 1989.

52. 'I didn't go to university to work on the shop floor'—a member of management staff in a small manufacturing company, October 1999.

53. 'The report sets out a coherent and persuasive view of design and technology as an essentially practical activity …' letter from Kenneth Baker Secretary of State for Education to Lady Margaret Parkes Chairman, referring to Interim Report on D&T, dated 23.11.1988 - see page 99 of the 1989a Orders.

54. 'You just give us the money to provide education, and leave it to us'—a secondary school deputy headteacher, October 1988, to a UBI Project Officer.

Examples from popular literature:

55. 'They were of a respectable family in the north of England; a circumstance more deeply impressed on their memories than that their brother's fortune and their own had been acquired by trade.' *Pride and Prejudice*, p14, Jane Austen, born 16th December 1775, died 18th July 1817.

56. … He'd become friendly with Tim, but then his mother had said it would be better if he didn't see any more of him. It was only long afterwards that he'd understood why. Tim's father had been a butcher who'd started a chain of shops and made a great deal of money, leading him to the besetting sin of all *nouveaux riches* —the naive belief that money could raise a person's social position. A person in *trade* could not be a gentleman, however rich. *A Conflict of Interest*, p39, by Jeffrey Ashford, Collins Crime Club 1989.

57. 'In 1848 two people came to Lyme Regis on honeymoon, they liked the area so much they decided they'd like to live here. One was Henry Peek, the other was his wife Margaret, and so this great house was built. Their tragedy was, because he was in trade, they were never accepted by polite Lyme Regis society. So that society, so neatly observed by Jane Austen proved to be just as unforgiving as she had suggested, but Peek and his wife stayed here and created a great estate, spending in all a quarter of a million pounds in the process. That was in the days when a few hundred pounds would buy you a house… .'—Hugh Scully, The BBC Antiques Road Show from Lyme Regis Sunday 19th January 1997.

Some other reports which are anti-feminist. As such, they harm the causes of business and industry, and therefore society as a whole:

58. 'When I walked into my first 'A' level Physics class, the Master said **"We have a girl! We don't usually have a girl to take Physics!"** As a result it took me a term to climb out of my shell, and they [the masters] made it really difficult for me for two years. The boys would work in groups and ignore me. I went on a WISE (Women Into Science and Engineering) Biology course for three days at the Imperial College, and that was really enjoyable and helped me a lot. I wished the school had organised a similar Physics course, but the Masters just weren't interested.'

59. 'My niece was taking Science and wanted to visit the WISE Bus (Women into Science and Engineering) which was visiting her school. She knew it would help her a lot, but because she was taking Science the teachers wouldn't let her. She was really disappointed.'—A professional engineer.

60. At a careers evening held for parents and students in a girls' grammar school, an ex-student who had recently graduated in engineering, and then became a Chartered Engineer was asked by a parent 'What was the most difficult part of her career in engineering?', and was told that 'You must be prepared to use the men's toilet if there were no others available.'

61. The perception of a young woman undergraduate on a Computer Science degree course was that the College lecturers were trying to turn her into a man. Support by the father persuaded the young woman to stay on at the college, and she obtained a First Class Honours Degree—1995.

62. At a well known grammar school, the Deputy Head (male) was interviewing a girl pupil in 1995, and discussing her choice of science subjects. The Deputy Head said he was amazed because 75% of girls want to do art subjects, and went on - 'I think that's [her choice] a rather silly thing; you know it's male dominated.'

63. 'My daughter had an opportunity to go round the WISE (Women Into Science and Engineering) bus which had called at her school. When she got back to her class, she and the others who went with her, were told that they would have to stay late for an hour to catch up on the lessons they had missed. That's enough to put them of engineering for life'—an ex teacher, 1995.

Late additions:

64. 'You are not paid to think. Your job is to maintain and service our products. So if you're not happy etc …. We have departments here that are paid to think and evaluate the markets. So unless you could show the sale of a large number of units … keep your opinions to yourself!'

    I left about a year later, and I heard at some later date that De Havilland did get a license to manufacture the Continental engine (so someone who was paid to think did so), but by then it was too late. The Americans had cornered the light aircraft industry to add to their monopoly of passenger aircraft—an ex De Havilland engineer, now retired.

65. … There needed to be something to complain about in our trio of new cities and this is where the final choice comes into its own. Wolverhampton is one of the many uncelebrated areas that can be said to have been forged on the anvil of the Industrial Revolution — and we've always been a bit odd about acknowledging the merits of that. Sniffiness will be back with a vengeance, but the stoical Wolverines — in their new city stronghold — will enjoy the last laugh. From a leading article entitled: *'A tale of three cities', The Times* December 19 2000.

Appendix 6 - Extracts from National Curriculum Orders: Economic and Industrial Understanding

Introduction

With the 1988 Education Reform Act, there was a concerted effort to recognise the need for economic and industrial understanding. The following extracts from various curriculum documents, demonstrate a significant concern expressed in considerable breadth and depth. In total, these extracts exceed one thousand words; this collection is worth reading to foster understanding for the uninformed, as well as reflection and recapitulation for those who feel familiar with the subject of Technology.

Design and Technology for ages 5 to 16 (1989)

1.1 '. . ., but it will also be an essential condition for the future prosperity of our business and industry.'

1.5 '. . . to understand the significance of design and technology to the economy and to the quality of life.'

1.6 'We have been particularly concerned to formulate a curriculum which meets the requirements of the 21st Century. It must contribute to pupils' economic and careers awareness, . . .'

1.8 'Our Terms of Reference described design and technology as an activity which goes across the curriculum, drawing on and linking with a wide range of subjects. . . .'

1.10 'Design and technology has a special relationship with science and mathematics. Although its aims are different from science and mathematics, it is intimately associated with them, drawing upon their knowledge and skills and, in turn, contributing in ways which stimulate and assist further advances in them. . . .'

1.11 'This special relationship needs to be fostered in the school curriculum. . . .'

1.12 'In the same way, because communication skills of diverse kinds are essential to good quality design and technology, we have made reference to the relevant attainment targets and programmes of study for English, . . .'

1.13 'There will also be occasions when pupils will undertake design and technological activity which draws on the specialist knowledge and skills of other foundation subjects, particularly history, geography and art. . . .'

'Sub-heading: The contribution of design and technology to cross-curricular issues and themes'

1.24 'Our approach to the teaching and learning of design and technology provides many opportunities for contributions to be made to pupils' understanding of a number of important cross-curricular issues and themes. In his response to our Interim Report, the Secretary of State mentioned in particular economic and career awareness and business understanding, while our Terms of Reference refer also to environmental awareness and to health and safety education.'

1.25 'In considering economic and careers awareness and business understanding we have been helped by a substantial review of work-related activities in primary and secondary schools. It is clear that there is much under this broad heading that has been developed by teachers in recent years, often with great success . . . This state of affairs is impressive in many respects, but is also a matter for concern because of fragmentation and lack of coherence in developments.'

1.26 'We consider, however, that strong permanent links are needed between schools and industry . . .'

1.28 '. . ., the rewards in terms of pupils' economic and industrial understanding can be considerable. . . .'

1.47 'The inclusion of design and technology as a foundation subject in the national curriculum is a considerable innovation and challenge. It occurs at a time when many countries throughout the world are beginning to acknowledge the potential of design and technology, not least in preparing pupils to understand and deal with the complex problems they are likely to face in their personal and working lives in the years ahead. Many of these problems have technological origins; equally, the means of solving them, of operating effectively in fields where there is not one right answer, where judgement as much as technique is the hallmark of successful practitioners, depends upon design and technological capability.'

Technology for ages 5 to 16 (1992)

1. 'In June 1992', a 'review was commissioned' of 'attainment targets 1 to 4', because 'teachers had experienced significant difficulties in interpreting the detailed statutory requirements associated with these attainment targets.'

2. The objectives of the review were to:

   • 'clarify the knowledge, skills and understanding which pupils should acquire at each key stage;

- to ensure that the curriculum was manageable, by reducing the complexity of the requirements and the amount of work required in each key stage;
- to clarify how when the skills, knowledge and understanding developed through other curriculum Orders should be put to use in technology.'

Mathematics for ages 5 to 16 (1988)

1.8 '. . . New technology is a powerful tool which opens up new areas of mathematics and changes the way in which society makes use of mathematics in the factory, office and home. . . .'

2.11 'The potential contribution of mathematics to the overall school curriculum is considerable. . . .'

3.14 'Mathematics has a crucial role to play in equipping young people to meet the responsibilities of adult life – as citizens, employees and members of households. . . .'

3.15 'We have taken it as axiomatic that the mathematics which pupils learn at school should support the mathematics which they actually need to use in later life, particularly at work. . . .'

Science for ages 5 to 16 (1988)

Page x - Letter from Professor J J Thompson to the Secretaries of State - '. . . We live in a society which is becoming increasingly dependent on science and technology. . . .'

1.12 '. . . We want pupils to engage fully in all aspects of Science and Technology: to acquire scientific knowledge and understanding, and necessary skills through experimentation and investigation; to have the opportunity to communicate about Science and Technology, and to consider their social and economic implications. . . .'

1.14 '. . . More generally, we should not underestimate the value of a good grounding in Science and Technology in all its aspects as a basis for coping with a world of rapid scientific and technological change, and for enriching life.'

1.15 '. . . We want Science and Technology to speak intelligibly and imaginatively to every boy and girl throughout their time at school, . . .'

1.18 'Research findings on science education in schools suggest that we should not be complacent. . . .'

1.21 'But even if we were satisfied with our pupils' performance in an international league table, and with their results as they appeared in United Kingdom research, the comments we have received from employers have made it clear that industry expects to

need more young men and women with a wider range of scientific and technological skills and knowledge. It is clear that our population's expertise in Science and Technology is not as high as it will need to be in the future. We would be failing in our duty if our proposals for Science and Technology in the National Curriculum did not help schools satisfy this requirement.'

2.7 'Whereas Science is concerned with the pursuit of reliable knowledge about the physical and biological world, Technology is led by human needs and involves meeting those needs or solving identifiable problems. It is concerned with optimisation, and with balancing costs and benefits in any solution.'

2.8 'Clearly there are important connections between Science and Technology. During its history, Science has drawn on Technology in developing its instrumentation and techniques of enquiry. Significant discoveries have depended on the development of particular tools, materials and techniques. Conversely, in attempting to solve a problem to meet a need, whether it is designing a bridge for a particular site or finding ways of providing human communities with clean drinking water, technologists may draw on and use scientific knowledge. Technology, however, is more than applied Science – it draws the knowledge it needs for solving problems from many disciplines.

Appendix 7 - Presentation of statistical results from 6th Form survey

The first three questions on the data gathering instrument (shown on pages 11 to 13) made greater definition of the data-base possible as follows:

Part A – Please indicate whether you are female or male? – the breakdown was as follows:

Female	1150
Male	1861
Missing entries	92
Duplicate entries on forms	2
Total number of cases	3105

The missing entries relate to the questionnaire where young people were required to indicate their gender; duplicate entries referred to young people who indicated both genders. Some missing entries occurred because faint marks were made on the questionnaire which could then not be machine-read.

Part B – In which year of your A-level studies are you? – the breakdown was as follows:

First year	2083
Second year	830
Missing entries	192
Duplicate entries on forms	0
Total no. cases	3105

Part C – Please indicate which subjects you are taking at A-level

Art	566
Design & Technology	1470
English	773
Geography	650
History	394
Maths	1051
Modern Foreign Language(s)	340
Science	1156
Other subjects - please define	1661

The scanned 3-page questionnaire produced some 70 variables, with many analytical possibilities. But in this thesis the purpose has been to show the holistic and pivotal role of technology in our lives, in industry, and the economy. Education has always been crucial in this process, but the nature of our culture has created a huge handicap for our society and particularly for the institution of Education, a handicap mostly unseen—see Chapter 7.

With the 1988 Education Reform Act, and the introduction of technology as a National Curriculum subject, our society and Education were at last given the opportunity to rectify the wrongs of the previous 120+ years. However, change, and specifically cultural change, does not happen quickly, but as a society how long can we afford to wait? As a newly introduced 'foundation' subject, D&T has to find a place among long established subjects including the higher ranked 'core' subjects of Mathematics, English and Science. From a cultural standpoint, and with statutory sanction, D&T has always been lower-ranked.

As discussed earlier in this chapter, the National Curriculum launched in 1988, also introduced Economic and Industrial Understanding (EIU) as a non-statutory cross-curricular theme. In 1986, there was an attempt to refocus the attitude of the public towards the role of industry in society; the RSA[2] launched Industry Year *1986* with the slogan *Thanks to Industry*. A video film was produced with this slogan as the title, and notes on the sleeve state 'the slogan … is intended as a challenge to a society which is insufficiently aware that almost everything we do depends on industrial activity and which shows little appreciation of such activity.'

Industry Year *1986* caused a significant surge in EIU-related activity, and laid the foundations upon which the National Curriculum Council were able to build when preparing the non-statutory guideline No 4, *Economic and Industrial Understanding* in 1990.

However, on 7th April 1993, Sir Ron Dearing was asked by the Secretary of State for Education 'to look into the scope for slimming down the National Curriculum …'—Dearing (1993:1). After the Dearing Review, a considerable reduction of content occurred in the statutory curriculum, and reference to EIU disappeared.

Nevertheless, education should at least teach us how we sustain ourselves as a society, and this should be passed on to young people as a legitimate slice of our culture. Although the majority of opinion perceives no compulsion about the delivery of EIU in the curriculum, Craft (1995:159) argued:

> Thus, within parts of the statutory curriculum (and despite Dearing's proposals to slim the curriculum and its assessment) relevance to work and the economy is now something to which all pupils from 5 years upward are entitled by law.

Although no direct reference to cross-curricular themes was made, Dearing (1993:27) concluded:

> The challenge facing the world of business and industry is as obvious as it is severe. To survive, let alone prosper, it is necessary, day in and day out, to aim for and achieve standards previously thought unobtainable. …
>
> As a nation we are, therefore, fortunate that our teachers are deeply committed to the well-being of their pupils. … coupled with an acceptance that schools are accountable to parents and society …

[2] Royal Society for the encouragement of Arts, Manufactures and Commerce

So this statistical survey will provide an opportunity to reflect on the perceived role in our lives of various curriculum subjects among A-level students, and at a point some seven years after the introduction of technology.

Initially, the analysis will concentrate on technology, and the core subjects of Mathematics, English and Science. Each subject will be considered in as many dimensions as the original questionnaire will allow, but the overriding focus will be education for economic and industrial understanding or EIU.

Ideally, the data-gathering instrument should have used the same sub-set of curriculum subjects throughout the questionnaire. However, this would have required a four-page questionnaire, and was perceived as a potential further source of resistance by teachers contemplating participation in this research.

The statistical results

Statistical data are concerned usually with 'the measure of central tendency among a batch of values'—Velleman (1992:7/1), and applies equally in this analysis. In terms of 'elementary' statistical theory, 'the median and the mode have considerable claims to use as measures of location', since they are easily interpreted—Kendall (1963:40). 'The median is the middle value and the mode is the most popular value'; furthermore the median is 'less dependent on the form of the frequency-distribution than the mean—Kendall (*ibid*). The author has adopted the 'median' as the measure of central tendency, an approach confirmed by two professional statisticians as appropriate to the nature of the data collected.

The statistical analysis produced more than eighty graphs, and in order to save on word count, the main body of results are presented in this Appendix. The median values are shown on the graphs, and the graph frames also show the sample sizes. The alpha/numeric reference in the top left hand corner of each graph frame refers to the questions on the data-gathering instrument.

Many of the graphs exhibit a peak around the mid-point on the rating scale of 5, and that obtains whether the plots have a positive slope (high on left), or a negative slope (high on right). This characteristic probably arises because a small proportion of the students were undecided, and 'sat on the fence', but the results are nevertheless valid.

Analysis begins with the subject of D&T, followed by English. First-level inferences appear under each graph in Appendix 7; the graph 'Figure' reference numbers are prefixed 'A' eg Fig. A7.01 to correspond with their location in the appendix. An overall summary follows the order of the subject analyses, and since technology has always been a cross-curricular subject, the weight of inference will gradually increase as the analysis extends into other curriculum subject areas.

D&T in education and industry

In this sub-section the following will be considered:

- How much interest do you have in the subject of D&T?
- In your opinion, how difficult is the subject of D&T?
- When it comes to getting a job, how important do you consider the subject of D&T?
- In the context of EIU, how important do you consider the subject of D&T?
- In our society, how much do you think the way we live now has been influenced by D&T?
- In your opinion, how creative does the curriculum allow you to be in D&T?
- As a modern society, how dependent do you think we are on D&T?

And so to the presentation of the results, starting with the responses to the first question.

How much interest do you have in D&T?

Fig. A7.01 below presents the interest shown in D&T by both female and male A-level students.

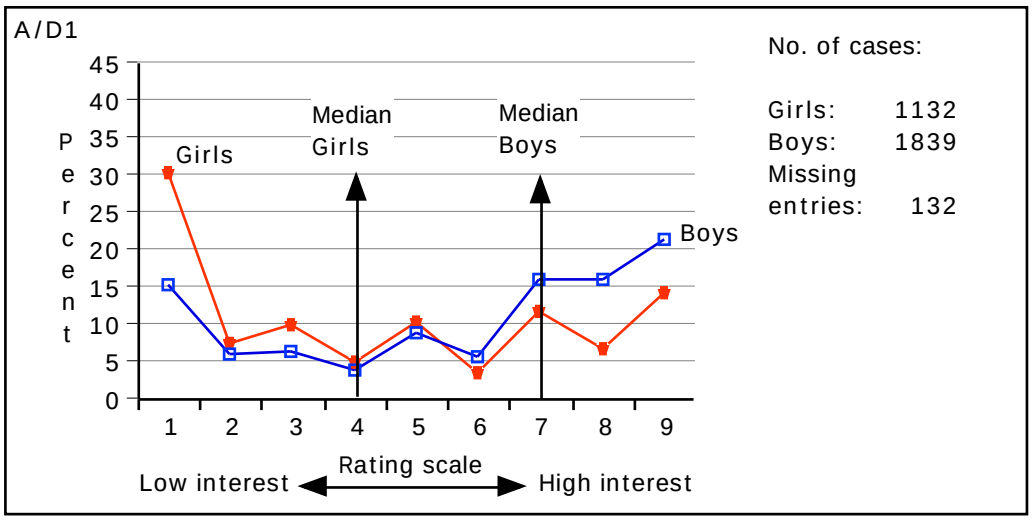


Fig. A7.01 - Interest in D&T - Analysis by gender

By inspection it may be seen that girls were less interested in D&T than boys with medians of 4 and 7 respectively.

When interest in D&T was analysed on the basis of students who were taking the subject, and compared with students who were not, a different picture emerged—Fig. A7.02.

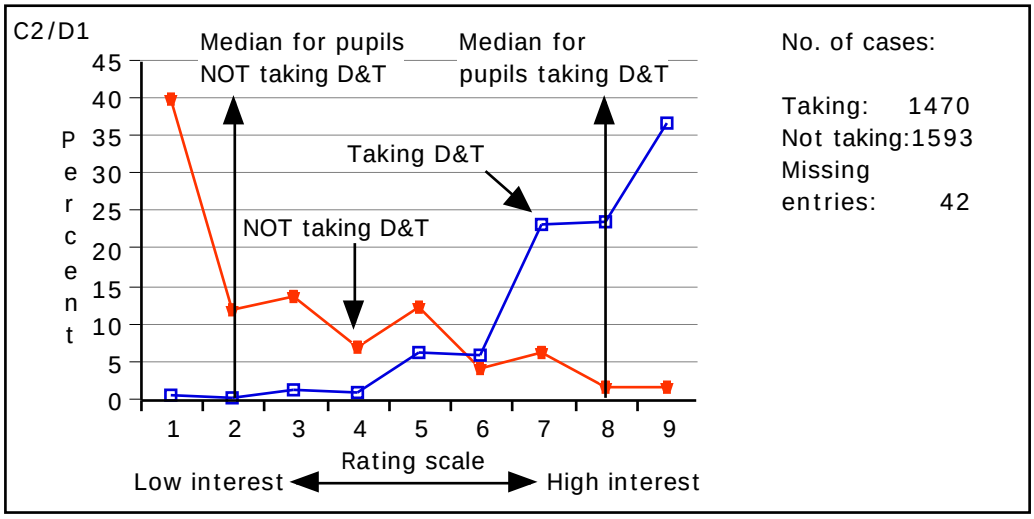


Fig. A7.02 - Interest in technology - Analysis by subject studied
Comparison between pupils taking D&T and pupils not taking D&T

Fig. A7.02 shows two very different curves, and much greater separation between the median values of 8 for pupils taking D&T, and 2 for pupils not taking D&T. What is a serious cause for concern with this result is that we are surrounded by the benefits of technology. Furthermore, without exception we are all consumers of technology to an extent mostly not understood nor recognised, and as shown here particularly by pupils not studying D&T.

In your opinion, how difficult is D&T?

Fig. A7.03 shows the difficulty with Design & Technology as perceived by the genders.

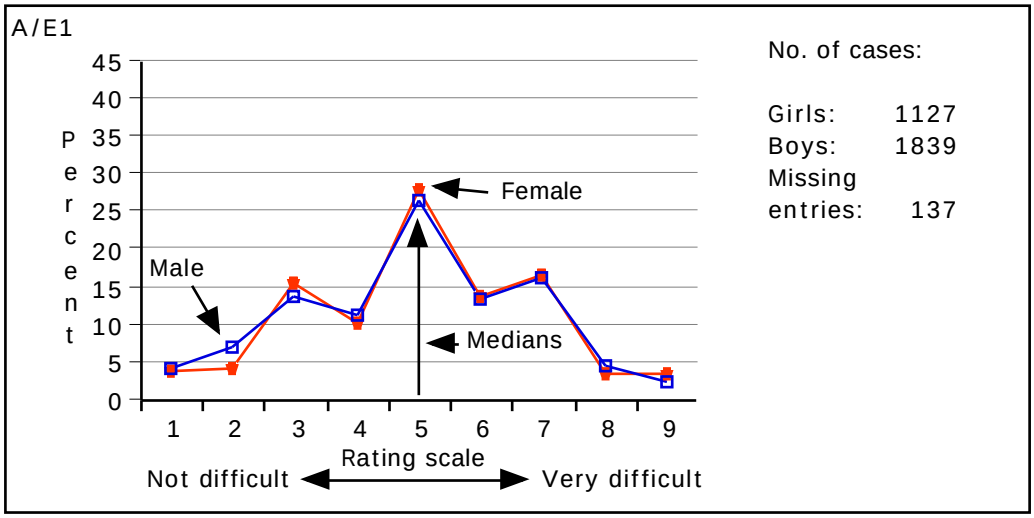


Fig. A7.03 - Difficulty with D&T - Analysis by gender

Fig. A7.03 shows that there was no difference of opinion between the genders since they shared common median values at 5.

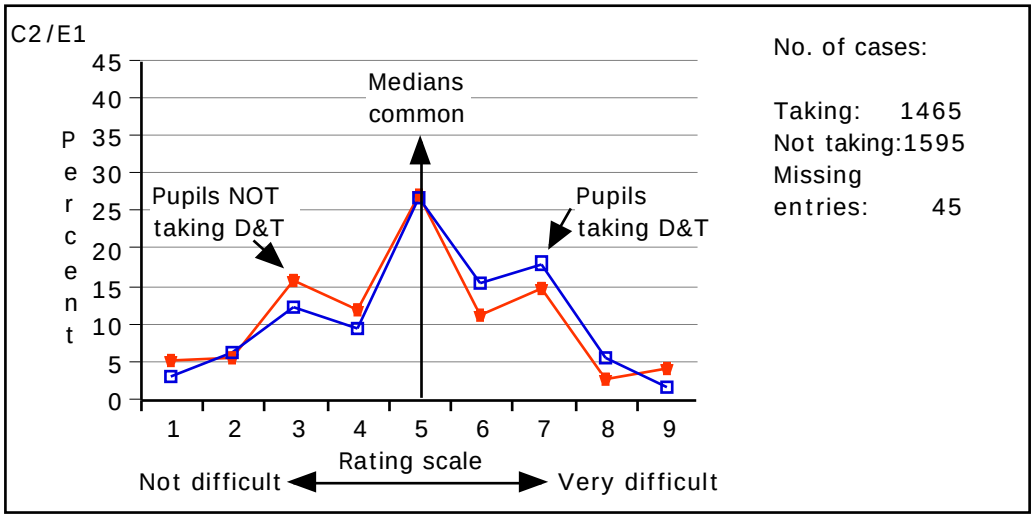


Fig. A7.04 - Difficulty with D&T - Analysis by subject studied
Comparison between pupils taking D&T and pupils not taking D&T

Similarly, Fig. A7.04, shows there was no difference of opinion about the difficulty of the subject between pupils studying D&T, and pupils who did not take D&T, since they shared common median values at 5. Later, the analysis of Maths and Science will show that they were both perceived to be more difficult than D&T, and yet Maths and Science are both components of D&T. This result is also a serious cause for concern.

When it comes to getting a job, how important do you consider D&T?

Gender perceptions of the importance of D&T when seeking a job are shown in Fig. A7.05.

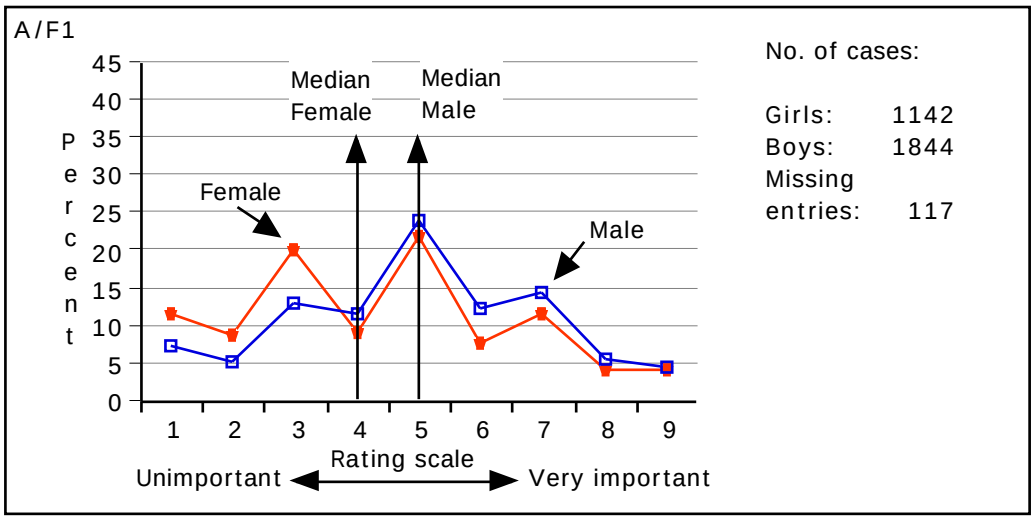


Fig. A7.05 - Importance of D&T when seeking a job - Analysis by gender

Fig. A7.05 indicates that boys attach marginally greater importance to D&T when seeking a job than do girls. This however, may be due to the influence of gender role models.

In the context of the importance of technology when seeking a job, Fig. A7.06 shows that

pupils who were taking D&T valued the subject more highly than pupils who were not taking D&T.

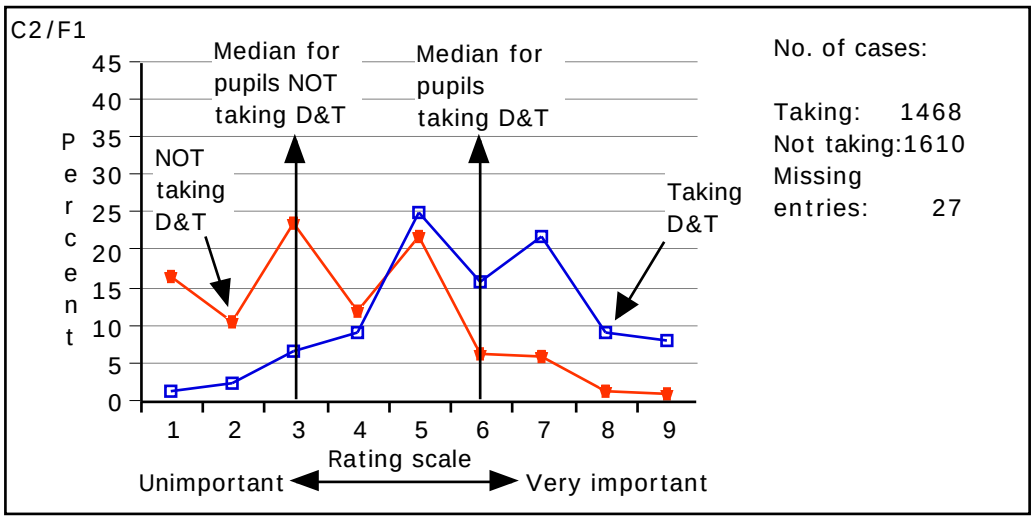


Fig. A7.06 - Importance of D&T when seeking a job - Analysis by subject studied
Comparison between pupils taking D&T and pupils not taking D&T

In the context of EIU, how important do you consider D&T?

The importance of D&T in the context of Economic and Industrial Understanding (EIU) for the genders appears in Fig. A7.07, with median values of 5 and 6 for girls and boys respectively. The mean values of 5.69 for girls and 6.19 for boys, indicate a half-rating difference, but mean values are influenced by clusters at the extremes.

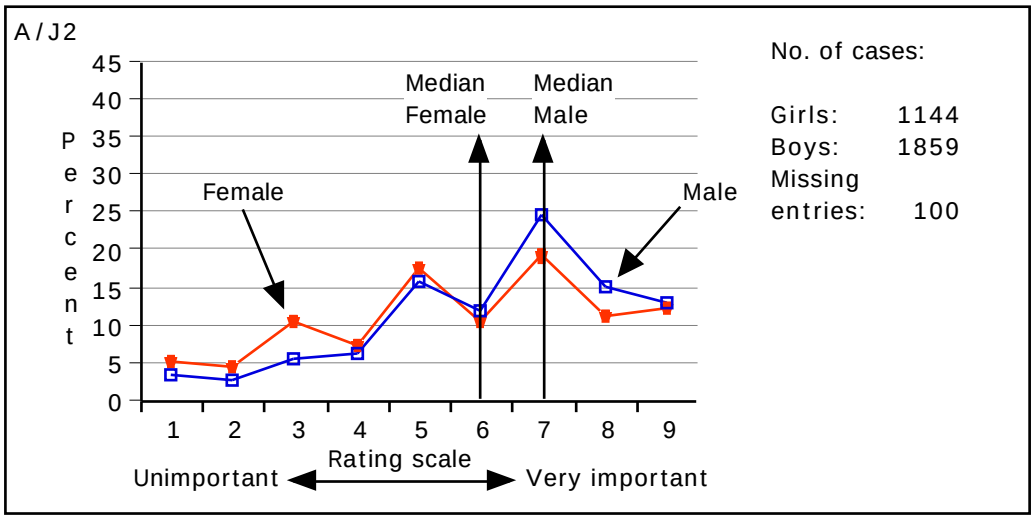


Fig. A7.07 - Importance of D&T in the context of EIU - Analysis by gender

The importance of D&T in the context of EIU is also shown in Fig. A7.08, but illustrates a comparison between those who did take D&T, with those who did not.

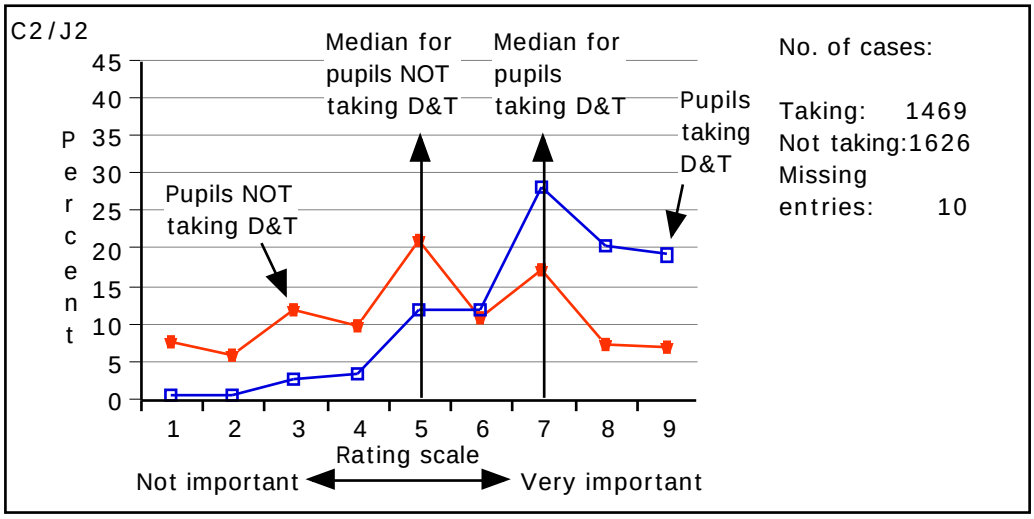


Fig. A7.08 - Importance of D&T in the context of EIU - Analysis by subject studied
Comparison between pupils taking D&T and pupils not taking D&T

Students who were taking D&T attributed more importance to D&T in the context of Economic and Industrial Understanding (EIU) than students who who were not taking the subject, and by two ratings—Fig. A7.08.

How much do you think the way we live now has been influenced by D&T?

How the genders rated the influence of D&T in our society is shown in Fig. A7.09. There was no difference in perception between girls and boys; the medians were fairly high at 7.

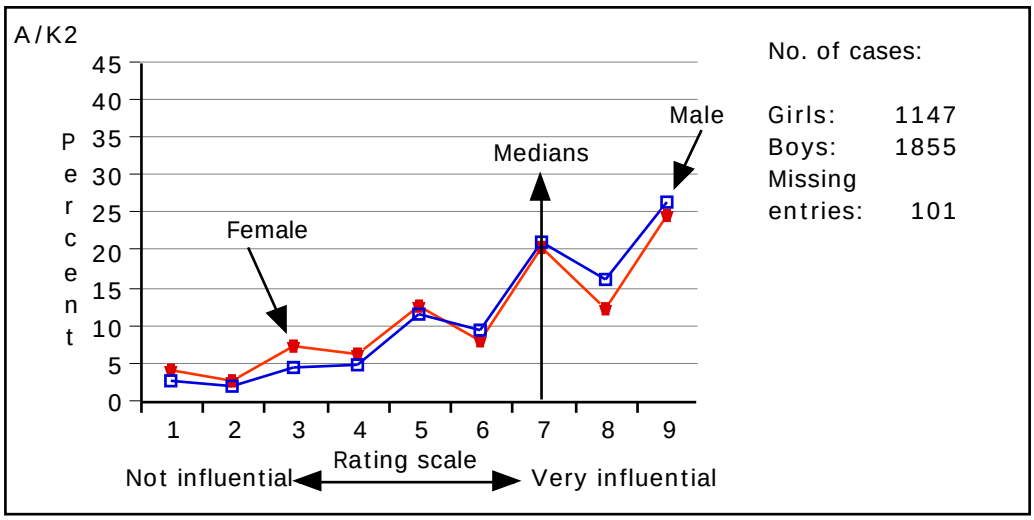


Fig. A7.09 - The influence of D&T on the way we live now - Analysis by gender

But once again, a different picture emerged when pupils who were taking D&T were compared with pupils who did not take the subject, as shown in Fig. A7.10.

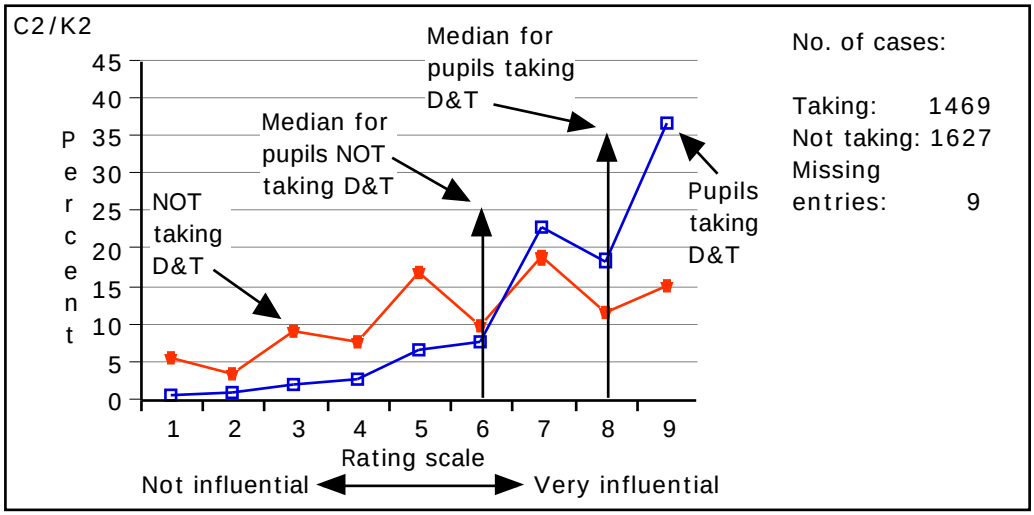


Fig. A7.10 - The influence of D&T on the way we live now - Analysis by subject studied
Comparison between pupils taking D&T and pupils not taking D&T

From Fig. A7.10, it may be seen that pupils studying D&T attributed a significant level of influence in our society with a median of 8. But pupils not studying D&T rated the influence at a median of 6; these results included students taking Maths and Science.

How creative does the curriculum allow you to be in D&T?

The perceived level of creativity possible with D&T in curriculum is shown in Fig. A7.11.

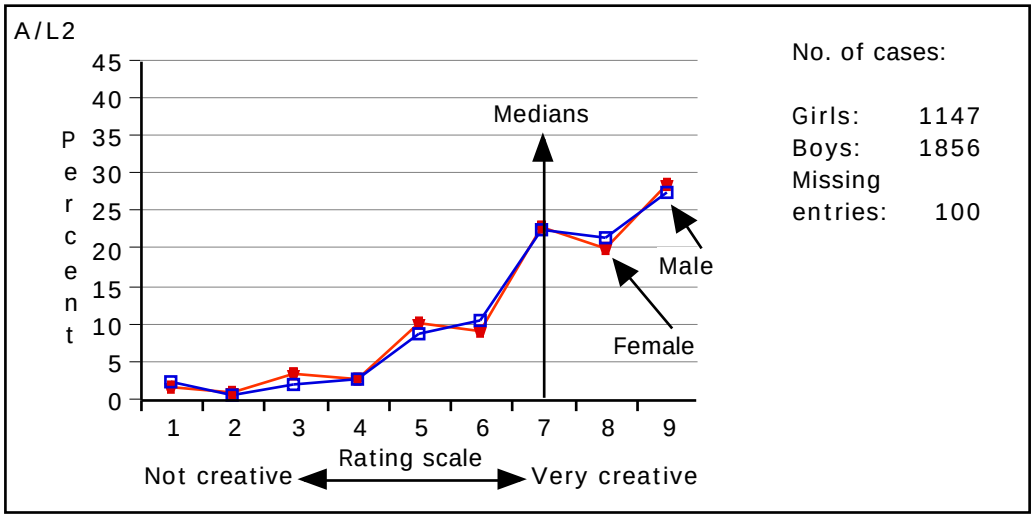


Fig. A7.11 - Creativity possible with D&T in the curriculum - Analysis by gender

For D&T in the curriculum, Fig. A7.11 shows that the creativity perceived possible was rated fairly high with median values of 7. However, when these data were analysed on the basis of those students taking D&T, and compared with pupils who were not taking the subject, the comparisons showed a very favourable response—see Fig. A7.12.

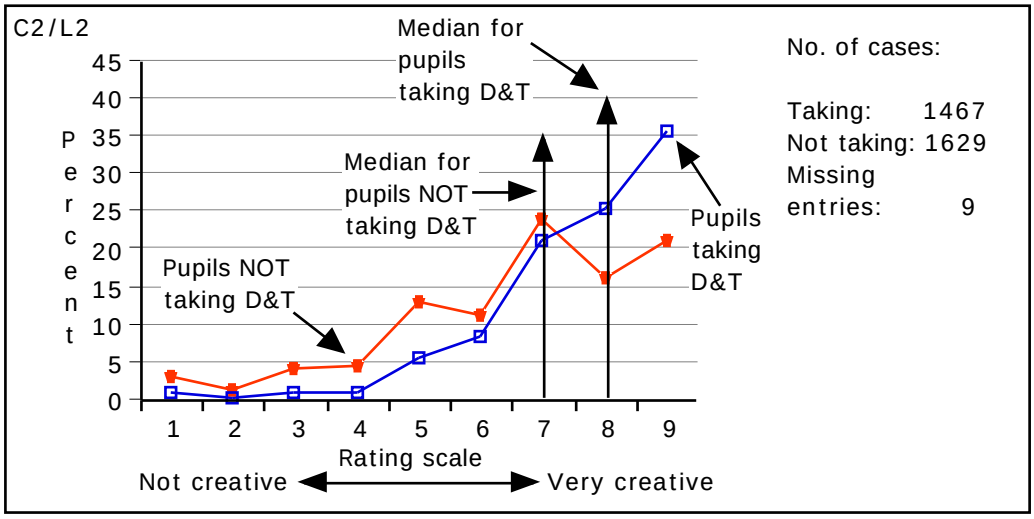


Fig. A7.12 - Creativity possible with D&T in the curriculum - Analysis by subject studied
Comparison between pupils taking D&T and pupils not taking D&T

From Fig. A7.12, students who did take D&T scored a median value of 8, while pupils who did not take D&T, rated highly the creative possibilities in the curriculum at a median of 7.

As a modern society, how dependent do you think we are on D&T?

Fig. A7.13 captures the extent to which our society is dependent on D&T as perceived by this A-level population, and shows the gender analysis.

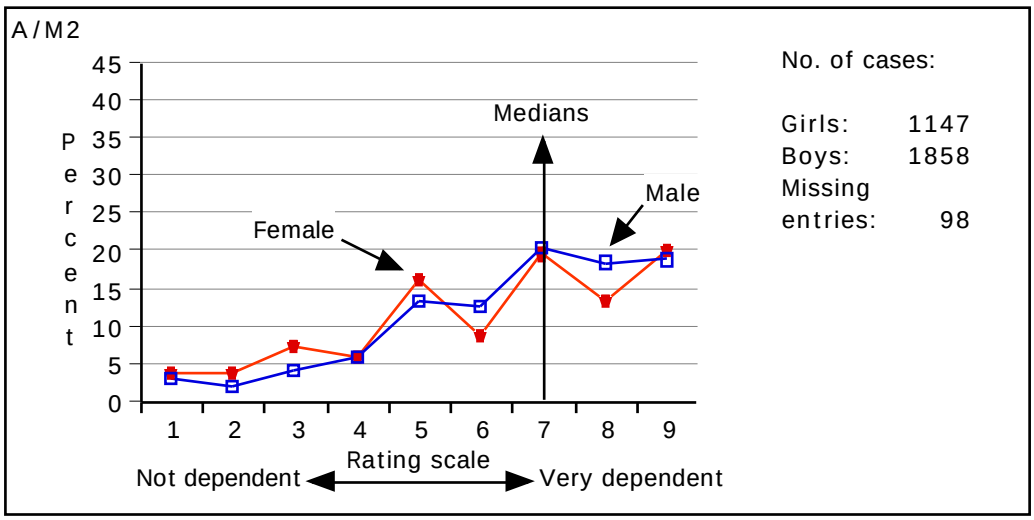


Fig. A7.13 - How dependent is our society on D&T? Analysis by gender

Fig. A7.13 shows that both girls and boys considered that our society was relatively dependent on D&T with median values at 7. However, if the issues were properly understood, the median values would have been 9.

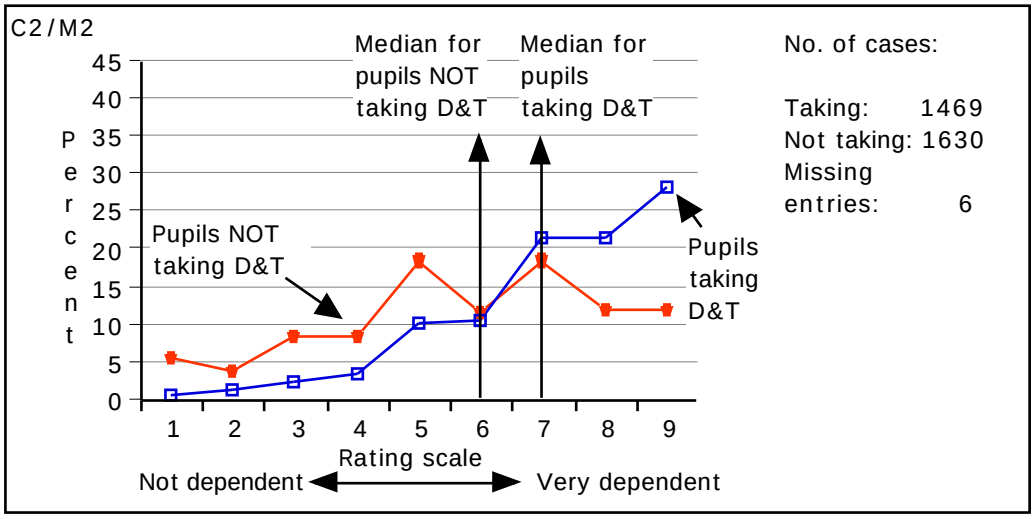


Fig. A7.14 - How dependent is our society on D&T? - Analysis by subject studied Comparison between pupils taking D&T with pupils not taking D&T

Fig. A7.14 portrays our society's dependence on D&T as perceived by pupils both studying and not studying the subject. This figure also shows another dimension of the dilemma for our society when pupils taking D&T were compared with pupils not taking the subject; the medians were 7 and 6 respectively.

08.06.03 English in education and industry

In this section the following will be considered:

- How much interest do you have in the subject of English?
- In your opinion, how difficult is the subject of English?
- When it comes to getting a job, how important do you consider the subject of English?
- In the context of EIU, how important do you consider the subject of English?
- In our society, how much do you think the way we live now has been influenced by English?
- In your opinion, how creative does the curriculum allow you to be in English?
- As a modern society, how dependent do you think we are on English?

How much interest do you have in English?

Fig. A7.15 presents the interest shown in English by both female and male A-level students; the median for girls was 5, and the median for boys was 3.

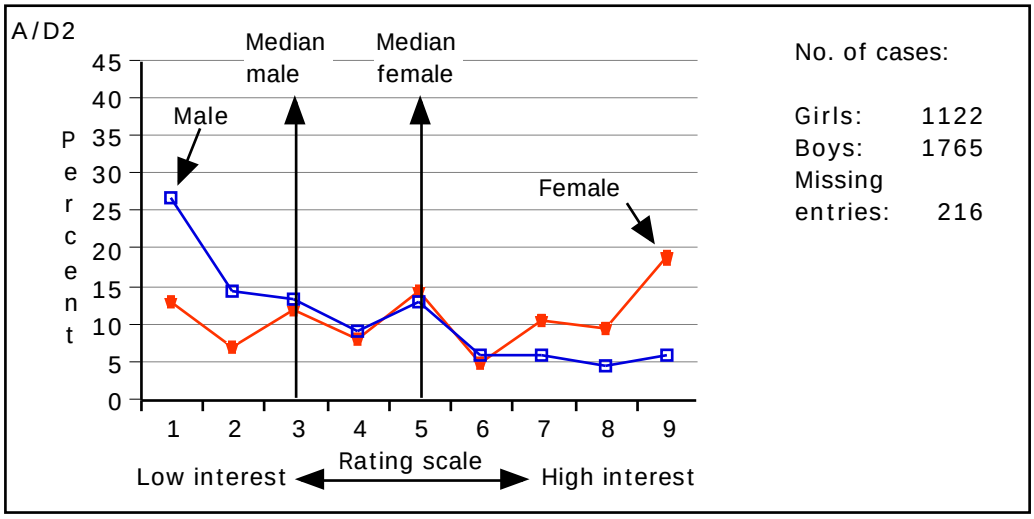


Fig. A7.15 - Interest in English - Analysis by gender

Analysis of interest on the basis of students who took English, by comparison with students who did not, appears in Fig. A7.16 below.

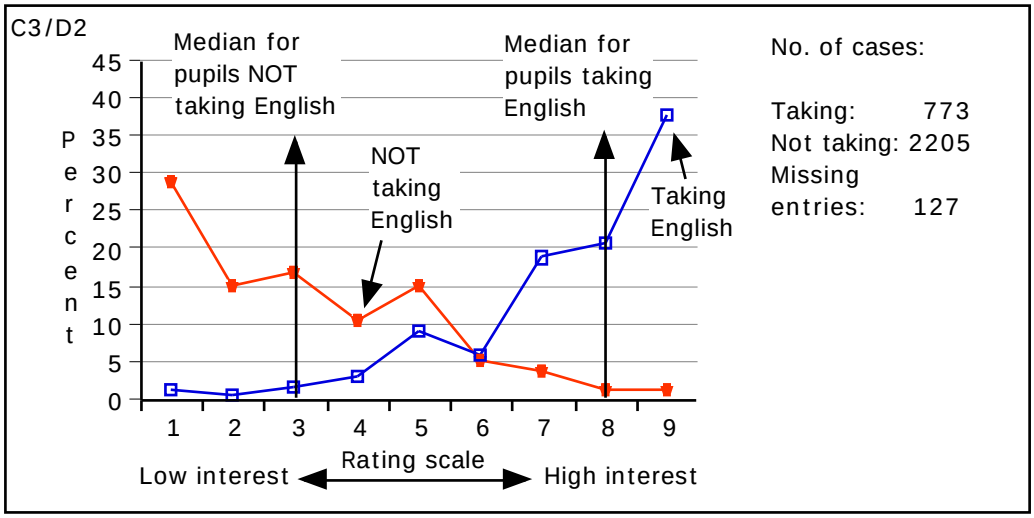


Fig. A7.16 - Interest in English - Analysis by subject studied
Comparison between pupils taking English and pupils not taking English

Fig. A7.16 shows two very different curves, and much greater separation between the median values of 8 for pupils taking English, and 3 for pupils not taking English.

In your opinion, how difficult is English?

With common medians of 5, Fig. A7.17 shows that girls and boys found a similar level of difficulty with English.

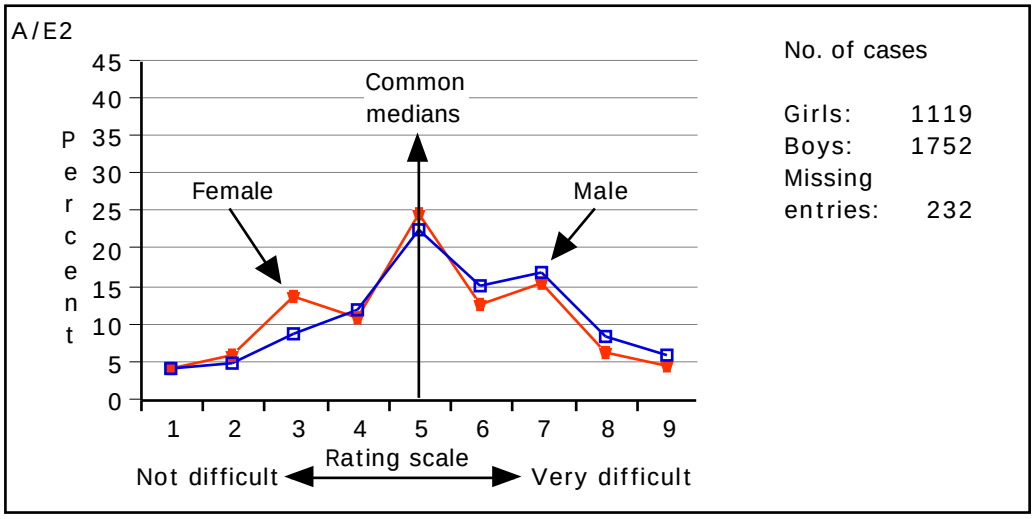


Fig. A7.17 - Difficulty with English - Analysis by gender

A similar picture emerged when comparisons were made between pupils taking English, and pupils not taking English as may be seen from Fig. A7.18 overleaf.

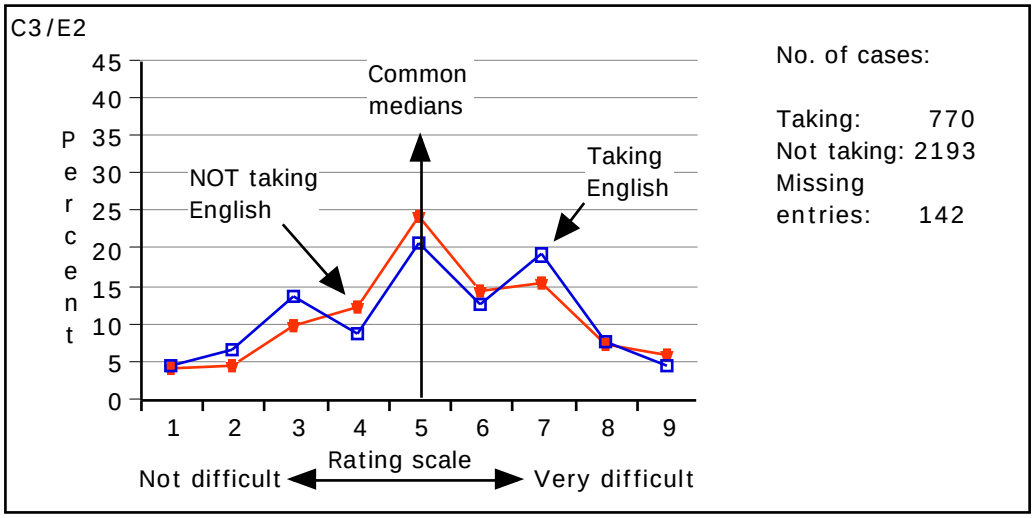


Fig. A7.18 - Difficulty with English - Analysis by subject studied
Comparison between pupils taking English and pupils not taking English

Fig. A7.18 shows that girls and boys found a similar level of difficulty with English with common medians of 5.

When it comes to getting a job, how important do you consider English?

Fig. A7.19 shows that girls rated the importance of English when seeking a job more highly than boys, but the median values at 8 and 7 respectively were both high, and good results.

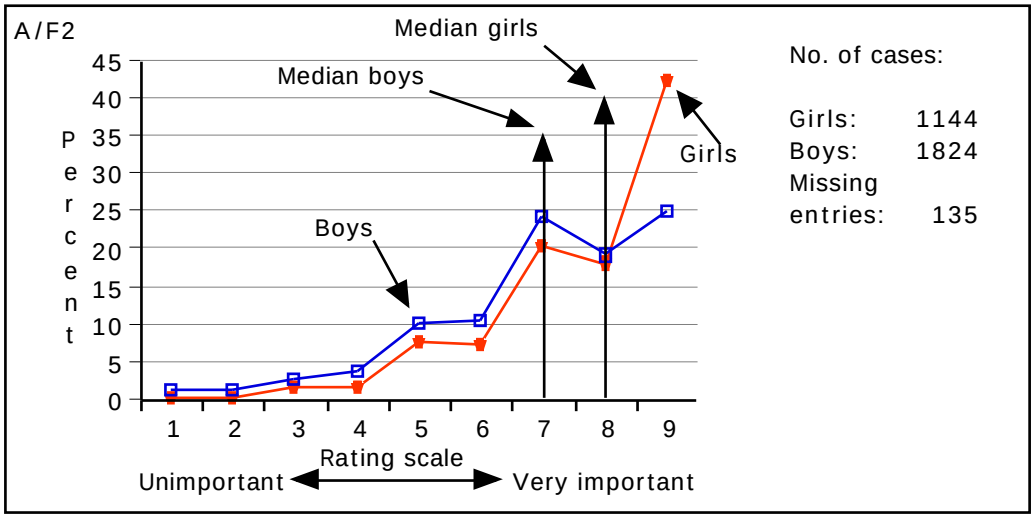


Fig. A7.19 - Importance of English when seeking a job - Analysis by gender

Fig. A7.20 overleaf shows the importance of English when seeking a job as perceived by pupils taking the subject, in comparison with pupils who were not taking the subject.

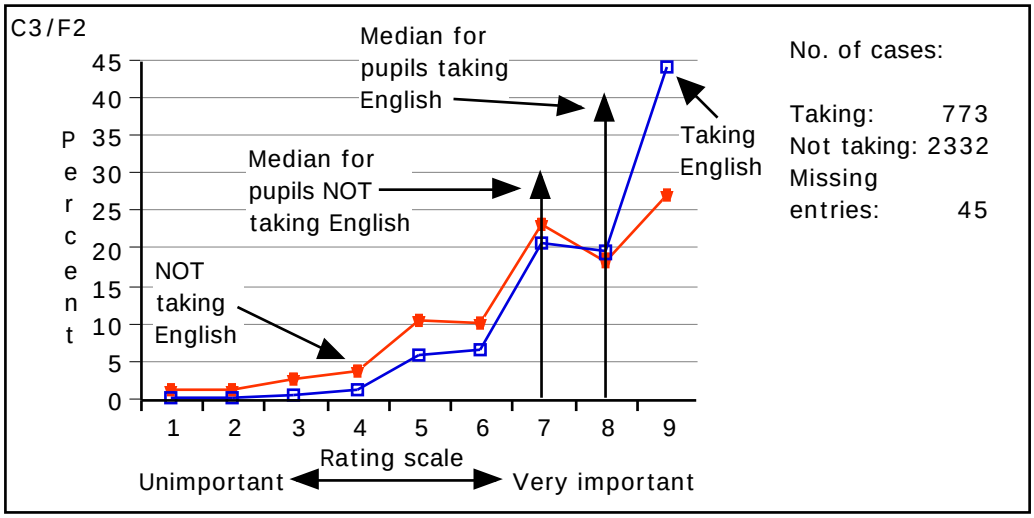


Fig. A7.20 - Importance of English when seeking a job - Analysis by subject studied
Comparison between pupils taking English and pupils not taking English

Fig. A7.20 shows that the median values remained high for pupils who were taking English, and for pupils who did not; the medians were 8 and 7 respectively.

In the context of EIU, how important do you consider English?

Fig. A7.21 offers a gender comparison of the importance of English in the context of EIU; the medians were 6 and 5 for girls and boys respectively, and disappointing.

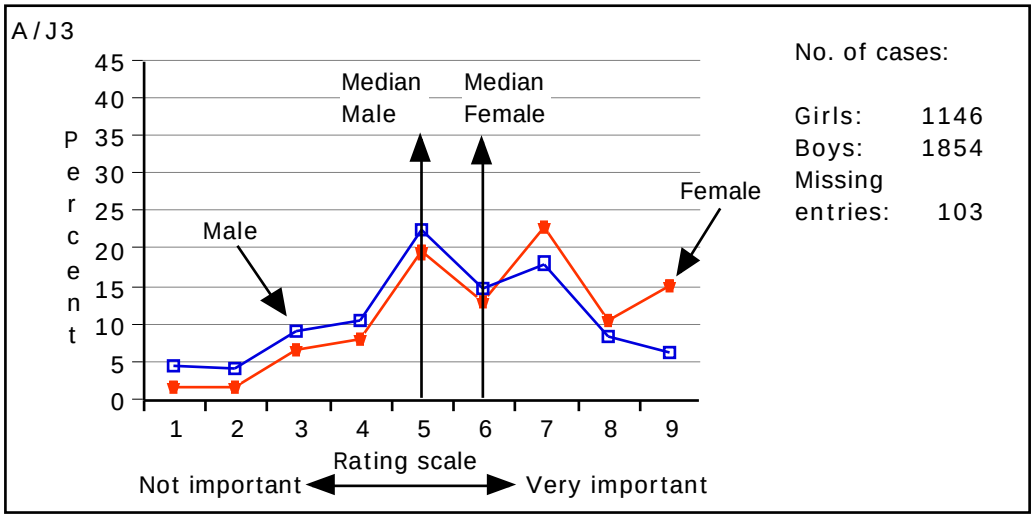


Fig. A7.21 - Importance of English in the context of EIU - Analysis by gender

A different picture emerged for the importance of English in the context of EIU when comparisons were made between pupils studying and not studying the subject, as may be seen from Fig. A7.22 overleaf.

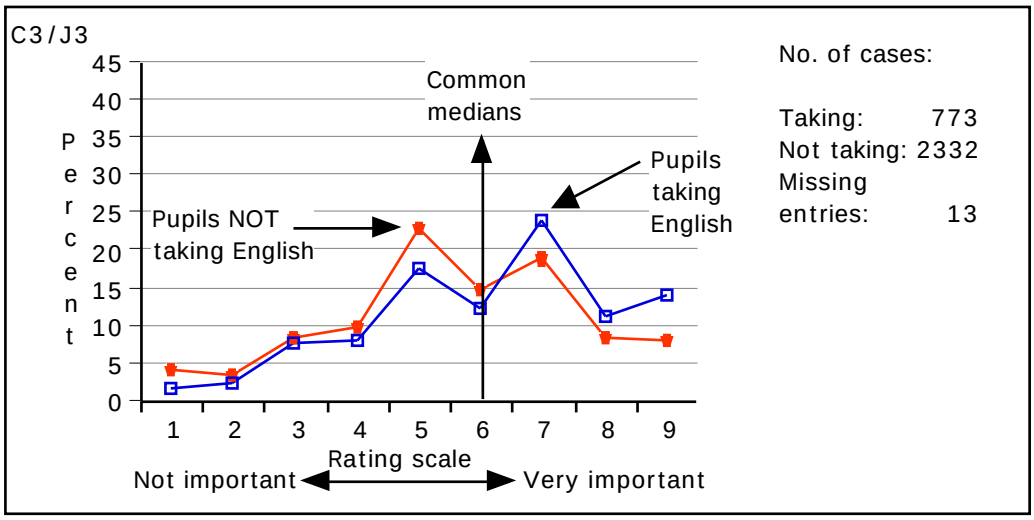


Fig. A7.22 - Importance of English in the context of EIU - Analysis by subject studied
Comparison between pupils taking English and pupils not taking English

Fig. A7.22 shows that there were common median values at 6 for pupils taking English, and for pupils not taking English.

How much do you think the way we live now has been influenced by English?

Fig. A7.23 shows that girls rated the influence of English on the way we live now in our society more highly than boys.

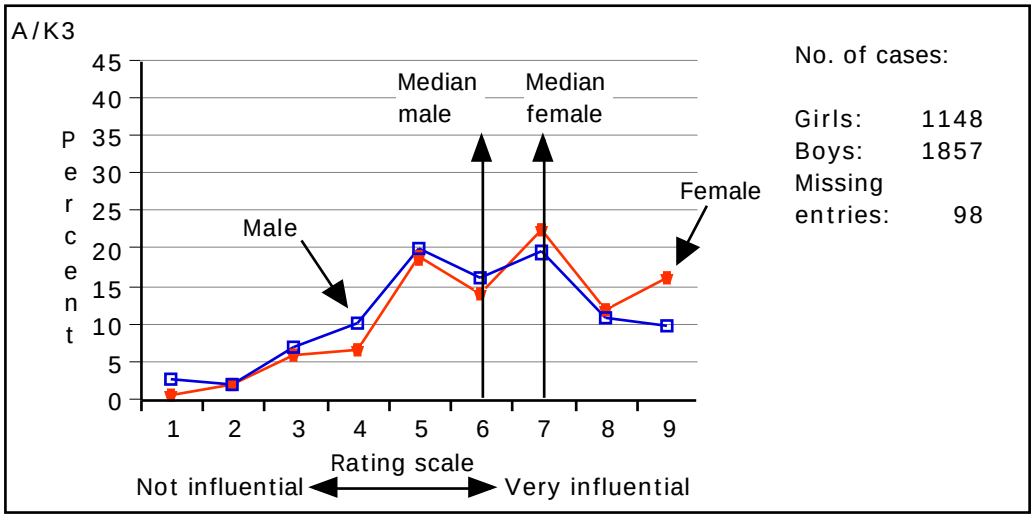


Fig. A7.23 - Influence of English on the way we live now - Analysis by gender

The alternative analysis shown in Fig. A7.24 overleaf, compares pupils who were studying English with those who were not.

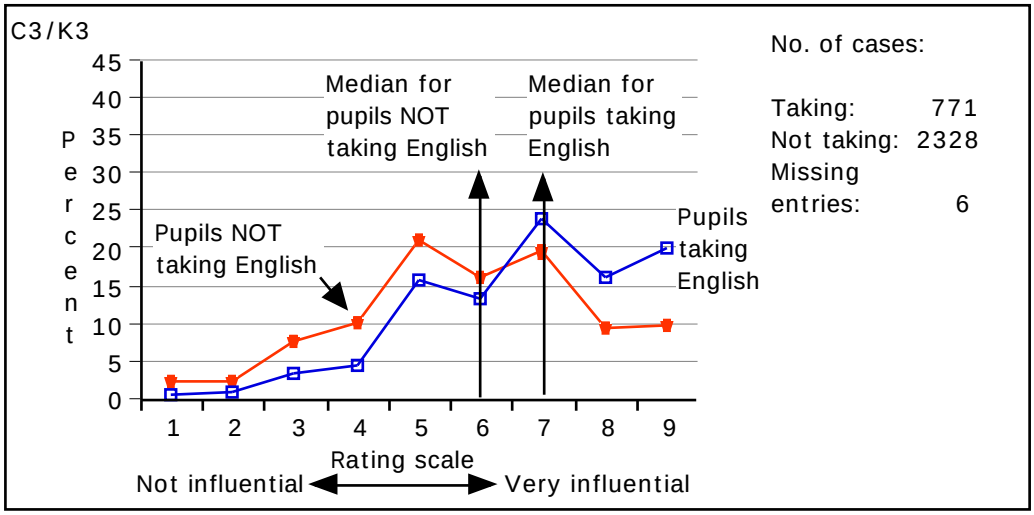


Fig. A7.24 - Influence of English on the way we live now - Analysis by subject studied
Comparison between pupils taking English and pupils not taking English

Fig. A7.24 shows that pupils taking English thought it was more influential on the way we live now in our society than pupils who were not studying the subject.

How creative does the curriculum allow you to be in English?

Referring to Fig. A7.25, girls rated the creative possibilities with English in the curriculum more highly than boys.

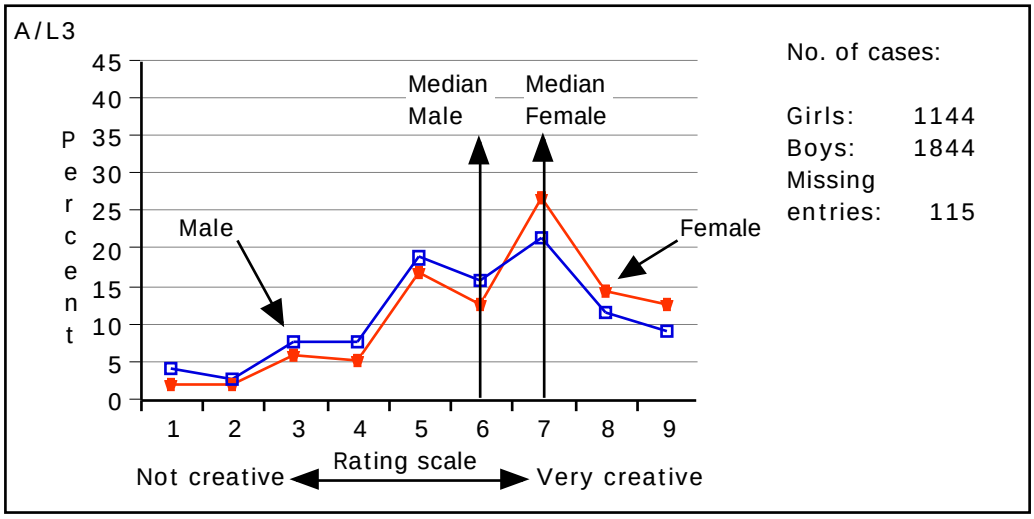


Fig. A7.25 - Creativity possible with English in the curriculum - Analysis by gender

Fig. A7.26 overleaf provides the alternative analysis for pupils who took English, in comparison with pupils who did not.

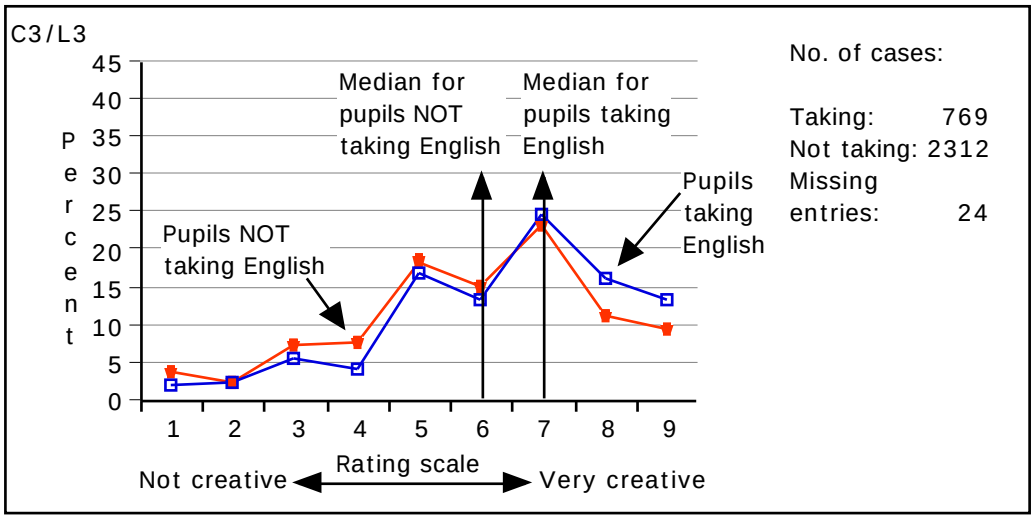


Fig. A7.26 - Creativity possible with English in the curriculum - Analysis by subject studied
Comparison between pupils taking English and pupils not taking English

From Fig. A7.26, pupils taking English valued the creative possibilities more highly than pupils not taking the subject.

As a modern society, how dependent do you think we are on English?

From Fig. A7.27, it may be seen that girls thought we were more dependent on English than boys, with median values of 7 and 6 respectively.

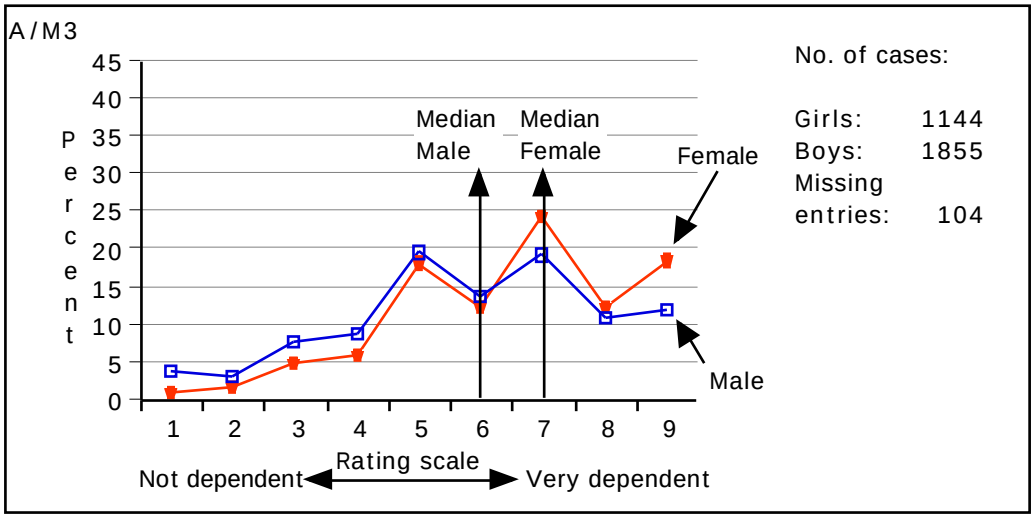


Fig. A7.27 - Dependency on English - Analysis by gender

Fig. A7.28 overleaf provides an analysis of our dependency on English as a society on the basis of pupils who took the subject, compared with pupils who did not.

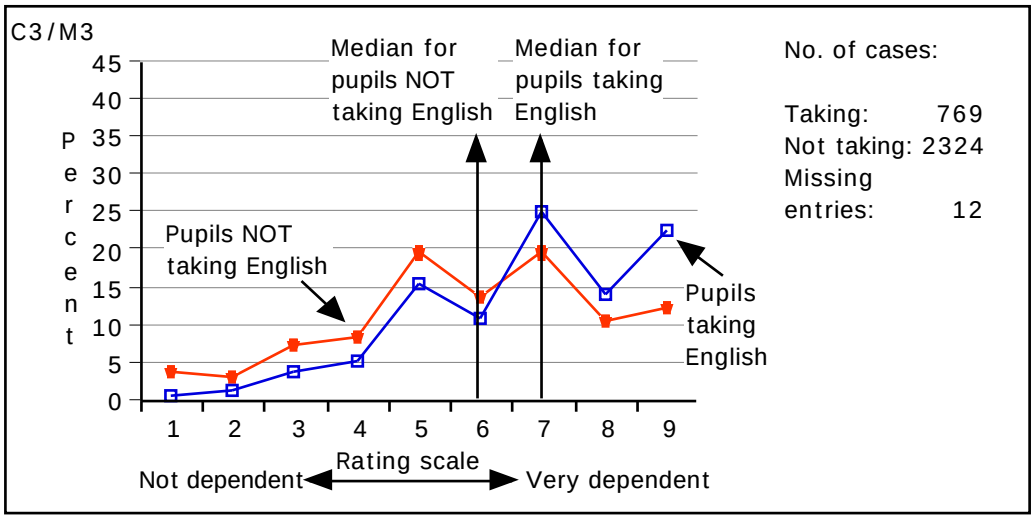


Fig. A7.28 - Dependency on English - Analysis by subject studied
Comparison between pupils taking English and pupils not taking English

Fig. A7.28 shows that the group studying English rated our dependency on the subject more highly than the group who were not studying the subject, with median values of 7 and 6 respectively.

Maths in education and industry

The analysis continues with an examination of the responses to the questions on the data-gathering instrument as follows:

- How much interest do you have in the subject of Maths?
- In your opinion, how difficult is the subject of Maths?

- When it comes to getting a job, how important do you consider the subject of Maths?
- In the context of EIU, how important do you consider the subject of Maths?
- In our society, how much do you think the way we live now has been influenced by Maths?
- In your opion, how creative does the curriculum allow you to be in Maths?
- As a modern society, how dependent do you think we are on Maths?

How much interest do you have in Maths?

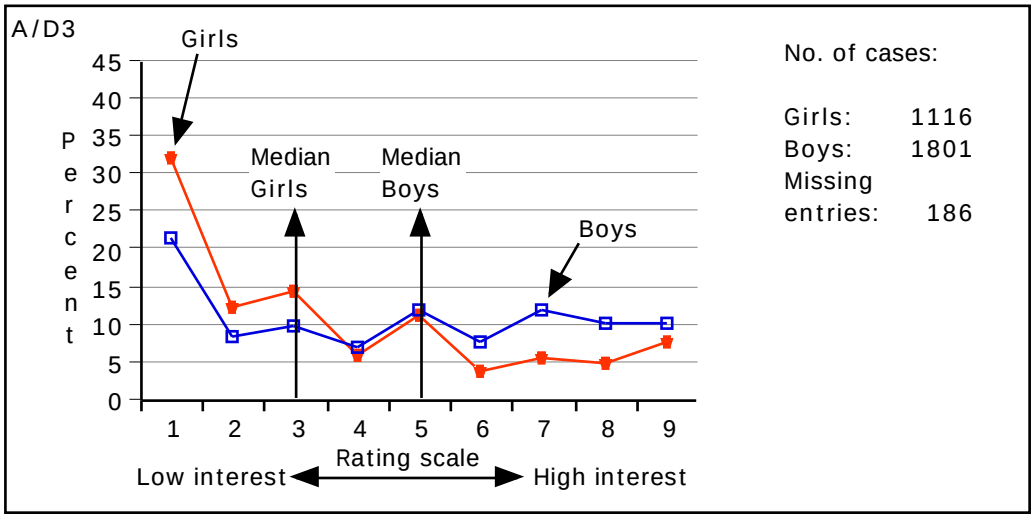


Fig. A7.29 - Interest in Maths - Analysis by gender

Fig. A7.29 shows that boys were more interested in Maths than girls were, and by a margin of 2 median ratings.

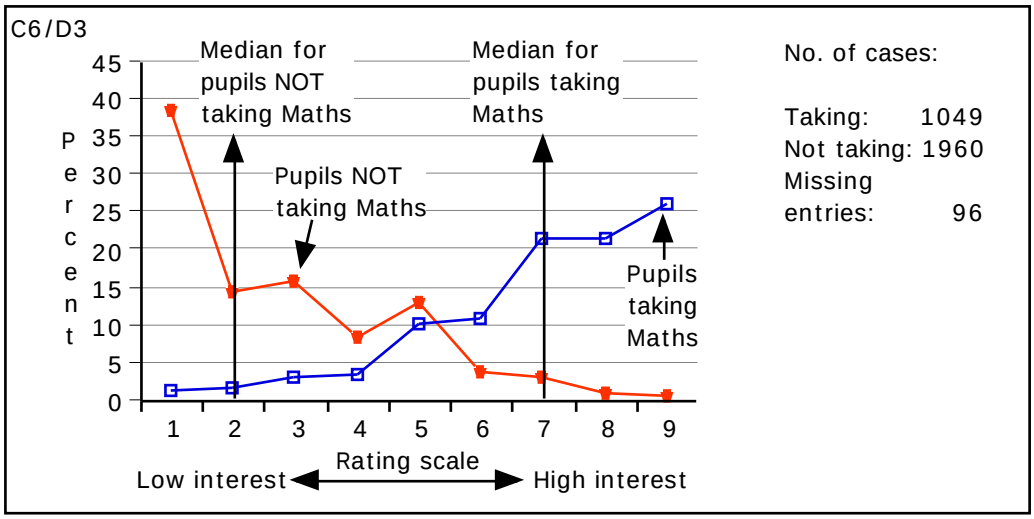


Fig. A7.30 - Interest in Maths - Analysis by subject studied
Comparison between pupils taking Maths and pupils not taking Maths

Fig. A7.30 shows two very different curves, and much greater separation between the median values of 7 for pupils taking Maths, and 2 for pupils not taking Maths.

In your opinion, how difficult is Maths?

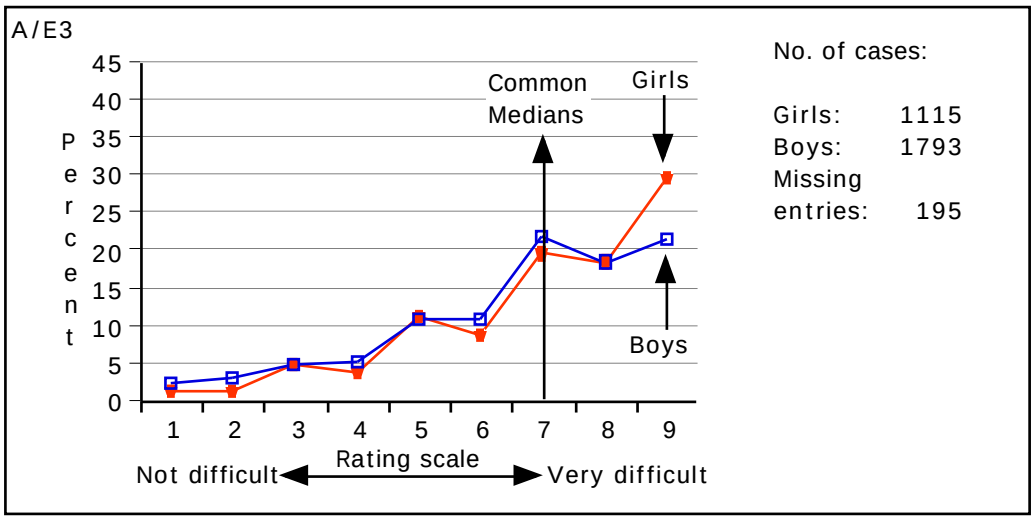


Fig. A7.31 - Difficulty with Maths - Analysis by gender

From Fig. A7.31, it may be seen that both girls and boys regarded Maths as a difficult subject, with a common median value of 7.

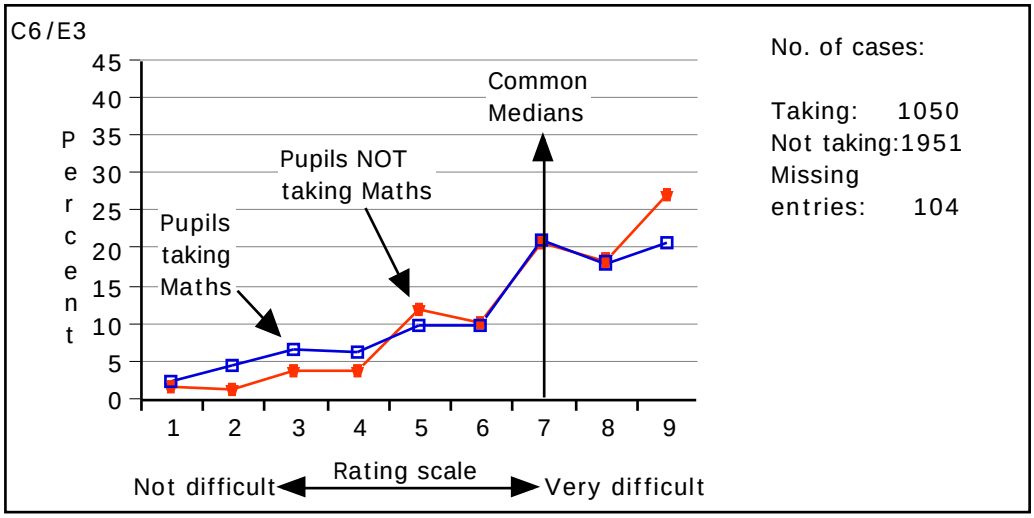


Fig. A7.32 - Difficulty with Maths - Analysis by subject studied
Comparison between pupils taking Maths and pupils not taking Maths

Similarly, Fig. A7.32, shows there was no difference of opinion about the difficulty of the subject between pupils studying Maths, and pupils who did not take Maths; they shared a common median value of 7.

When it comes to getting a job, how important do you consider Maths?

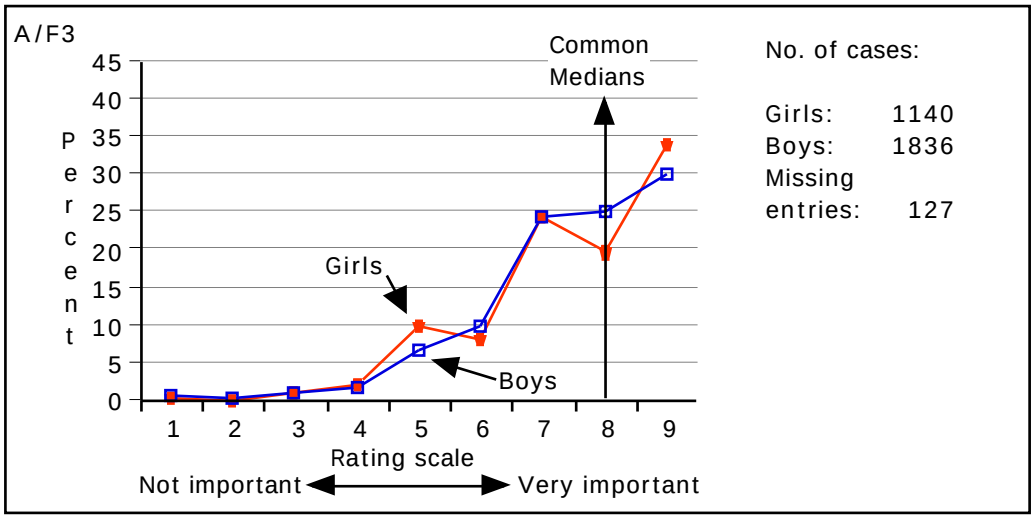


Fig. A7.33 - Importance of Maths when seeking a job - Analysis by gender

Both girls and boys rated the importance of Maths very highly when seeking a job, as demonstrated in Fig. A7.33 by the common median values of 8.

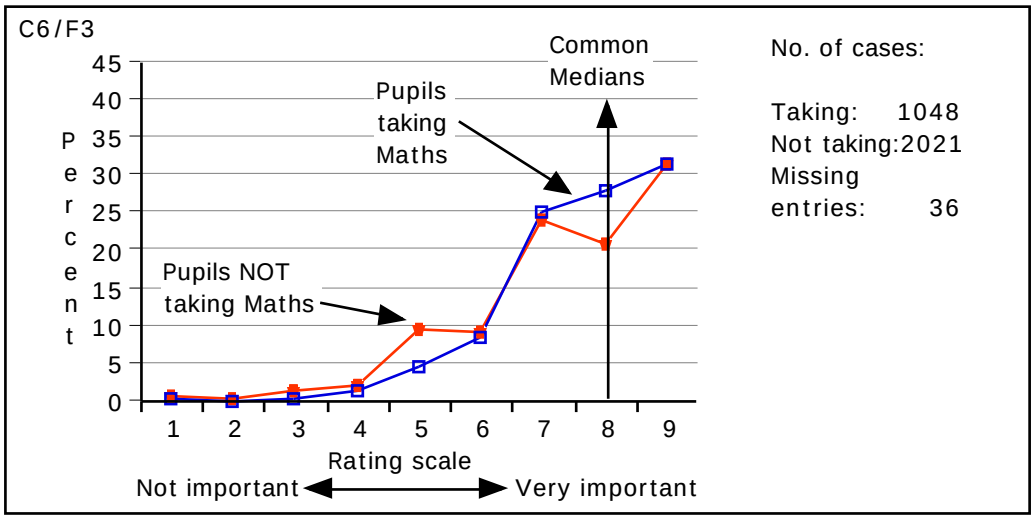


Fig. A7.34 - Importance of Maths when seeking a job - Analysis by subject studied
Comparison between pupils taking Maths and pupils not taking Maths

In the context of the importance of Maths when seeking a job, Fig. A7.34 shows that the valuation attributed by pupils studying the subject was the same as pupils who were not taking Maths—a median of 8. What is significant about the plots in Figures A7.33 and A7.34 is how close the curves run to one another whether analysed on the basis of gender or subject, and all the medians are very high at '8'. So the importance of Maths in the context of getting a job was well understood.

In the context of EIU, how important do you consider Maths?

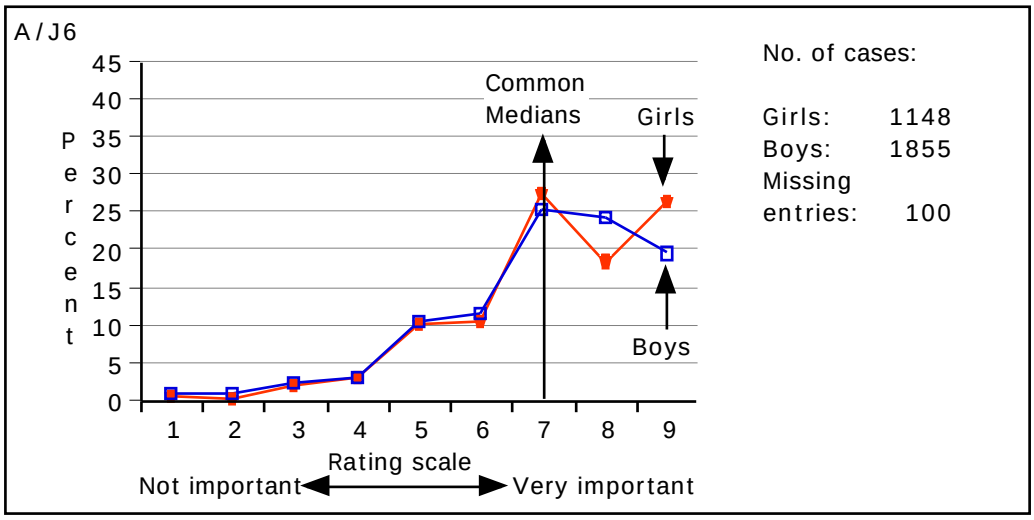


Fig. A7.35 - Importance of Maths in the context of EIU - Analysis by gender

The importance of Maths in the context of EIU was rated highly by both girls and boys at a median value of 7, as may be seen in Fig. A7.35.

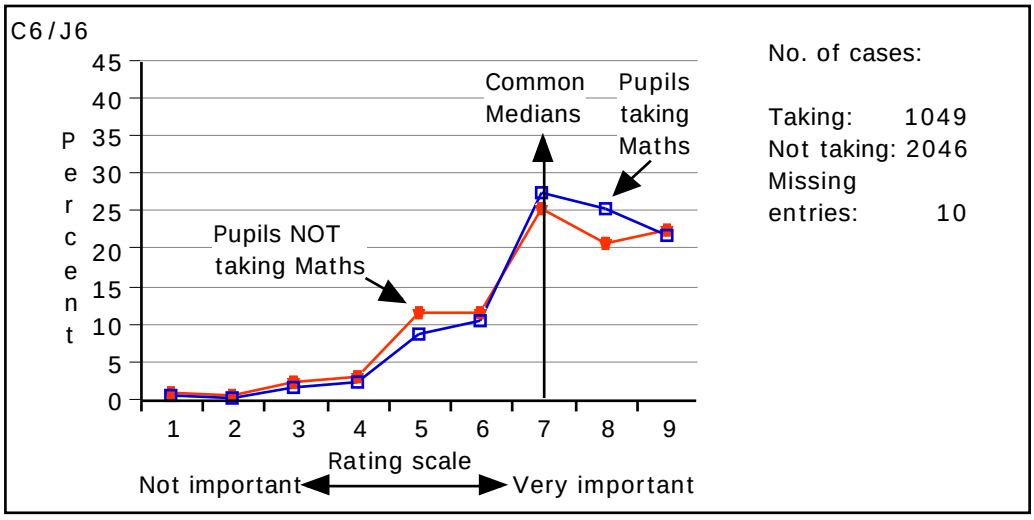


Fig. A7.36 - Importance of Maths in the context of EIU - Analysis by subject studied
Comparison between pupils taking Maths and pupils not taking Maths

Fig. A7.36 above provides the alternative analysis comparing pupils who took Maths with pupils who did not; in both instances the subject was rated highly at a median value of 7.

How much do you think the way we live now has been influenced by Maths?

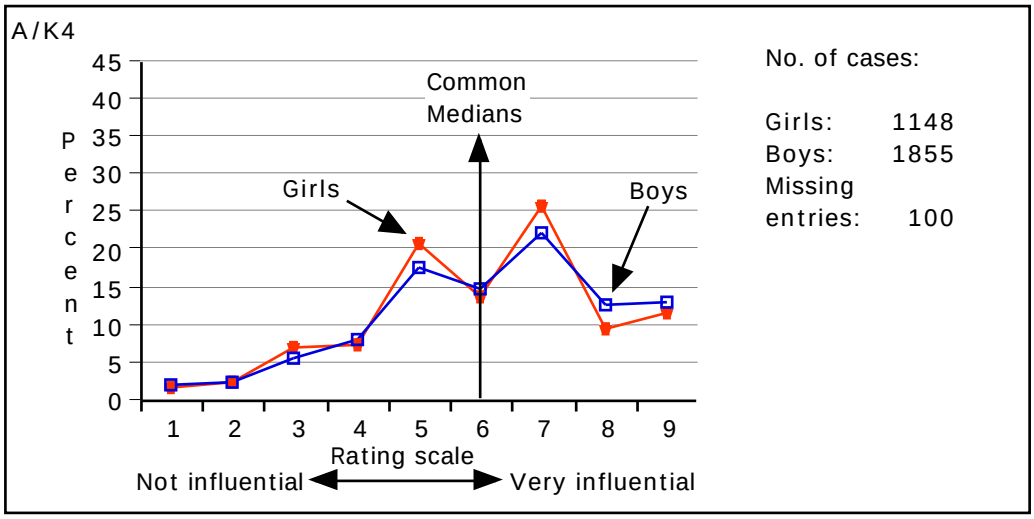


Fig. A7.37 - Influence of Maths on the way we live now - Analysis by gender

Referring to Fig. A7.37, both girls and boys rated the influence of Maths in our society at a median value of 6.

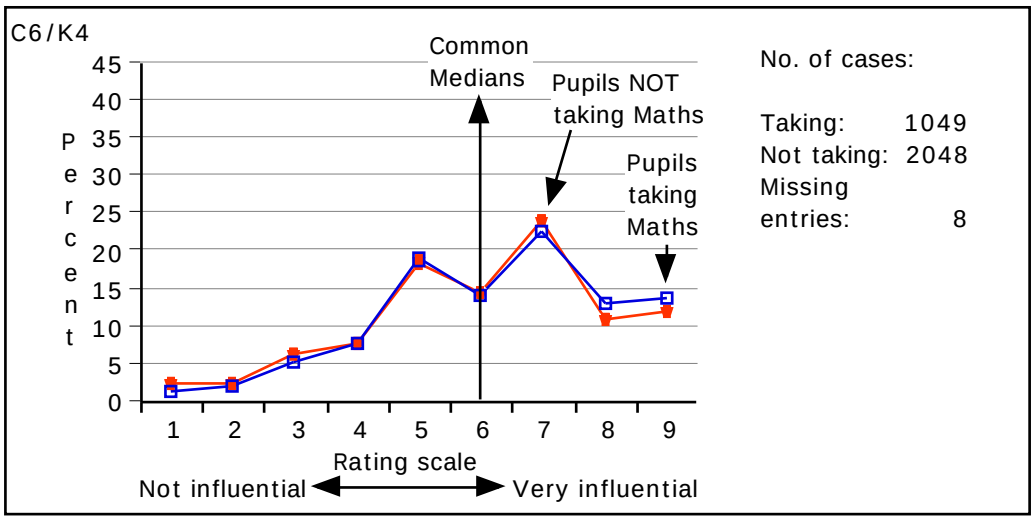


Fig. A7.38 - Influence of Maths on the way we live now - Analysis by subject studied
Comparison between pupils taking Maths and pupils not taking Maths

The alternative analysis in Fig. A7.38, compares pupils who took Maths with pupils who did not; in both instances the influence of Maths in our society was rated at a median value of 6.

How creative does the curriculum allow you to be in Maths?

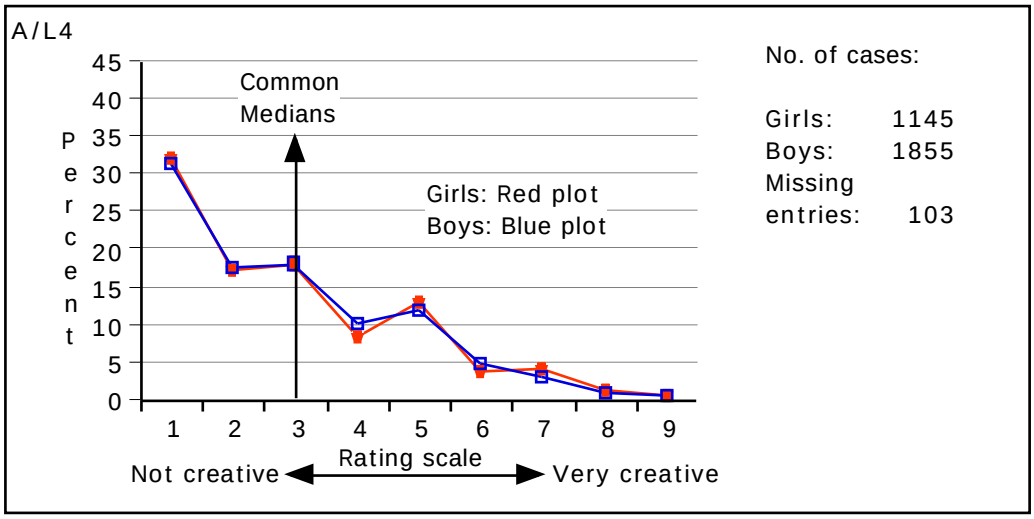


Fig. A7.39 - How creative does the curriculum allow you to be in Maths? - Analysis by gender

The level of creativity perceived in the curriculum with Maths by both girls and boys was low at a common median value of 3 as shown in Fig. A7.39. The plots run so closely that the curves cannot be separated for annotation.

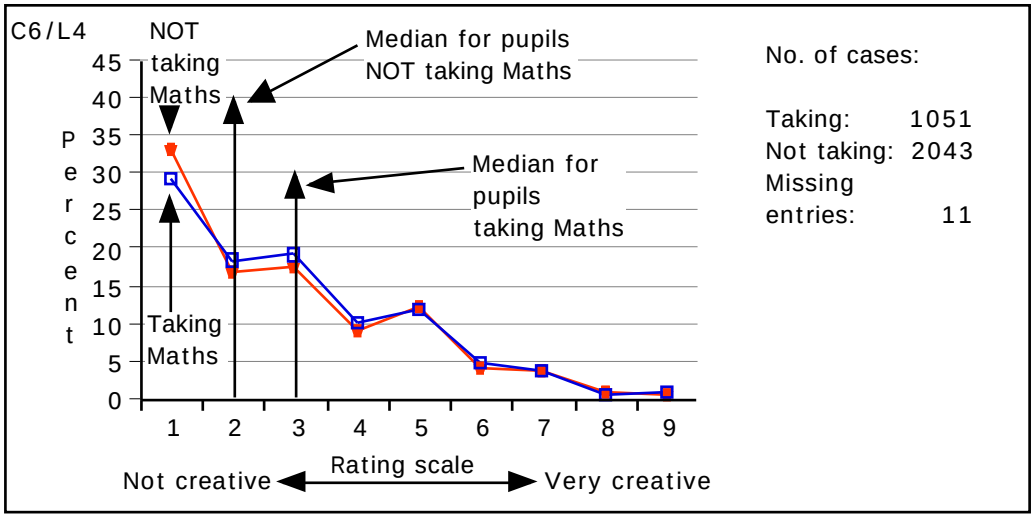


Fig. A7.40 - How creative does the curriculum allow you to be in Maths? - Analysis by subject studied
Comparison between pupils taking Maths and pupils not taking Maths

When analysed on a comparative basis between pupils studying Maths, and not studying the subject, the median values for creativity were 3 and 2 respectively—see Fig. A7.40.

As a modern society, how dependent do you think we are on Maths?

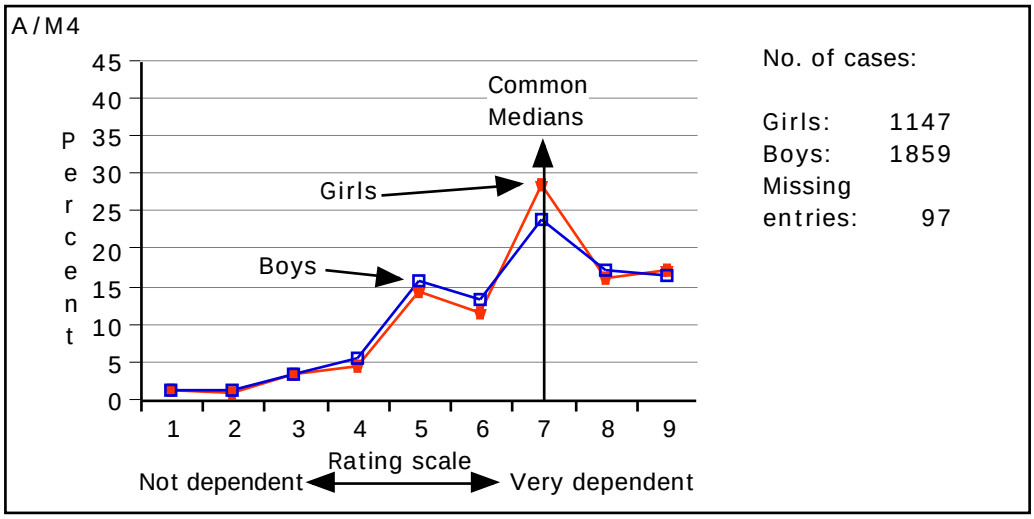


Fig. A7.41 - How dependent do you think we are on Maths? - Analysis by gender

Fig. A7.41 shows that there was no difference of opinion between boys and girls about our dependency on Maths as a society; they shared common median values of 7.

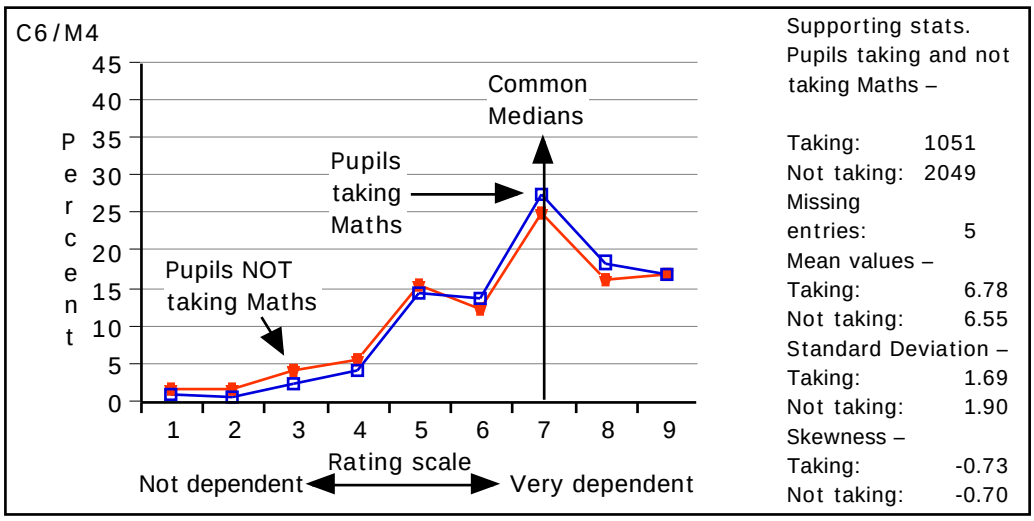


Fig. A7.42 - How dependent do you think we are on Maths? - Analysis by subject studied
Comparison between pupils taking Maths and pupils not taking Maths

Similarly, Fig. A7.42 shows that there was no difference of opinion between students taking Maths, and students not taking Maths, in the context of our dependency on the subject as a society; they shared common median values of 7.

Maths in education and industry, as perceived by A-level students

With regard to the interest in Maths, analysis by gender shows that boys are more interested in the subject than girls, and by a margin of two median ratings from 5 to 3 respectively—Fig. A7.29. The alternative analysis, comparing pupils taking Maths with students not

studying the subject, produced median values of 7 and 2 respectively—Fig. A7.30.

Maths was perceived to be a difficult subject; analysis by gender yielded common medians of 7; 29.6% of girls rated the level of difficulty at a scale maximum of 9—Fig. A7.31. In the context of difficulty, common median values of 7 were also obtained when comparing students studying the subject with those who did not take Maths—Fig. A7.32.

Although the level of interest in Maths was not highly rated, and it was perceived to be a difficult subject, the importance of Maths when it comes to getting a job was clearly understood. The median values were common at 8 whether analysed by gender, or by comparing pupils who were studying Maths with those who were not—Figures A7.33 and A7.34 respectively.

Maths was also highly valued in the context of EIU. Median ratings were common at 7 in the analysis by gender, and in the analysis by subject studied. Although the importance of Maths in the context of getting a job was highly valued with common median values of 8, the application of mathematical skills in EIU was perceived a little less important with the medians at 7—Figures A7.35 and A7.36.

The question concerning the influence of Maths on the way we live now produced common median values of 6 for the analysis by gender, and by subject studied—Figures A7.37 and A7.38. Although above the middle ranking of 5, this result does not properly represent the influence of Maths on the way we live now. For example, consider the understanding of maths required as part of the resolution of the problem of longitude, discussed in this thesis on page 71.

In response to the question 'How creative does the curriculum allow you to be in Maths?', girls and boys produced common median values of 3. For pupils studying Maths the median was 3, and for students not taking the subject the median was 2—Figures A7.39 and A7.40. Creativity in Maths is often at the leading edge of discovery in Technology and Science, and the absence of such awareness is a cause for concern.

Testing for our dependency on Maths as a society, this question produced common median values of 7 in the analysis by gender, and in the analysis by subject studied—Figures A7.41 and A7.42. So the importance of Maths in our society is relatively well understood.

Summarising overall for Maths, with one exception the gender analysis showed that all parameters of analysis produced medians that were common to girls and boys. The exception concerned 'interest in D&T', where the median rating was 3 for girls and 5 for boys.

Science in education and industry

The analysis continues with an examination of the responses to the questions on the data-gathering instrument as follows:

- How much interest do you have in the subject of Science?
- In your opinion, how difficult is the subject of Science?
- When it comes to getting a job, how important do you consider the subject of Science?
- In the context of EIU, how important do you consider the subject of Science?
- In our society, how much do you think the way we live now has been influenced by Science?
- In your opion, how creative does the curriculum allow you to be in Science?
- As a modern society, how dependent do you think we are on Science?

How much interest do you have in Science?

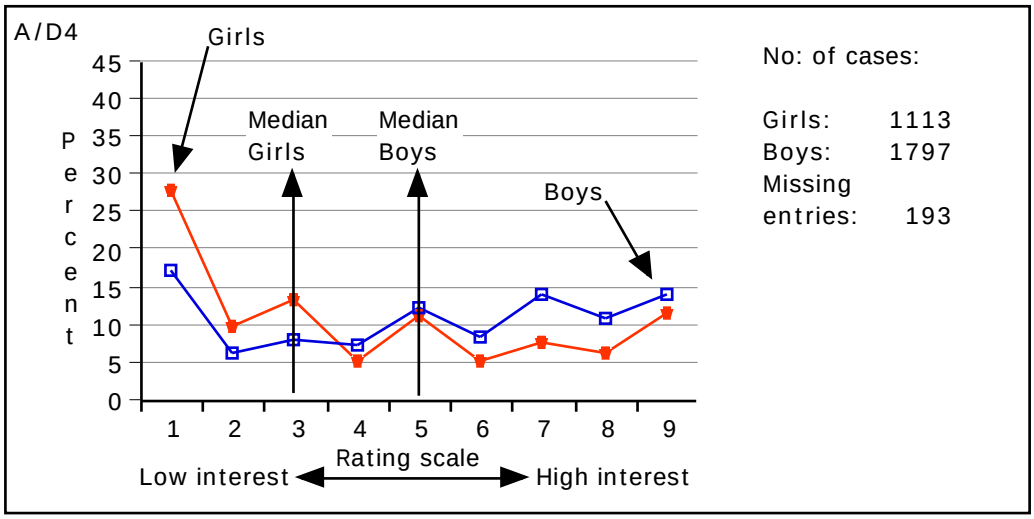


Fig. A7.43 - Interest in Science - Analysis by gender

Boys were more interested in Science than girls; the median ratings were 5 and 3 respectively —Fig. A7.43.

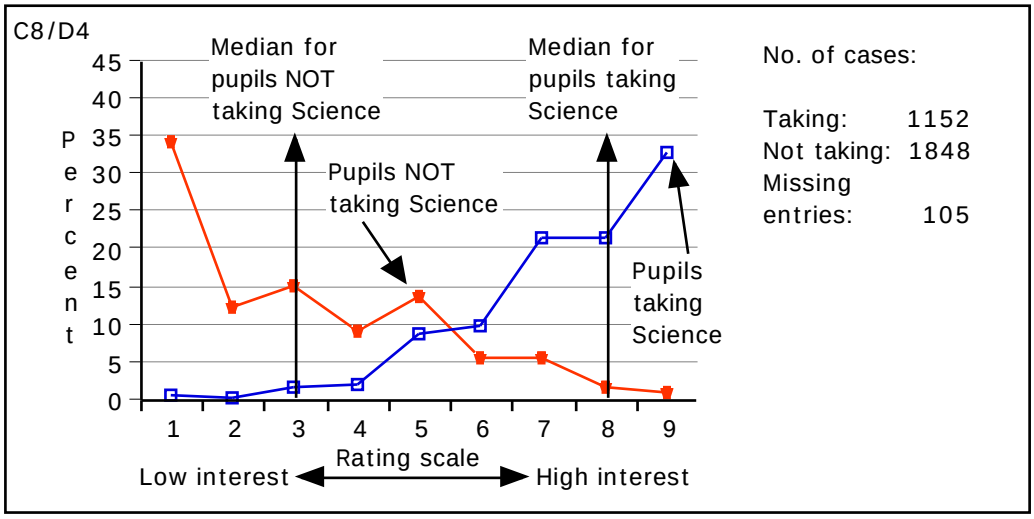


Fig. A7.44 - Interest in Science - Analysis by subject studied
Comparison between pupils taking Science and pupils not taking Science

By inspection, Fig. A7.44 shows that the separation of the medians was far greater when analysed on the basis of pupils taking Science, compared with students not taking the subject; the medians were 8 and 3 respectively.

In your opinion, how difficult is Science?

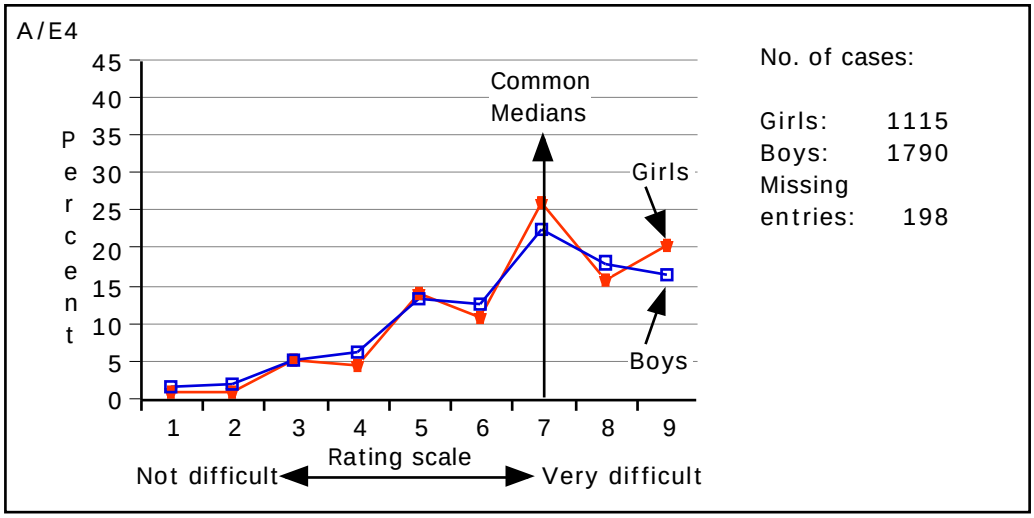


Fig. A7.45 - Difficulty with Science - Analysis by gender

Both genders attributed the level of difficulty with Science at a median value of 7—Fig. A7.45.

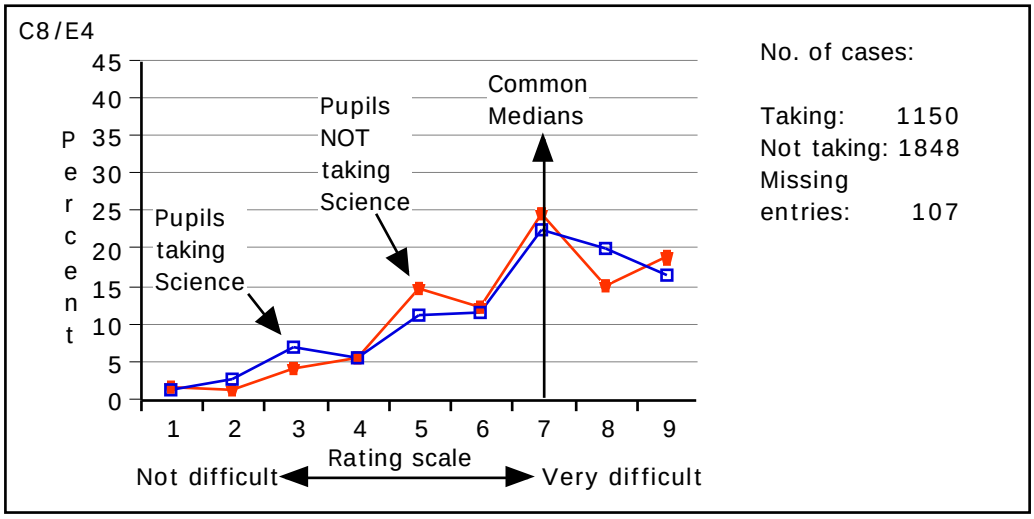


Fig. A7.46 - Difficulty with Science - Analysis by subject studied
Comparison between pupils taking Science and pupils not taking Science

The analysis of students taking Science, compared with pupils not taking the subject, also yielded common medians of 7—Fig. A7.46.

When it comes to getting a job, how important do you consider Science?

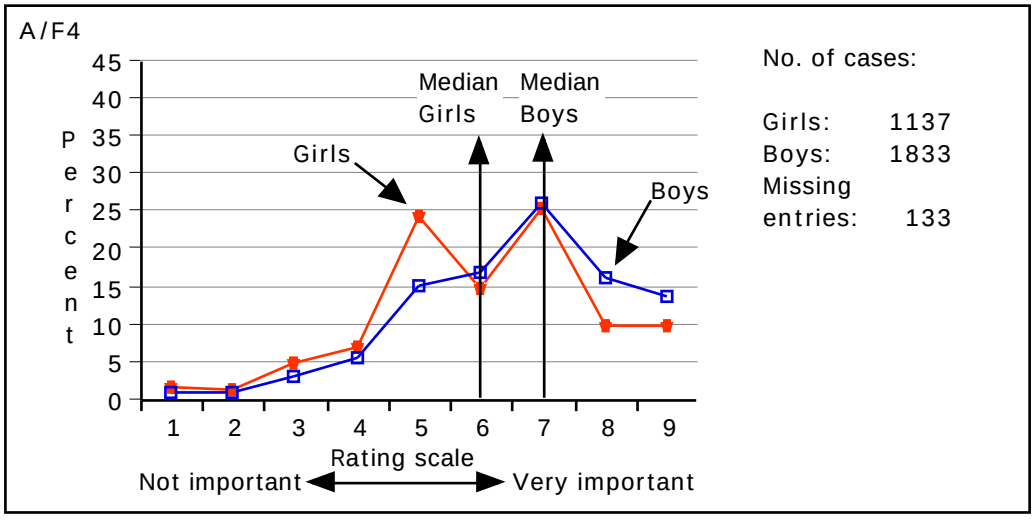


Fig. A7.47 - Importance of Science when seeking a job - Analysis by gender

By inspection, Fig. A7.47 shows that when it comes to getting a job, boys considered Science more important than girls; the medians were 7 and 6 respectively.

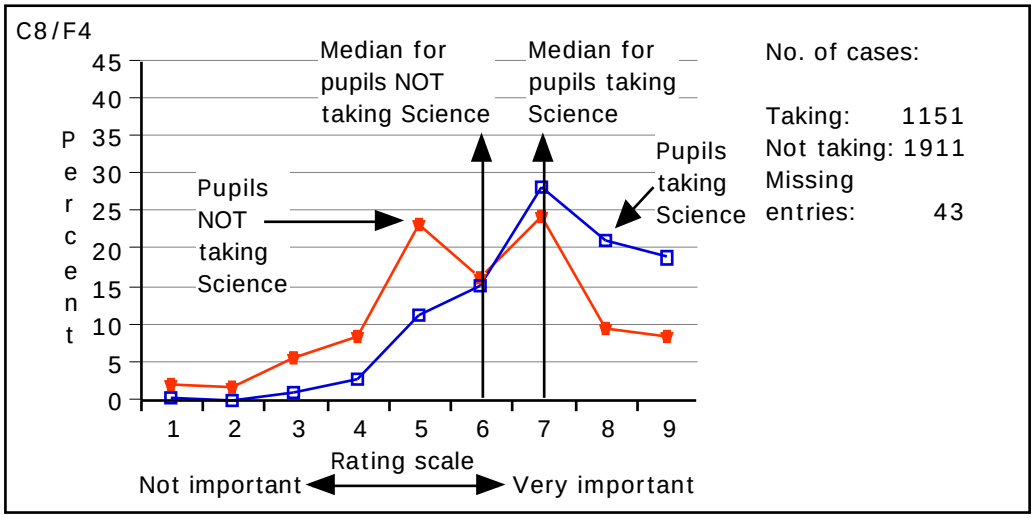


Fig. A7.48 - Importance of Science when seeking a job - Analysis by subject studied
Comparison between pupils taking Science and pupils not taking Science

From Fig. A7.48, the importance of Science when seeking a job was more highly valued by pupils who took the subject than students who did not; the median values were 7 and 6 respectively.

In the context of EIU, how important do you consider Science?

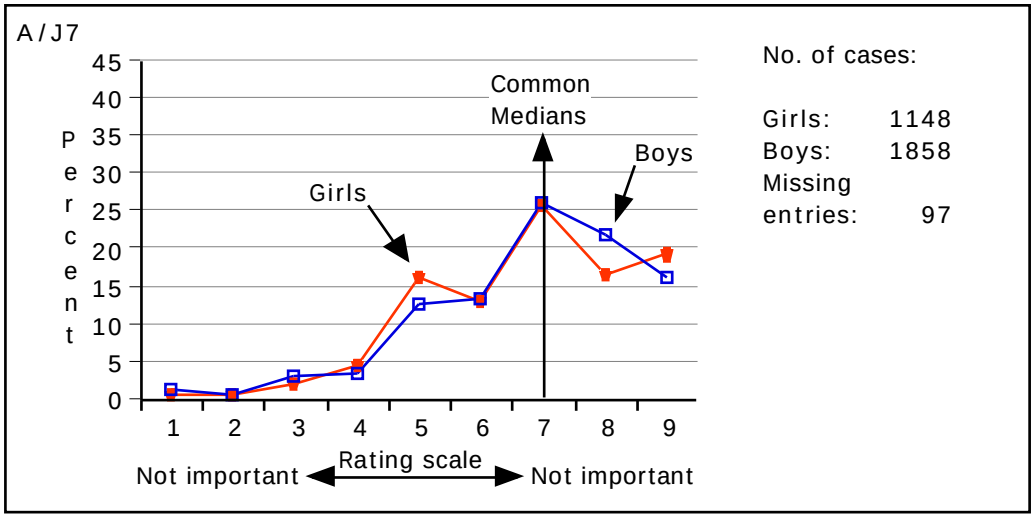


Fig. A7.49 - Importance of Science in the context of EIU - Analysis by gender

The importance of Science in the context of EIU was quite well understood by both girls and boys with a common median value of 7; the mean values were similar within 0.01—Fig. A7.49.

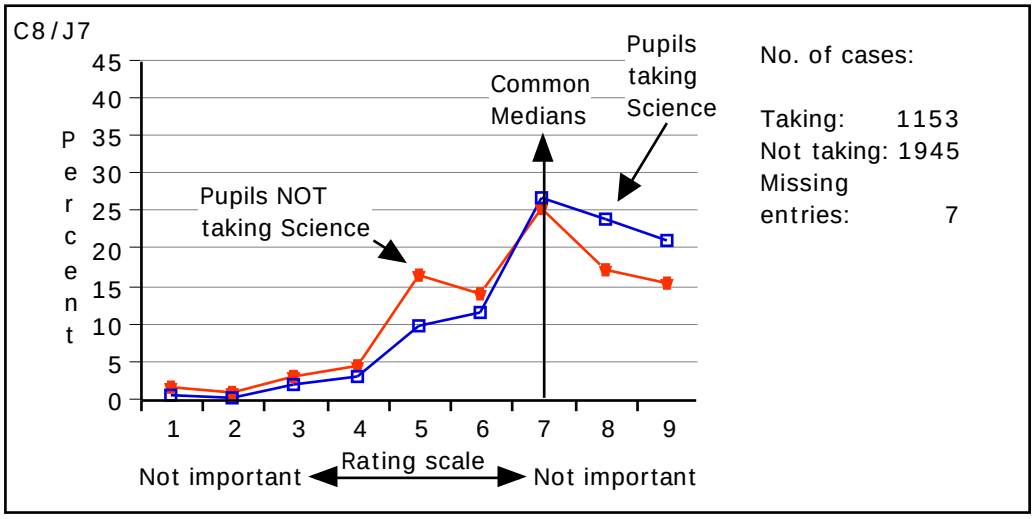


Fig. A7.50 - Importance of Science in the context of EIU - Analysis by subject studied
Comparison between pupils taking Science and pupils not taking Science

Fig. A7.50 shows that the importance of Science in the context of EIU was quite well understood; pupils who did not take the subject scored the same median value of 7 as students who did take Science.

How much do you think the way we live now has been influenced by Science?

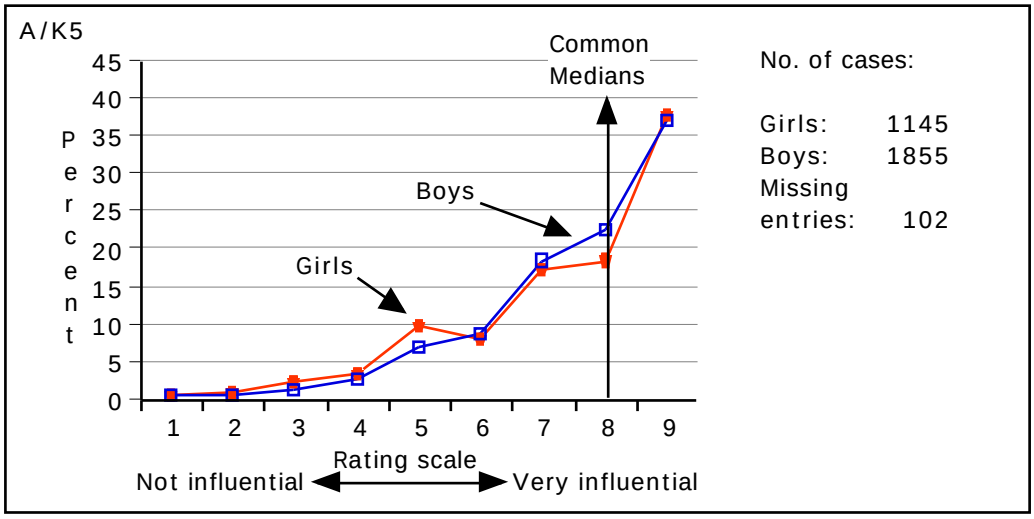


Fig. A7.51 - Influence of Science on the way we live now - Analysis by gender

The influence of Science in our society was very well understood by both girls and boys, with a common median value of 8—Fig. A7.51.

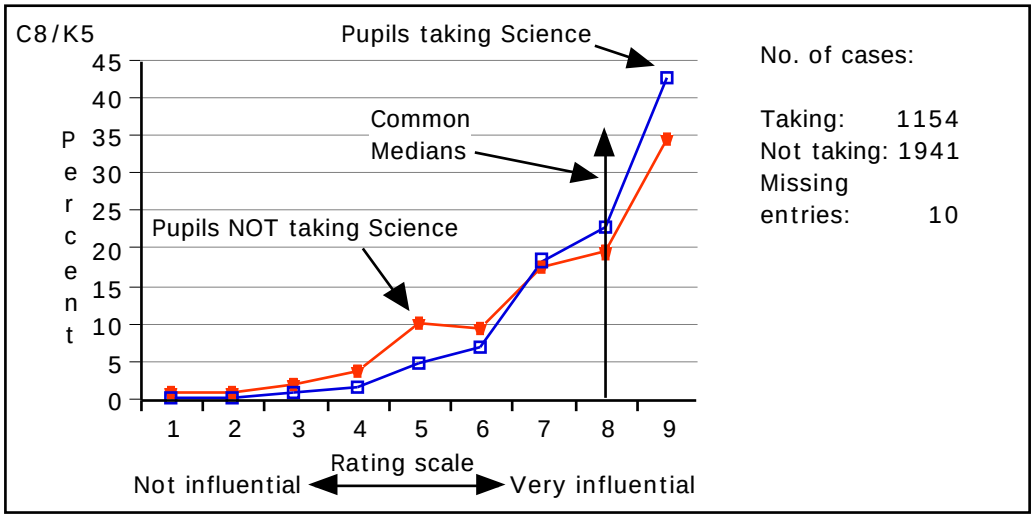


Fig. A7.52 - Influence of Science on the way we live now - Analysis by subject studied Comparison between pupils taking Science and pupils not taking Science

Similarly, from Fig. A7.52, it may be seen that the median value of 8 for pupils not studying Science was the same as for students taking the subject.

How creative does the curriculum allow you to be in Science?

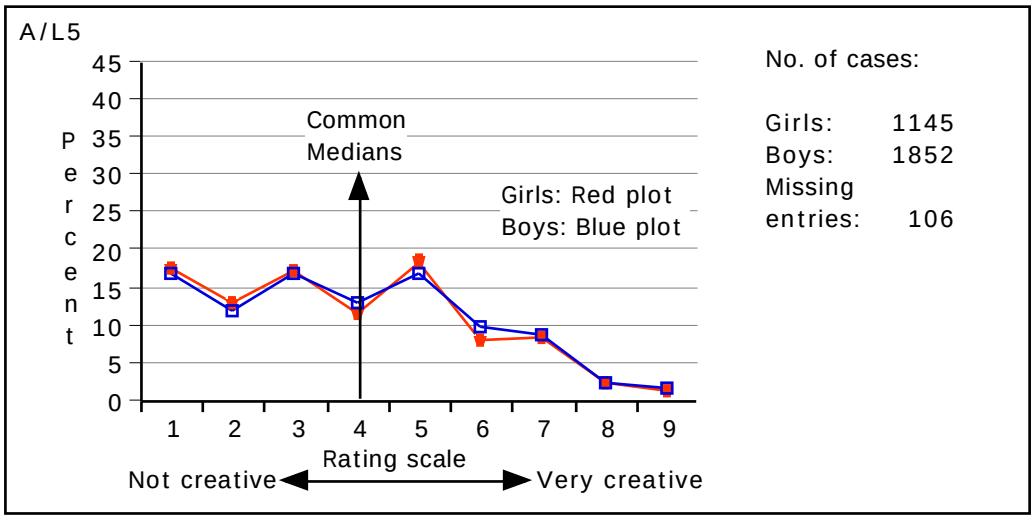


Fig. A7.53 - How creative does the curriculum allow you to be in Science? - Analysis by gender

For Science, the perceived level of creativity in the curriculum by both girls and boys equated to a median of 4—Fig. A7.53. The individual plots were so close that they could not be separated for identification purposes.

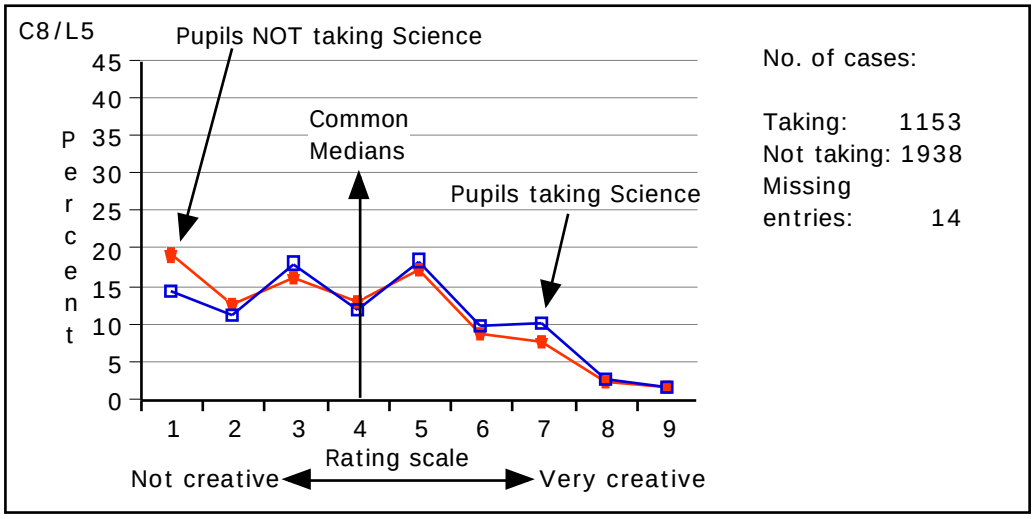


Fig. A7.54 - How creative does the curriculum allow you to be in Science? - Analysis by subject studied
Comparison between pupils taking Science and pupils not taking Science

From Fig. A7.54, the degree of creativity for Science allowed in the curriculum, as perceived by pupils taking the subject, as well as students who did not take Science, equated to a median value of 4.

As a modern society, how dependent do you think we are on Science?

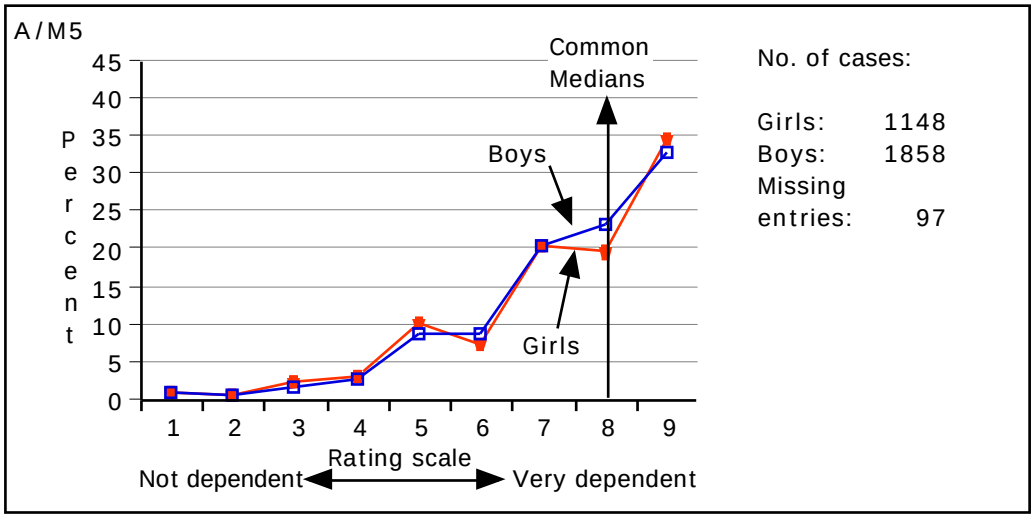


Fig. A7.55 - How dependent do you think we are on Science? - Analysis by gender

As a modern society, both genders attributed a high level of dependency on Science; a median value of 8—Fig. A7.55.

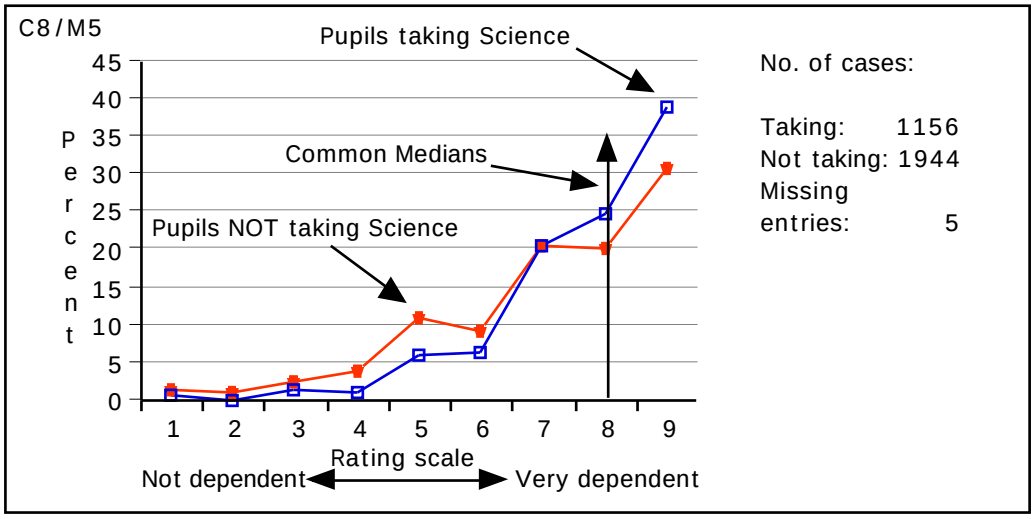


Fig. A7.56 - How dependent do you think we are on Science? - Analysis by subject studied Comparison between pupils taking Science and pupils not taking Science

As a modern society, whether students were studying Science or not, they too attributed a high level of dependency on the subject; the median values were common at 8—Fig. A7.56.

Science in education and industry, as perceived by A-level students

The interest in Science shown by boys equated to a median of 5, and for girls it was 3—Fig. A7.43. However, the separation of the medians was far greater when the comparison was made on the basis of students taking Science with pupils not taking the subject; the median values were 8 and 3 respectively—Fig. A7.44. This is a cause for concern since Science is a key component of Technology, and without exception we are all beneficiaries and consumers of Technology.

Science was perceived to be a difficult subject by both girls and boys; both groups recorded median values of 7—Fig. A7.45. Similarly, the comparison between groups taking Science with those not taking the subject, also produced common median values of 7—Fig. A7.46.

In the context of getting a job, boys attributed a greater degree of importance to Science than did girls; the median values were 7 and 6 respectively—Fig. A7.47. In the same context, pupils who were studying Science attributed more importance to the subject than students not taking the subject; again, the median values were 7 and 6 respectively—Fig. A7.48. In these two graphs, all the median values were above the mid-point of 5, so even those students showing a low level of interest in Science had some understanding of its value in the context of getting a job.

The role of Science in the context of EIU was quite well understood; comparison by gender, or by subject studied, yielded median values of 7—Figures A7.49 and A7.50. In the same context, these results mirror those with Maths where median values of 7 were also obtained for the two methods of analysis—Figures A7.37 and A7.38. However, there is a cause for

concern. Maths and Science are components of Technology; the comparable analyses for D&T produced medians of 6 and 7 for girls and boys respectively, and 7 and 5 for pupils taking and not taking D&T—Figures A7.07 and A7.08. So the same level of awareness does not yet exist in D&T. But in reality, all the median values should have been at least 8.

The influence of Science on the way we live now was well understood. The analysis by gender, together with the analysis comparing students taking the subject with pupils not studying Science, all produced high median values of 8—Figures A7.51 and A7.52.

However, although the influence of Science on the way we live now was well understood, the level of creativity perceived in the curriculum equated to medians of 4 by both methods of analysis—Figures A7.53 and A7.54. Whereas for Science all these results were less than the median mid-point of 5, the comparable questions for D&T gave higher results. Both girls and boys rated the creativity at a median value of 7, while pupils studying D&T gave a median rating of 8, and students not taking the subject recorded 6. The role of Science in D&T is clearly not understood.

As a modern society, our dependence on Science was clearly well understood. The analysis by gender recorded common median values of 8, and the analysis comparing pupils taking Science with students not studying the subject, also produced common median values of 8—Figures A7.55 and A7.56.

Art in education and industry

This analysis continues with an examination of the responses to the questions on the data-gathering instrument as follows:

- In the context of EIU, how important do you consider the subject of Art?
- In our society, how much do you think the way we live now has been influenced by Art?
- In your opinion, how creative does the curriculum allow you to be in Art?
- As a modern society, how dependent do you think we are on Art?

Note there are only four parameters of analysis rather than the seven used so far. This was because the same sub-set of questions was not used through out the questionnaire, in order to avoid a fourth page—a possible source of deterrence for teachers contemplating participation in this research. And so to the results:

In the context of EIU, how important do you consider Art?

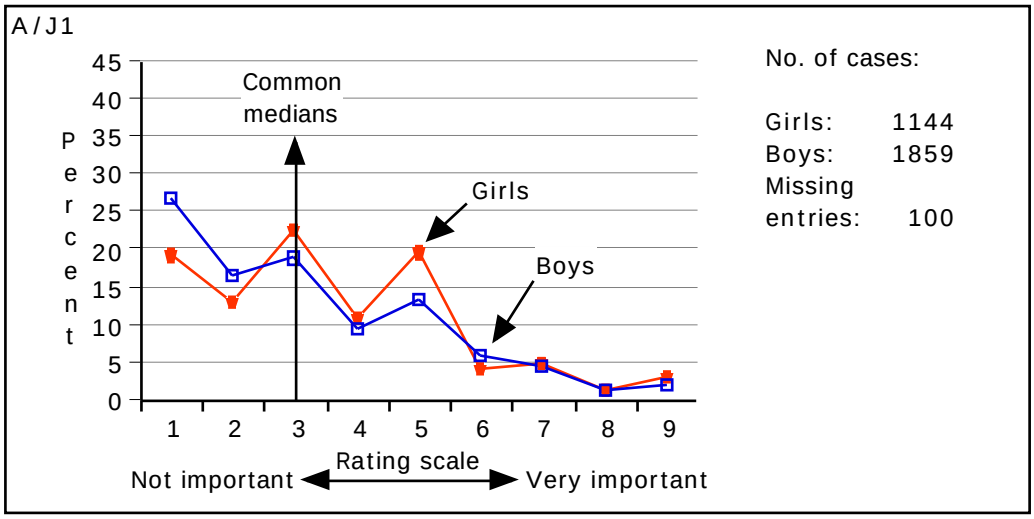


Fig. A7.57 - Importance of Art in the context of EIU - Analysis by gender

The level of importance attributed to Art in the context of EIU was low at a median of 3 for both girls and boys—Fig. A7.57.

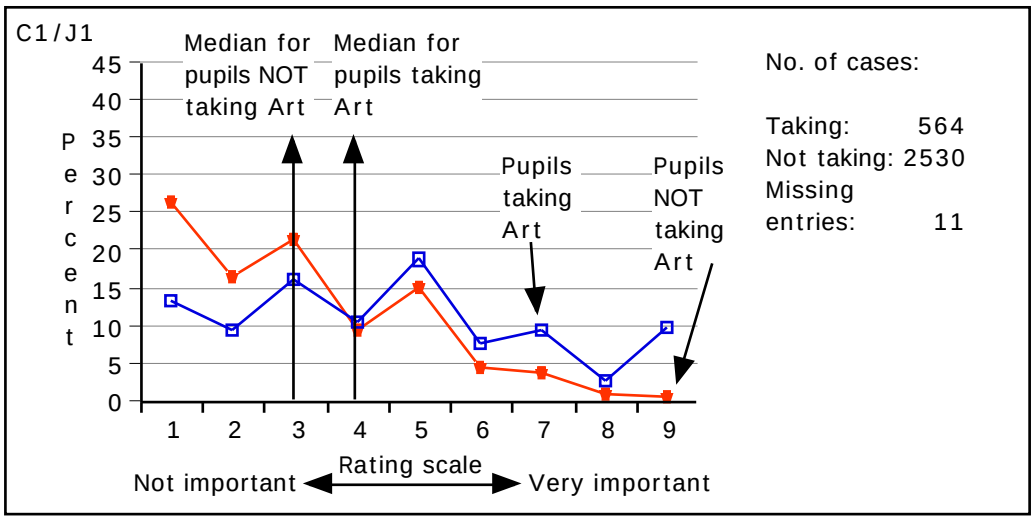


Fig. A7.58 - Importance of Art in the context of EIU - Analysis by subject studied
Comparison between pupils taking Art and pupils not taking Art

From Fig. A7.58, it may be seen that students who were studying Art rated the importance of the subject in the context of EIU at a median of 4, while the collective responses of pupils who were not taking Art yielded a median of 3.

How much do you think the way we live now has been influenced by Art?

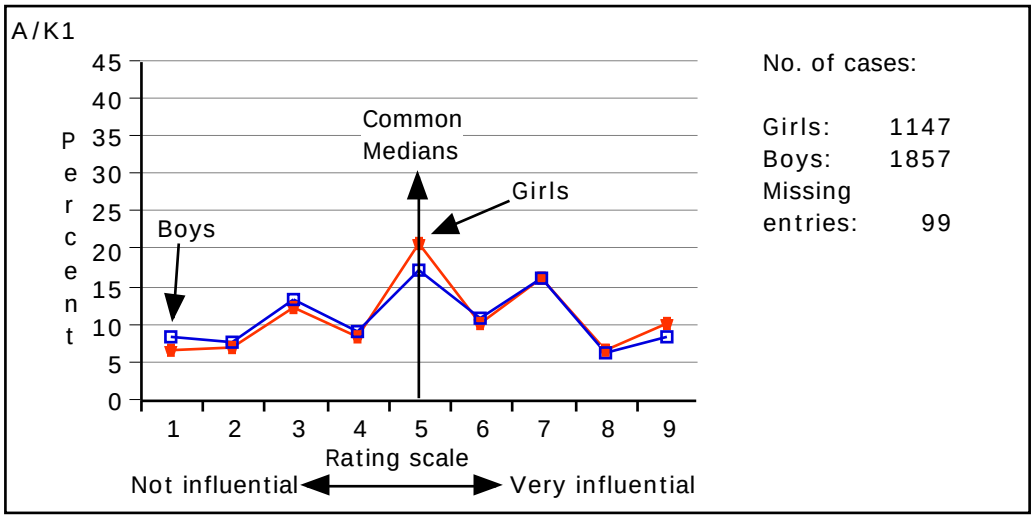


Fig. A7.59 - Influence of Art on the way we live now - Analysis by gender

Girls and boys were in agreement about the influence of Art on the way we live now; they recorded median values of 5—Fig. A7.59.

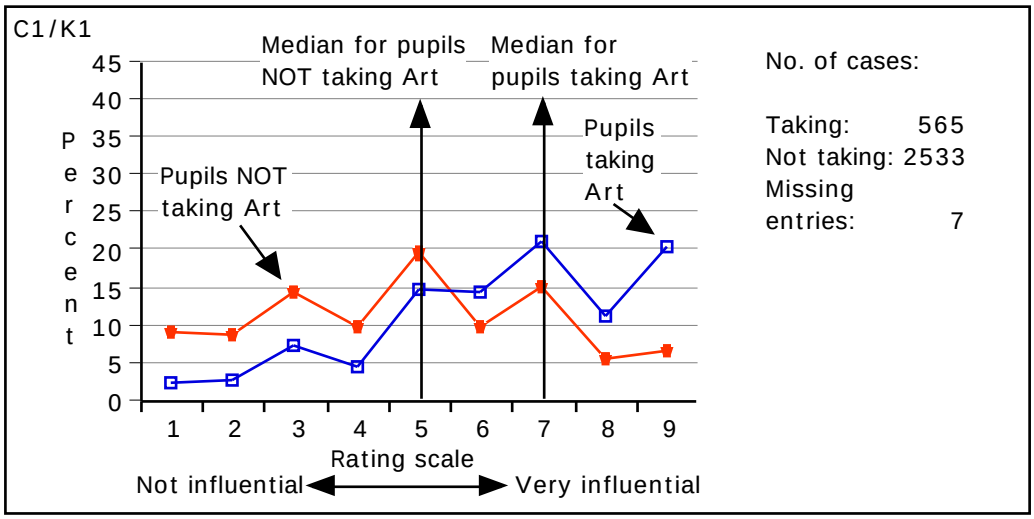


Fig. A7.60 - Influence of Art on the way we live now - Analysis by subject studied
Comparison between pupils taking Art and pupils not taking Art

The influence of Art on the way we live now was rated at a median value of 7 by pupils studying the subject, and 5 by students not taking Art—Fig. A7.60.

How creative does the curriculum allow you to be in Art?

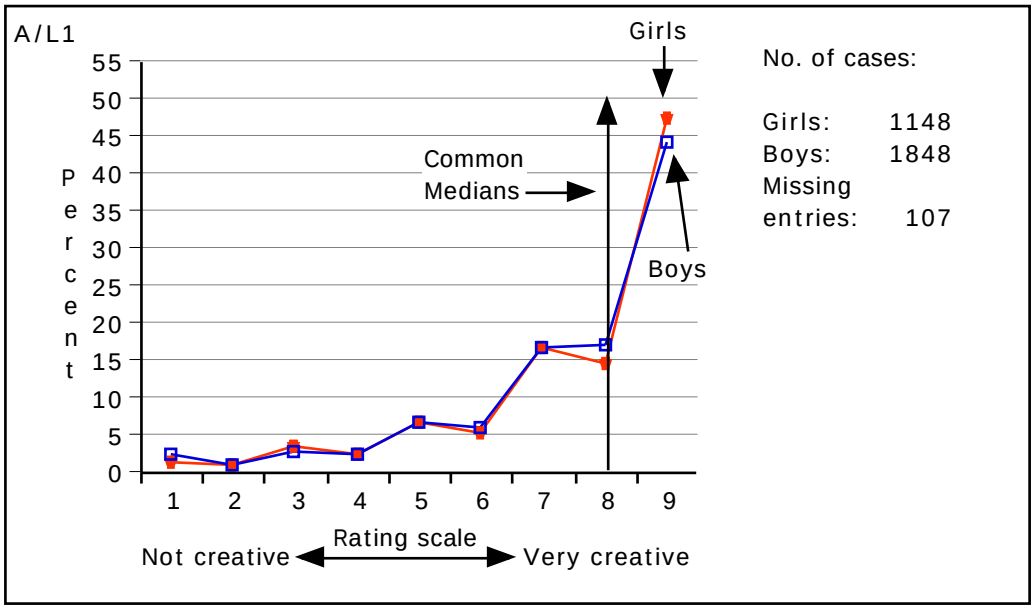


Fig. A7.61 - How creative does the curriculum allow you to be in Art? - Analysis by gender

With the subject of Art, the creative possibilties in the curriculum were highly rated; the median values were common at 8 for both girls and boys—Fig. A7.61.

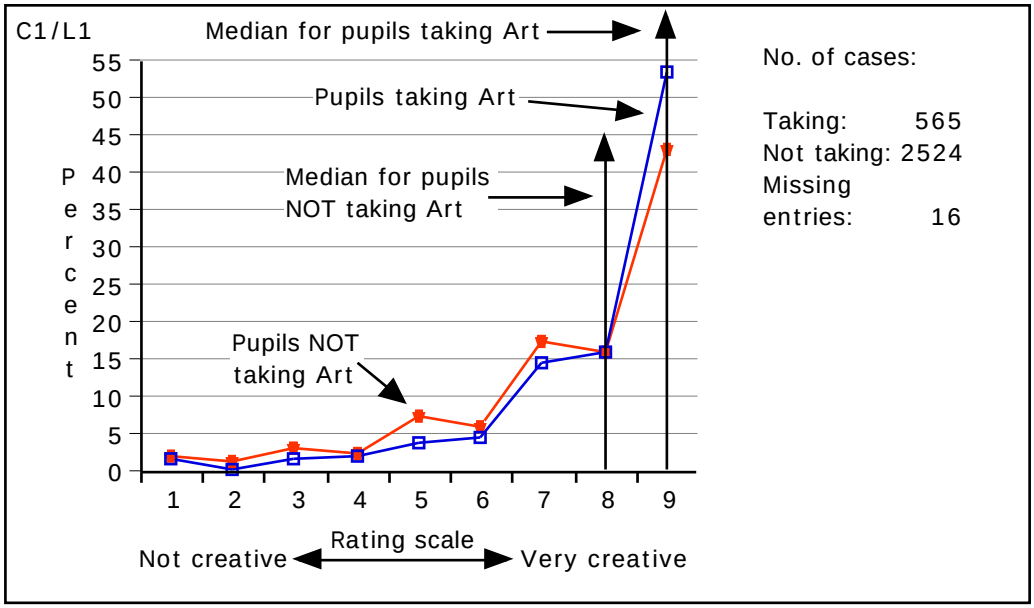


Fig. A7.62 - How creative does the curriculum allow you to be in Art? - Analysis by subject studied
Comparison between pupils taking Art and pupils not taking Art

Students taking Art, rated the creative possibilties in the curriculum very highly, producing a maximum median value of 9; even pupils not taking Art rated the creative possibilities at a median of 8—Fig. A7.62.

There is a difference about Figures A7.61 and A7.62 that should be explained, and relates to the vertical or 'Y' scales which have been extended to 55% to accommodate the plots; all other 'curves' have been plotted on 'Y' scale maxima of 45%.

Since the analysis in Fig. A7.62 has thrown up a median maximum value of 9, it is appropriate to be reminded of the definition:

> The median is the middle value … half the values in the variable are less than or equal to the median, and half are greater than or equal to it. … the median is not affected by occasional extraordinary data values—Velleman (1992:7/2).

Fig. A7.63 below shows in detail the derivation of this remarkable result:

Rating scale	1	2	3	4	5	6	7	8	9	*	Totals
Not taking Art	57	32	85	64	189	154	439	409	1095	3	2527
Not taking Art %	2.26	1.27	3.36	2.53	7.48	6.09	17.4	16.2	43.3	0.12	100
Taking Art	10	3	11	13	23	26	84	91	304	1	566
Taking Art %	1.77	0.53	1.94	2.3	4.06	4.59	14.8	16.1	53.7	0.18	100
Total numbers	67	35	96	77	212	180	523	500	1399	4	3093
Total as %	2.17	1.13	3.1	2.49	6.85	5.82	16.9	16.2	45.2	0.13	100

Fig. A7.63 - Detailed statistics showing derivation of median value of 9 in response to the question: 'How creative does the curriculum allow you to be in Art?' Comparison between pupils taking and not taking Art

Further inference will be drawn from this extraordinary result in the summary on Art.

As a modern society, how dependent do you think we are on Art?

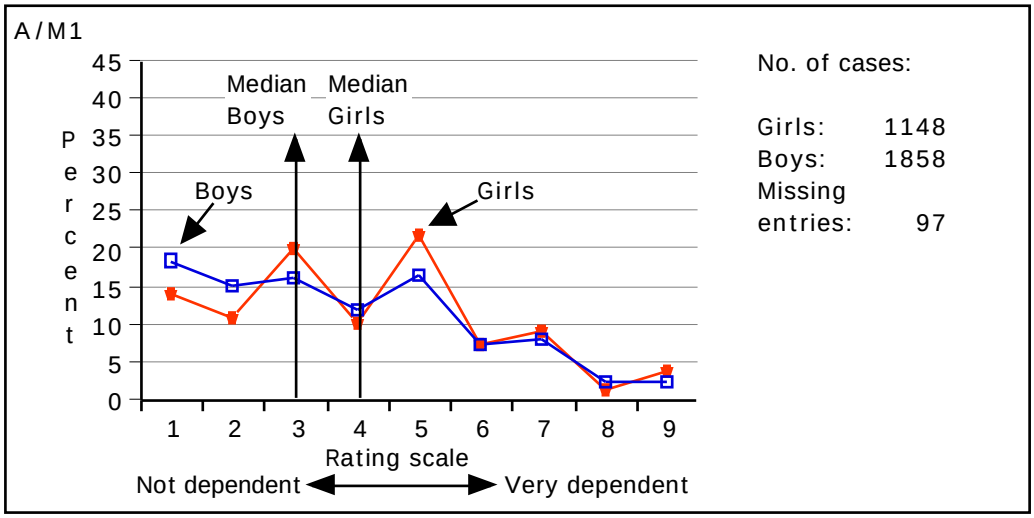


Fig. A7.64 - How dependent do you think we are on Art? - Analysis by gender

Recording a median value of 4, girls rated our dependency on Art more highly than boys, at a median value of 3—Fig. A7.65.

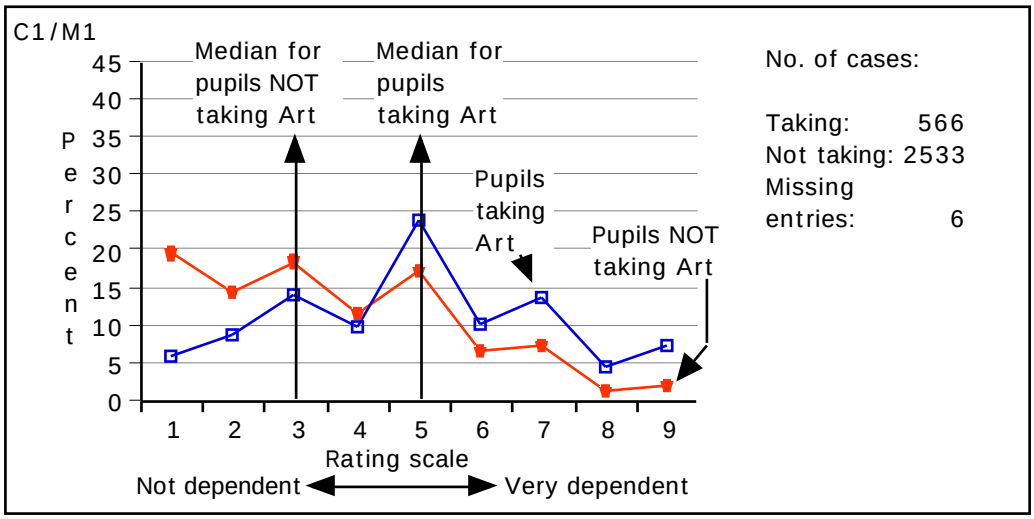


Fig. A7.65 - How dependent do you think we are on Art? - Analysis by subject studied Comparison between pupils taking Art and pupils not taking Art

Pupils who were studying the subject rated our dependency on Art as a modern society at a median level of 5, while students not taking Art recorded a median of 3—Fig. A7.65.

Summarising the place of Art in our society as perceived by A-level students

Although this examination of Art covered only four parameters of analysis, instead of seven as used for D&T, English, Maths and Science, there are a number of significant results to consider.

Art has a low rating for importance in the context of Economic and Industrial Understanding (EIU); analysis by gender produced common medians of 3 for girls and boys—Fig. A7.57. The alternative analysis produced a median of 4 for pupils taking Art, and 3 for students not taking Art—Fig. A7.58.

These poor results are curious, since young people exercise 'appearance choice' every day, in their buying habits and other activities. What is a serious cause for concern is the absence of any link with EIU, and yet industry devotes significant skill and financial resources to the determination of product 'appearance' and 'style'.

Product appearance and style are crucial elements within any product development process. The first requirement in good design is to make a product that is visually pleasing so as to build 'showroom-traffic'; this is jargon in the motor industry for encouraging potential buyers into the showrooms.

Responses to the question 'How much do you think the way we live now has been influenced by Art?' yielded a median value of 5 for girls and boys—Fig. A7.59. Analysis by subject

studied, showed that students taking Art rated the subject influence more highly at a median value of 7, and pupils not taking Art rated the influence at a median level of 5—Fig. A7.60. These responses are inconsistent with the answers concerning EIU.

The question 'How creative does the curriculum allow you to be in Art?' produced results that were unusually high in this research. The analysis by gender gave common median values of 8—Fig. A7.61. Students taking Art scored a median maximum of 9, and pupils not taking the subject recorded a median of 8—Fig. A7.62. From Fig. A7.63, it may be seen that 53.7% of the students taking Art rated the level of creativity on the scale maximum, thus satisfying the definition of 'median'; but these exceptional ratings were backed up with a median of 8 for students not taking Art.

These responses have been examined in conjunction with similar responses for other subjects concerning 'creativity' as shown in Fig. A7.66 below.

	Medians by gender - Girls/Boys	Medians by subject - Taking/Not taking
Art	8/8	9/8
D&T	7/7	8/7
English	7/6	7/6
Maths	3/3	3/2
Science	4/4	4/4

Fig. A7.66 - Comparison of median values obtained to the question: 'How creative does the curriculum allow you to be in the various subjects?' by the two methods of statistical analysis used in this research

Fig. A7.66 shows a comparison that presents a serious cause for concern, and provides confirmation of the most damning kind that the creativity in D&T, Science and Maths that has brought us from the Stone Age to the way we live now was neither perceived nor understood. With this stark inference, how can the good intent that was undoubtedly behind the Education Reform Act of 1988, as summarised in Appendix 6, ever be realised?

Although creativity in Art was very highly rated, our dependency on Art was not; in the gender analysis girls scored a median value of 4 and boys 3—Fig. A7.64. The alternative analysis, comparing students taking Art with pupils not taking the subject, produced medians of 5 and 3 respectively—Fig. A7.65. Here was confirmation of the absence of any link with Economic and Industrial Understanding.

From this collection of results, it may be inferred that creativity is perceived more in products than in processes. However, the tools and technologies by which humankind progressed from the Stone Age, arose not only by imaginative visualisation of the products, but by the imaginatively conceived processes necessary to make them.

Similarly, it was and is innovative, imaginatively conceived products and processes that sustains the dynamic in any competitive world-class performance by UK companies, particularly technological companies, and which the government seeks to promote. And a more modern definition of the imaginative core that resides jointly within the product development process, and the product development manufacturing process, is known as 'simultaneous engineering'—see page 79.

Cross-curricular themes:

The data-gathering instrument sought answers to the question 'Did you have teachers for the following cross-curricular themes at your school?':

- Careers Education & Guidance,
- Education for Citizenship,
- Education for Economic & Industrial Understanding,
- Environmental Education,
- Health Education.

Bar-charts that capture the educational provision for these themes are presented in Figures A7.67 to A7.71.

Did you have teachers for Careers Education & Guidance?

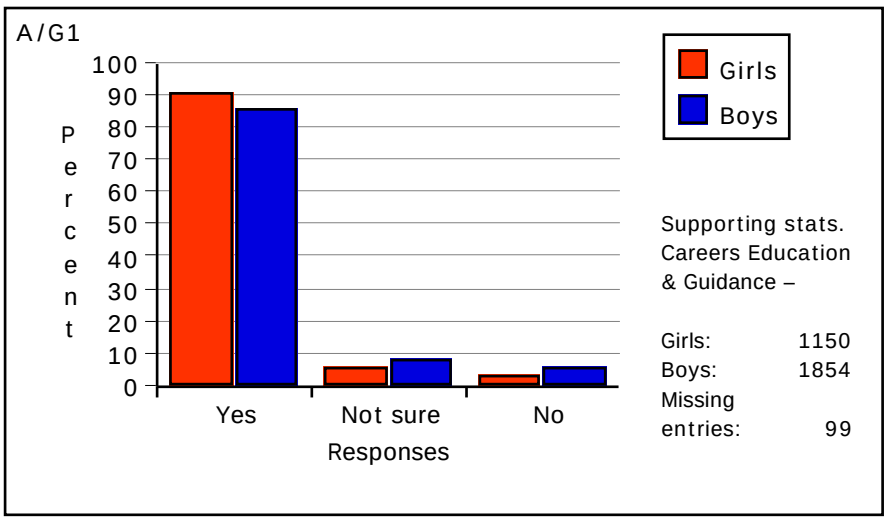


Fig. A7.67 - Did you have teachers for Careers Education & Guidance?

From Fig. A7.67, it may be seen that more than 90% of girls and 85% of boys had teachers for Careers Education & Guidance.

Did you have teachers for Education for Citizenship?

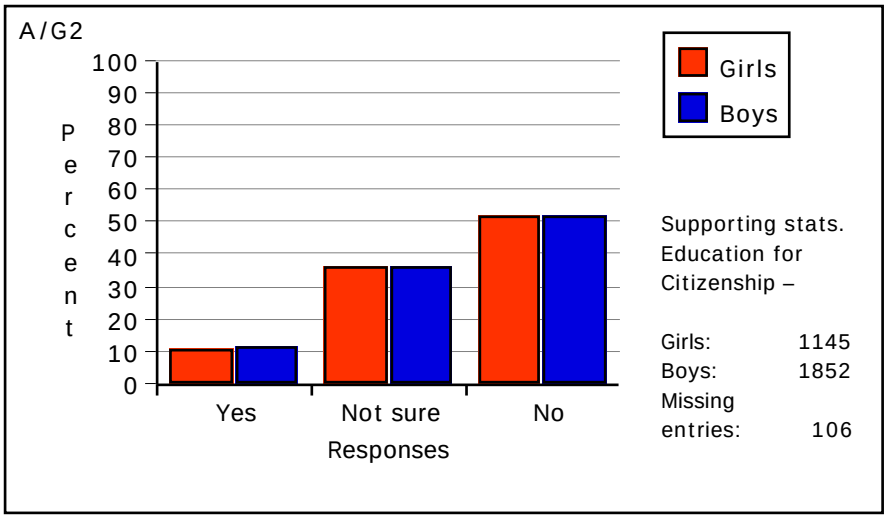


Fig. A7.68 - Did you have teachers for Education for Citizenship?

Some 11% of the pupils had teachers for Education for Citizenship; about 36% were not sure, and 52% did not—Fig. A7.68.

Did you have teachers for Education in EIU?

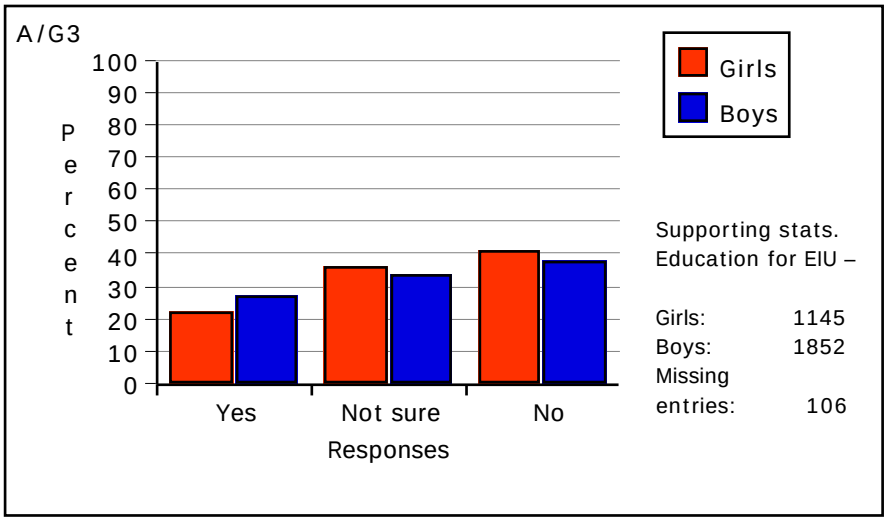


Fig. A7.69 - Did you have teachers for Education in EIU?

Fig. A7.69 shows that 22% of girls and 27% of boys had teachers for EIU; the rest were either 'not sure', or they were certain that they 'did not'.

Did you have teachers for Environmental Education?

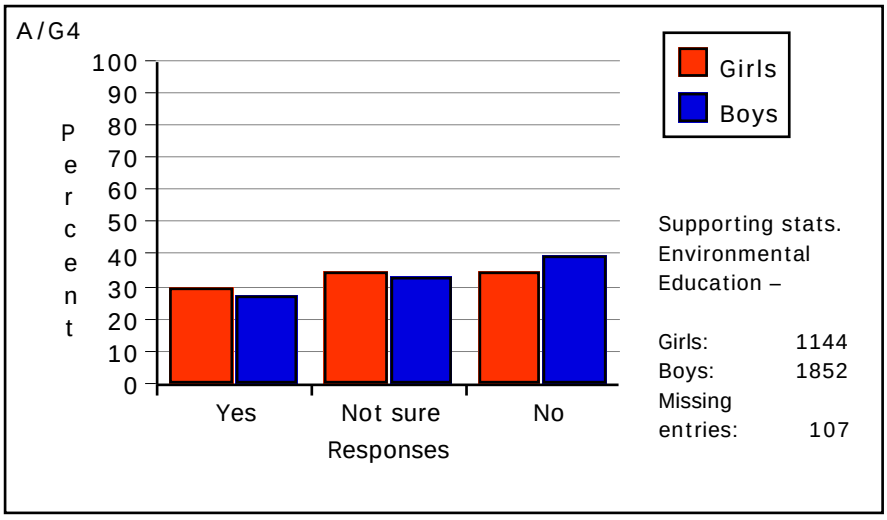


Fig. A7.70 - Did you have teachers for Environmental Education?

Some 30% of girls and 27.5% of boys had teachers for Environmental Education; more than 30% were 'not sure', while more than 35% were certain that they 'did not'—Fig. A7.70.

Did you have teachers for Health Education?

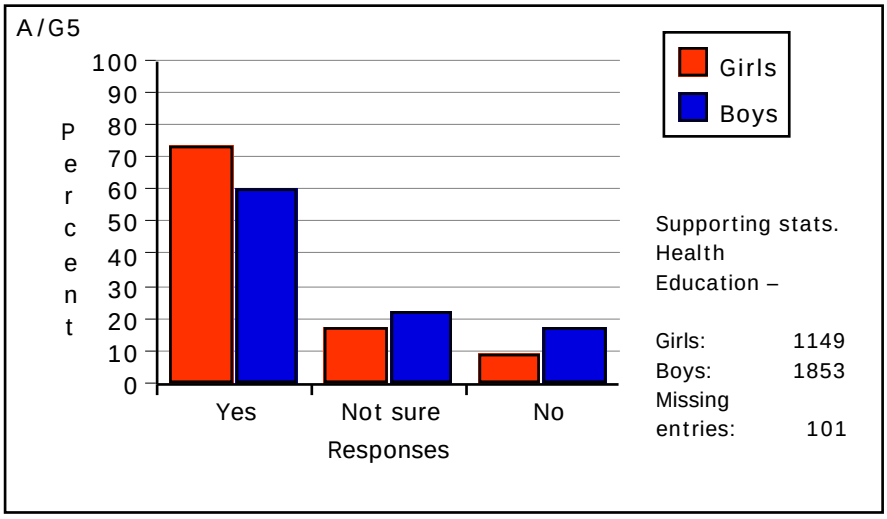


Fig. A7.71 - Did you have teachers for Health Education?

Some 73% of girls and 60% of boys had teachers for health education; the rest were either 'not sure', or knew that they 'did not'—see Fig. A7.71.

Summarising the educational provision for cross-curricular themes

Fig. A7.72 below offers a tabular summary of the cross-curricular educational provision as perceived by this A-level student population.

Themes	A	A	B	B	C	C	D	D	E	E
Gender	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Yes %	90.9	85.7	10.9	11.7	22.6	27.6	29.8	27.5	73.1	59.9
Not sure %	5.7	8.7	37.0	36.3	36.7	34.0	35.1	33.2	17.8	22.7
No %	3.5	5.5	52.0	52.0	40.7	38.3	35.1	39.1	9.1	17.3
Total	100	100	100	100	100	100	100	100	100	100

Fig. A7.72 - Summary of cross-curricular educational provision

The legend for Fig. A7.72 was as follows:

- 'A' - Careers Education & Guidance,
- 'B' - Education for Citizenship,
- 'C' - Education for Economic & Industrial Understanding,
- 'D' - Environmental Education,
- 'E' - Health Education.

The main points were:

- More than 90% of girls and 85% of boys had teachers for Careers Education & Guidance—see also Fig. A7.67.
- Some 11% of the pupils had teachers for Education for Citizenship; about 36% were not sure, and 52% did not—see also Fig. A7.68.
- 22% of girls and 27% of boys had teachers for EIU; the rest were either 'not sure', or were certain that they 'did not'—see also Fig. A7.69.
- 30% of girls and 27.5% of boys had teachers for Environmental Education; more than 30% were 'not sure', while more than 35% were certain that they 'did not'—see also Fig. A7.70.
- Some 73% of girls and 60% of boys had teachers for Health Education; the rest were either 'not sure', or knew that they 'did not'—see also Fig. A7.71.

There are a number of aspects to these results that present causes for concern. While there was overwhelming support for Careers Education & Guidance, as citizens we are without exception part of the economic fabric of society. However, in employment, do we become consumers or creators of wealth? So in this context, the result for EIU was disappointing.

As first implemented, the 1988 National Curriculum was overloaded. This was confirmed by the Secretary of State for Education when he ordered an enquiry 'to look into the scope for slimming'—Dearing (1993:1). The bar charts and statistics above present a picture of the provision, after the introduction of the revised National Curriculum. But what do A-level students think about these cross-curricular themes? Do they think the cross-curricular themes should be part of the National Curriculum? The data-gathering instrument offered students the opportunity to respond to these questions; their answers are presented in the

next sub-section.

What do A-level students think about Cross-curricular themes?

Do you think Careers Education & Guidance should have a place in the National Curriculum?

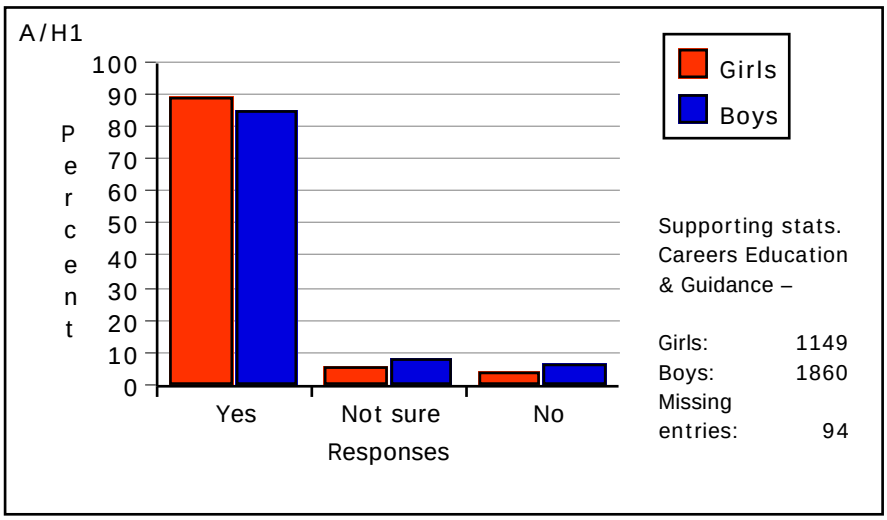


Fig. A7.73 - Should Careers Education & Guidance have a place in the National Curriculum?

Some 89% of girls and 84% of boys thought Careers Education & Guidance should have a place in the National Curriculum.

Do you think Education for Citizenship should have a place in the National Curriculum?

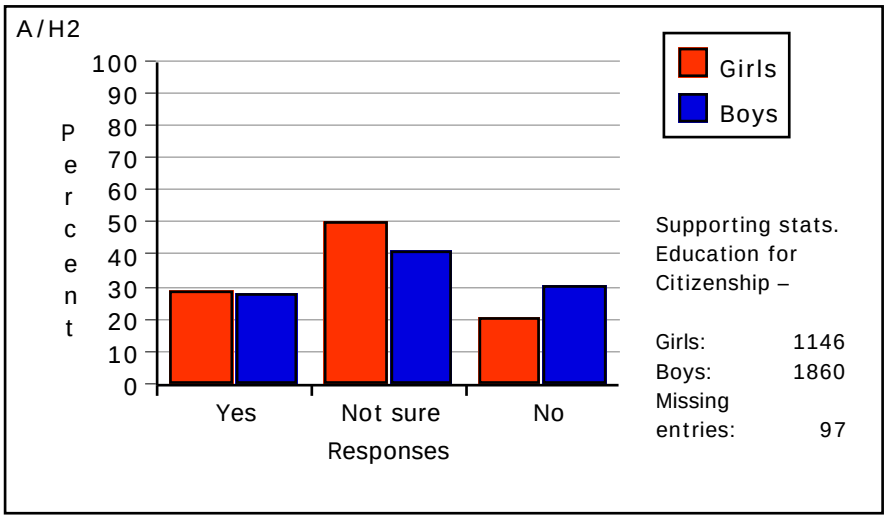


Fig. A7.74 - Should Education for Citizenship have a place in the National Curriculum?

From Fig. A7.74, fewer than 30% of girls and boys thought that Education for Citizenship should have a place in the National Curriculum.

Do you think Education for EIU should have a place in the National Curriculum?

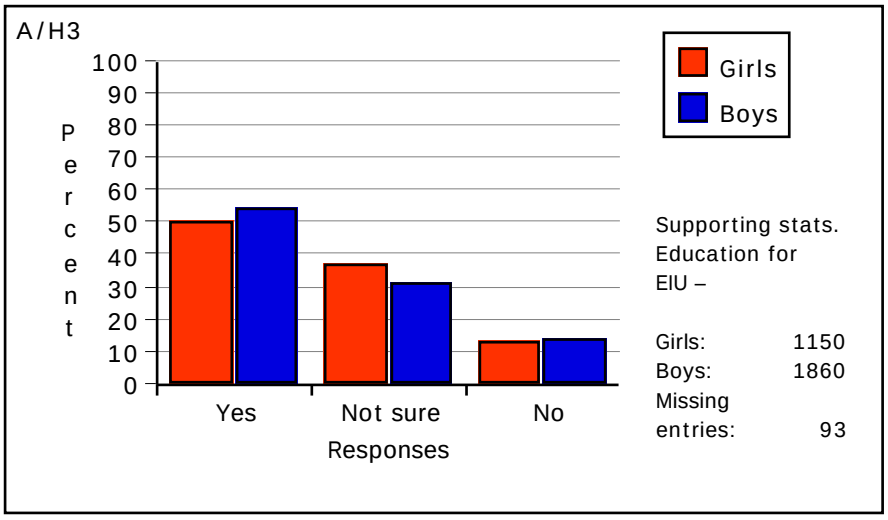


Fig. A7.75 - Should Education for Economic & Industrial Understanding have a place in the National Curriculum?

49.7% of girls and 54.4% of boys thought that Education for Economic & Industrial Understanding should have a place in the National Curriculum.

Do you think Environmental Education should have a place in the National Curriculum?

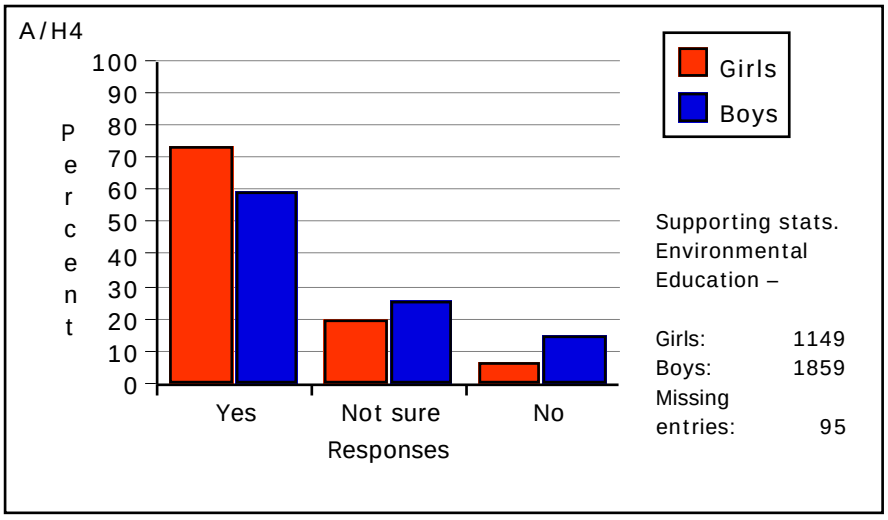


Fig. A7.76 - Should Environmental Education have a place in the National Curriculum?

73% of girls and 59% of boys considered Environmental Education should have a place in the National Curriculum.

Do you think Health Education should have a place in the National Curriculum?

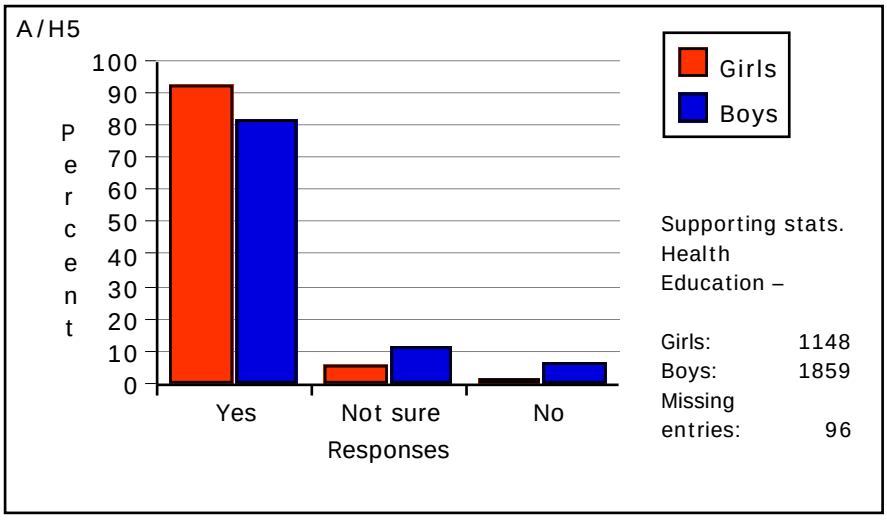


Fig. A7.77 - Should Health Education have a place in the National Curriculum?

Almost 93% of the girls and 82% of the boys thought that Health Education should have a place in the National Curriculum.

Summarising whether Cross-curricular themes should be in the National Curriculum

Using the following legend:

- 'A' - Careers Education & Guidance,
- 'B' - Education for Citizenship,
- 'C' - Education for Economic & Industrial Understanding,
- 'D' - Environmental Education,
- 'E' - Health Education.

Fig. A7.78 provides a tabular summary of Figures A7.73 to A7.77, and enables more direct comparison.

Themes	A	A	B	B	C	C	D	D	E	E
Gender	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Yes %	89.5	84.7	29.0	28.1	49.8	54.4	73.0	59.5	92.8	81.8
Not sure %	6.2	8.5	50.2	41.0	37.1	31.5	20.2	25.8	5.8	11.8
No %	4.3	6.8	20.8	30.8	13.1	14.1	6.8	14.6	1.5	6.3
Totals %	100	100	100	100	100	100	100	100	100	100

Fig. A7.78 - Summary of responses by A-level students to the question Do you think the Cross-curricular themes should have a place in the National Curriculum?

By reference to Fig. A7.78, and the theme legend A to E shown above, more than 89% of girls and 84% of boys thought that Careers Education & Guidance should be in the National Curriculum. There was less enthusiasm for Education for Citizenship, girls recording 29% and boys 28.1%. In the context of Education for Economic & Industrial Understanding, 49.7% of girls and 54.4% of boys considered it should be in the National Curriculum. With regard to Environmental Education, 73% of girls, and 59.5% of boys thought it should be in the National Curriculum. For Health Education, 92.8% of girls and 81.8% of boys considered it should be part of the National Curriculum.

As a modern society, how dependent do you think we are on Commerce?

Fig. A7.79 presents the responses to this question.

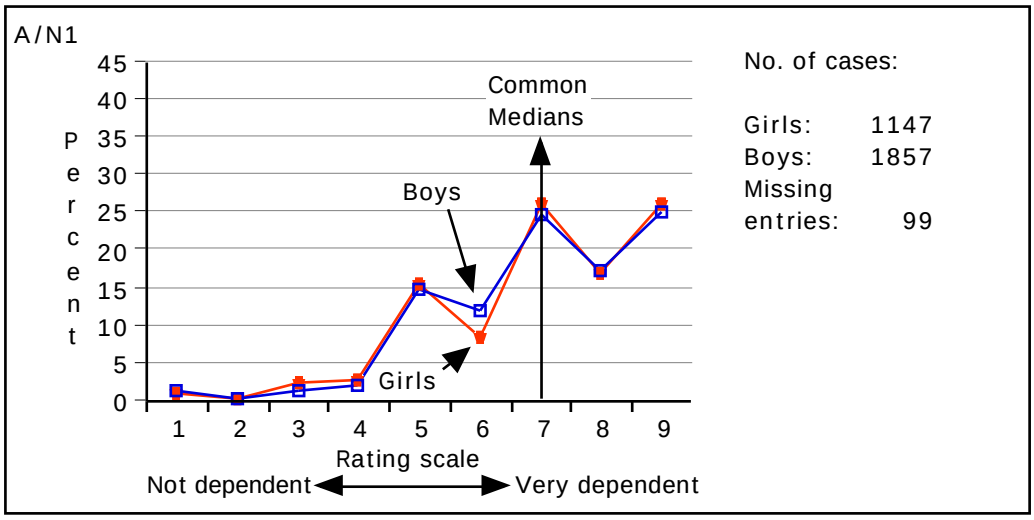


Fig. A7.79 - As a modern society, how dependent do you think we are on Commerce?

From Fig. A7.79, it may be seen that at a median value of 7 by both girls and boys, our dependency on Commerce was fairly highly rated.

As a modern society, how dependent do you think we are on Finance?

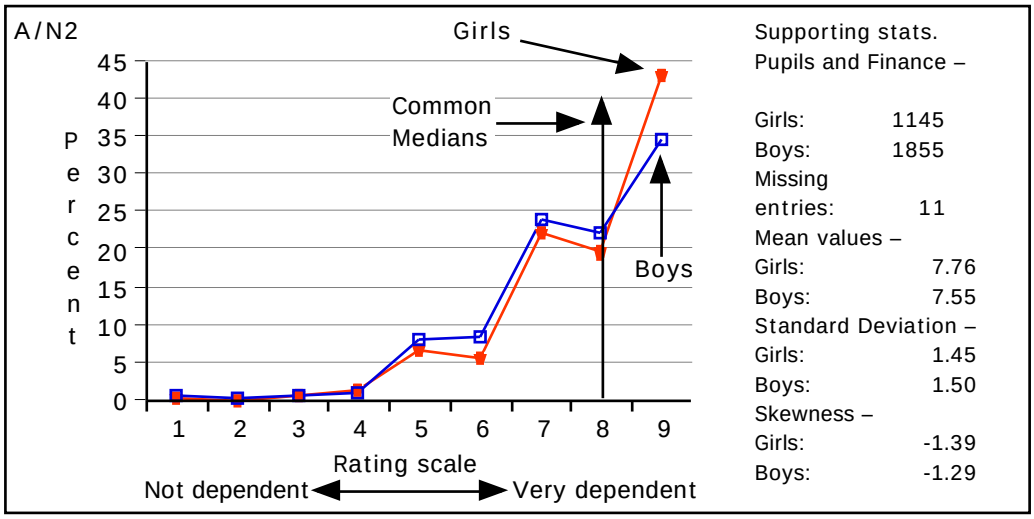


Fig. A7.80 - As a modern society, how dependent do you think we are on Finance?

From Fig. A7.80, it may be seen that at a median value of 8 by both girls and boys, our dependency on Finance was more highly rated than our dependency on Commerce, and yet they are equally important.

As a modern society, how dependent do you think we are on Industry?

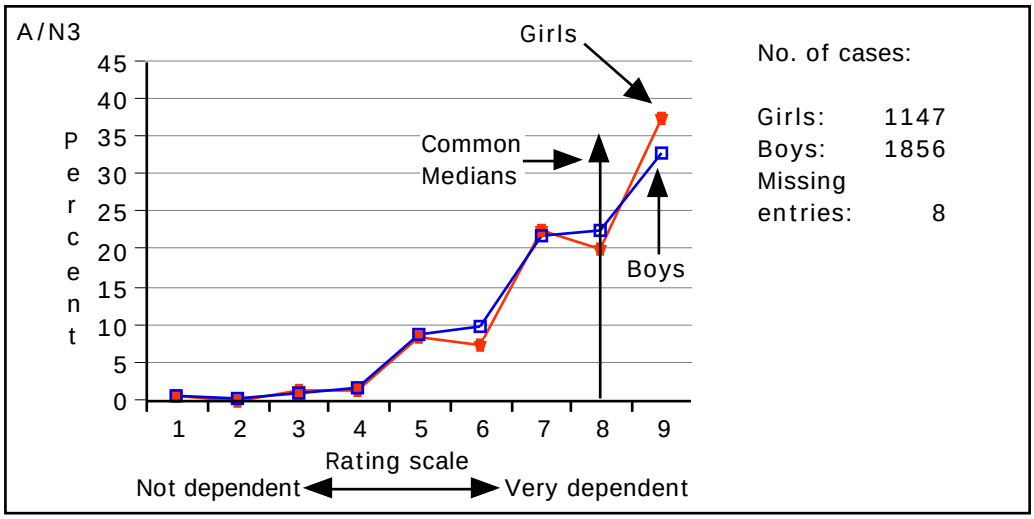


Fig. A7.81 - As a modern society, how dependent do you think we are on Industry?

From Fig. A7.81, it may be seen that at a median value of 8 by both girls and boys, our dependency on Industry was rated equally important with our dependency on Finance.

Summarising for perceived dependence on economic activity

The data-gathering instrument offered the opportunity to ascertain perceived dependence on Commerce, Finance and Industry. Given that only 22% of girls and 27% of boys claimed to have had teachers for EIU, the results in Figures A7.79 (Commerce), A7.80 (Finance), and A7.81 (Industry) with medians of 7, 8, and 8 respectively, were quite remarkable. However, 49.75% of girls and 54.4% of boys thought that EIU should have a place in the National Curriculum, so one in two students had some economic awareness.

Appendix 8 - Content analysis of transcripts

Since as discussed in the thesis, technology plays such a pivotal role in the function of every society, which few recognise, the purpose in this appendix will be to examine what various groups of people understood by both the word 'technology' and the pivotal place it holds in our society. This appendix contains the detailed analysis that provides the basis of discussion in Chapter 8. The groups who kindly cooperated in this research included:

- D&T teachers
- D&T student teachers
- Parents in technology jobs
- Technology A-level studentss
- Humanities teachers
- Humanities student teachers
- Parents in non-technology jobs
- Humanities A-level students

The opinions and views of these groups were expressed during individual recorded interviews in response to a one-page schedule—see page 14. These were complementary groups in order to try and achieve a balanced response. The method of group selection worked well, with two exceptions: (1) the D&T teachers were established in eight secondary schools, and they were asked to find a Humanities colleague who would be willing to be interviewed. One of the D&T teachers was unable to find a willing Humanities colleague. (2) one of the recordings of parents in technological jobs was accidental erased. So instead of there being 64 transcripts, there were 62.

For administrative purposes, question 1 on the schedule dealt with the personal details necessary for sub-group identity. So the data-gathering, associated with how the meaning of 'technology' was perceived, begins properly with question 2. Question 2 was 'open-ended' for 'qualitative inquiry', and to encourage people 'to respond in their own terms'— Patton (1990:295). Questions 3 was more structured since it offered a list—Bell (1992:59). Questions 4 to 8 were a mixture of structured and open-ended queries. Question 9 sought a quantitative response on a scale of 1 (low) to 9 (high).

Fig. A8.01 on the next page, summarises the word count transcribed for each of the eight sub-groups, and in response to each of the data-gathering questions from 2 to 9; the sub-groups have also been paired so that teachers appear in the first two columns, followed by parents, student teachers, and A-level students.

It may be seen from Fig. A8.01 that there was great variation in the total transcribed word count for each sub-group, ranging from 1452 words by the parents in non-technical jobs, to 5098 words for the D&T teachers.

Word counts for Q2 to Q9	T D&T teach-ers	H Human-ities teach-ers	T Par-ents in tech jobs	H Par-ents in non tech jobs	T Tech-nology student teach-ers	H Human-ities student teach-ers	T Tech-nology A-level stud-ents	H Human-ities A-level stud-ents	Word count totals
Question No.									
2	389	243	356	183	272	181	149	165	1938
3	542	356	265	182	264	370	452	270	2701
4	883	444	407	91	386	223	203	218	2855
5	651	1324	433	107	435	260	280	265	3755
6	488	528	264	224	242	186	205	250	2387
7	655	290	238	223	593	251	305	316	2871
8	501	363	497	208	425	270	298	393	2955
9	989	401	173	234	313	113	254	256	2733
Sub-totals	5098	3949	2633	1452	2930	1854	2146	2133	22195
No. of people	8	7	7	8	8	8	8	8	62

Fig. A8.01 - Transcribed word-count summary by sub-group for questions 2 to 9

Fig A8.01 provides a summary of the raw material to be analysed.

A08.01 Structure of analysis

Each of the 62 transcripts represents a valuable personal opinion in a technological context. As the generic creative system of humankind that has brought us from the Stone Age to the way we live now, technology has always been about achieving change in order to sustain ourselves through progressively greater productivity and/or progressively greater capability.

Use of the words associated with achieving or identifying change provides one indicator of the extent to which the role of technology and the technological processes in our lives are understood, and in this context the transcripts present good examples for 'content analysis'—see p19. Early growth in the use of content analysis occurred in the first half of the 20th Century, and included the analysis of 'public opinion'—Krippendorff (1985:15).

Question 2 on the schedule was framed to seek 'opinion', and asked 'Can you describe briefly what is meant by technology?' The 'content-analysis' process was used to search for 'key-words-in-context' usually abbreviated to KWIC. For this analysis, the KWIC list had to recognise that among eight groups of people the language used to express understanding of technology could also be different. The structure of the KWIC list was centred on words associated with technology as the generic creative system of humankind through which change was achieved, and was based on the following themes:

- creative imaginative activities such as design,
- the creative practical activities,
- terms that describe change, such as advancing, improving and 'making life easier',
- the universal nature of technology,
- technology in the national economy,

- the practical reality of technology,
- problem solving,
- human social needs.

The KWIC list was developed progressively using these themes against the transcripts, as well as the National Curriculum Orders for D&T published in 1989, and the Orders for Technology published in 1992. The transcripts were used since they represented what people from very different backgrounds thought about technology, and how they perceived and described the influence of technology.

Words often have many derivatives; for example the derivatives of 'create' includes 'creates', 'creating', 'creative', 'creatively' and 'creativity'. Only 'creating' and 'creatively' appear in the National Curriculum Orders. Nevertheless, the other derivatives also express the creative theme that has always been fundamental in the technological evolution which brought humankind from the Stone Age to the way we live now.

An example of a key-word-in-context or KWIC analysis, as produced by the application Conc 1.80, appears in Fig. A8.02.

4	anything as well with	**IT**.□□ Technology in its broadest
7	more comfortable.	**It** can be anything of that type
11	...mbination of Design,	**IT** and state of the art work
13	things to many people.	**It** seems to have been subdivided
13	been subdivided into	**IT** and hard materials woodwork and
19	problems. I've heard	**it** said that technology is about
10	business whether its	**leisure**, work or whatever
6	environment to make	**life** easier or more advanced I
18	the design.□□ Using	**machinery**, artefacts to solve
20	involves using	**machinery**, artefacts, materials to
9	tool that is of man	**made** design or man made use that
9	made design or man	**made** use that actually helps humans
6	their environment to	**make** life easier or more advanced I
21	advancements to	**make** learning easier. I don't really
9	its any tool that is of	**man** made design or man made use
9	of man made design or	**man** made use that actually helps

Fig. A8.02 - KWIC analysis for Humanities teachers

Fig. A8.02 shows that in this instance the key words found included 'IT', 'leisure', 'life', 'machinery', 'made', 'make', and 'man'. The numbers down the left-hand side of Fig. A8.02 locates the sentence in which the key-word appears. To place the 'key-word' in context, a few words appear before and after the key-word which is shown in **bold** script.

Analysis of responses to question 2: *Can you describe briefly what is meant by technology?*

Appendix 9 reproduces all the transcripts in response to question 2. Using the above guidelines, the final KWIC list, although not exhaustive, contained some 214 words, and is shown in Appendix 10. Fig. A8.03 provides a brief summary of some of the findings from Appendices 9 and 10.

Occupation	No of people	Total words in transcripts	Key words used from list
D&T teachers	8	389	87
Humanities teachers	7	243	69
Parents in technology jobs	7	356	74
Parents in non-technology jobs	8	183	38
D&T student teachers	8	272	67
Humanities student teachers	8	181	41
Technology A-level students	8	149	33
Humanities A-level students	8	165	39
Total key words			448
Note: Keywords in National Curriculum orders			68

Fig. A8.03 - Numerical summary of Appendices 9 and 10

Although the KWIC list was not an exhaustive summary, Fig. A8.03 shows that the combination of the National Curriculum Orders for D&T (1989) and Technology (1992) contained some 68 of the keywords on the list as developed. When describing what was meant by technology, it may be seen from Fig. A8.03 that D&T teachers collectively headed the list and used some 87 words from the KWIC list.

In ranking order, parents in technology jobs (professional electronic engineers), were second in their collective KWIC use with 74 words. Although there were only 7 people in this group, collectively they produced the second highest number of words at 356. A contributory factor was the greater degree of uncertainty that became manifest when these professional engineers were confronted by the question 'Can you describe briefly what is meant by Technology?'; for example:

> 'I was trying to think what do I understand by technology'
> 'That is a good question because it has many meanings'

Some members of this group who were at first unsure, expressed their uncertainty and thinking aloud, so adding to the aggregate word count in their transcripts.

Continuing to refer to Fig. A8.03, the 7 Humanities teachers amassed some 243 words in their transcripts, but they recorded the third highest KWIC use at 69 words. Where would they have come with 8 transcripts?

The transcripts for D&T student teachers produced an aggregate of 272 words, and 67 KWIC.

Continuing with reference to Fig. A8.03, the transcripts for the Humanities student teachers yielded a total of 181 words, and 41 KWIC.

From Fig. A8.03, it be may be seen that the transcripts for Parents in non-technology jobs yielded some 183 words, while the transcripts for the Humanities A-level students produced some 165 words; both these groups used 39 KWIC. That leaves the Technology A-level students who had the lowest total for words in the group transcripts, and at 33 the lowest KWIC.

Creative activities of the mind in technology

The analysis continues with selected sub-sets of keywords from the transcripts, and chosen to represent the themes upon which the list of keywords were established. However, because of the universal nature of technology in our lives, in every field of human experience and often unseen, some keywords would fit in more than one theme sub-set.

For the first sub-set, Fig. A8.04 shows how the creative content of technology as the product of the imagination was perceived and expressed.

Keywords	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word usage count
Create	2	0	1	0	0	0	0	0	3
Design	3	4	2	1	4	4	2	0	20
Develop	0	0	2	0	3	0	1	2	8
Idea	1	0	0	0	3	0	0	0	4
Imagine	0	0	0	0	0	0	0	0	0
Innovate	0	0	2	0	0	0	0	0	2
Intellectual	0	0	0	0	0	0	0	0	0
Invent	0	0	0	0	0	0	0	0	0
Plan	0	0	0	1	1	0	0	0	2
Thinking	0	0	0	0	1	0	0	0	1
Totals	**6**	**4**	**7**	**2**	**12**	**4**	**3**	**2**	**40**

Fig. A8.04 - Key words in technology describing creative activities

The 9 keywords shown in Fig. A8.04 above, represent a distillation of the 27 keywords used in the content analysis as presented in Appendix 10. By inspection, it may be seen that between these 8 groups different sub-sets of words were used in response to question 2.

In the context of the creative activities in technology, Fig. A8.04 shows that the group of D&T student teachers made greater use of these keywords. The keyword most commonly used was 'design' with twenty instances; every group used this word with the exception of the Humanities A-level students. The word 'develop' was used on eight occasions, including twice by the Humanities A-level students.

One of the most important keywords in Fig. A8.04 was 'create', and in this table it represents five derivatives. Only the D&T teachers and professional electronic engineers used the word 'create', with 2 and 1 instances respectively. The word 'idea' was used once by D&T teachers, and three times by D&T student teachers. 'Innovate' was used twice by the professional electronic engineers. The word 'thinking' was used only once, and by the D&T student teachers. There was no use of 'imagine', 'intellectual' and 'invent', also representing creative activities of the mind in technology.

The creative hand/eye coordinated skill activities in technology

Fig. A8.05 groups the keywords associated with the creative hand/eye coordinated skill activities in technology for this group.

Keywords	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word usage count
Build	1	0	0	0	0	0	1	0	2
Construct	0	0	0	1	0	0	0	0	1
Craft	0	0	0	0	0	0	1	0	1
Make	7	4	2	5	3	4	2	4	31
Manufacture	0	0	0	0	0	0	0	0	0
Produce	3	0	1	0	0	0	1	0	5
Totals	**11**	**4**	**3**	**6**	**3**	**4**	**5**	**4**	**40**

Fig. A8.05 - Key words in technology describing creative hand/eye coordinated skill activities

The output of the creative technological imagination of humankind is all around us, and first becomes manifest as design concepts. Subsequently, the concept becomes a specification from which to make the tools we use as extensions of ourselves. The processes associated with making reality of the visual technological images of the mind, involves the use of hand/eye coordinated skills. In order to achieve the best product with the best quality, the hand/eye coordinated skills should also be driven by the imagination.

Fig. A8.05 shows 6 keywords that are crucial in the processes of making reality of our creative visual images, and 5 of these words appear in the National Curriculum Orders for Technology. All 8 groups recorded use of 5 of these 6 words; the exception was manufacture. The keyword most used was 'make' with 31 out of 40 hits, but was there any link between hand/eye coordinated skills and the imagination?

Terms that describe change

Fig. A8.06 shows eleven keywords that refer to change in technology; once again the list has been distilled from the original list of keywords.

Keywords	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word usage count
Advance	0	1	0	2	1	1	2	2	9
Change	0	0	0	0	0	0	0	0	0
Comfortable	0	1	0	0	0	0	0	0	1
Convenient	0	0	0	0	0	0	0	1	1
Easier	0	2	0	1	2	2	0	1	8
Forward	0	0	0	1	1	0	0	1	3
Future	0	0	0	0	1	1	2	0	4
Improve	2	0	0	0	0	0	1	0	3
Modern	0	0	1	0	0	0	0	0	1
New	1	0	0	0	0	0	0	1	2
Progress	1	0	0	0	0	0	1	0	2
Totals	**4**	**4**	**1**	**4**	**5**	**4**	**6**	**6**	**34**

Fig. A8.06 - Key words in technology that describe change

The eleven keywords shown in Fig. A8.06 represents a distillation of some 22 words shown in Appendix 10. There were 34 instances in which these 11 keywords were used. The word 'advance' was used 9 times, while the word 'easier' (used in the sense of 'making life easier'), appeared 8 times in the transcripts; these two words were not used by the D&T teachers nor the professional engineers. Nevertheless, this form of use represents appropriately perceived understanding of the impact of technology in our lives.

The universal influence of technology

Fig. A8.07 shows six keywords that refer to the universal influence of technology as perceived by these eight groups; once again the list has been distilled from the original list of keywords, but on this occasion only seven words are represented.

Keywords	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word usage count
Anything	2	2	2	0	1	1	0	0	8
Endless	1	0	0	0	0	0	0	0	1
Everybody	1	0	0	0	0	0	0	0	1
Everyday	1	0	0	0	1	0	0	0	2
Everything	0	0	0	1	4	0	0	1	6
Life	4	1	0	1	3	1	0	1	11
Totals	**9**	**3**	**2**	**2**	**9**	**2**	**0**	**2**	**29**

Fig. A8.07 - Key words denoting the perceived universal influence of technology

The perceived universal influence of technology was well captured by the D&T teachers, and the D&T student teachers, both with a sub-total of 9; their combined usage was more than 60% of the overall total—see Fig. A8.07.

Between them, the Humanities teachers, Parents in non-technical jobs, Humanities student teachers, and Humanities A-level students used words associated with the universal influence of technology on 9 occasions—see Fig. A8.07.

Technology in the national economy

Fig. A8.08 contains 8 keywords that demonstrate the perceived link between technology and the national economy; in this instance the list represents 18 keywords.

Keywords	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word usage count
Business	0	1	0	0	0	0	0	0	1
Economy	0	0	0	0	0	0	0	0	0
Enterprise	0	0	0	0	0	0	0	0	0
Industry	1	0	3	0	0	1	1	0	6
Market	0	0	0	0	0	0	1	0	1
Profit	0	0	1	0	0	0	0	0	1
Prosperity	0	0	0	0	0	0	0	0	0
Sell	0	0	2	0	0	0	0	0	2
Totals	**1**	**1**	**6**	**0**	**0**	**1**	**2**	**0**	**11**

Fig. A8.08 - Key words denoting the link between technology and the economy

Question 2 provided an opportunity to show the national economic importance of technology. From Fig. A8.08, it may be seen that the aggregate KWIC use was 11, and 6 of these was by parents in technological jobs (professional engineers). Thus it may be inferred that the crucial link between technology and the national economic wellbeing was not at the forefront of the minds among these groups.

The reality of technology

Fig. A8.09 contains twelve keywords that express the reality of technology for this eight-group sub-set of people; in this instance the list represents nineteen keywords.

Keywords	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word usage count
Artefacts	1	2	0	0	0	0	0	0	3
Computers	0	1	2	10	3	8	0	6	30
Equipment	0	0	0	0	0	0	1	2	3
Hardware	0	0	0	0	0	0	0	1	1
IT	0	3	0	1	2	2	0	0	8
Machine	1	2	0	1	2	0	0	2	8
Materials	5	2	1	0	1	0	1	0	10
Mechanisms	3	0	0	0	0	1	2	0	6
Practical	5	1	1	0	1	0	0	0	8
Products	1	0	1	0	0	0	0	0	2
Software	0	0	0	0	1	0	0	1	2
Tools	0	2	0	0	1	1	0	0	4
Totals	**16**	**13**	**5**	**12**	**11**	**12**	**4**	**12**	**85**

Fig. A8.09 - Key words denoting the reality of technology for these groups

Referring to Fig. A8.09, the highest score was for 'computers' at 30; parents in non-technology jobs mentioned computers 10 times, Humanities student teachers scored 8, and humanities A-level students scored 6. D&T teachers made no reference to computers.

IT, 'hardware' and 'software' are computer-related keywords, and accounted for a further eleven KWIC. So nearly half the keyword use count in Fig. A8.09, was directly associated with computers.

The keyword 'materials' was used a total of 10 times; 5 of these uses were by D&T teachers —Fig. A8.09.

Problem solving

Fig. A8.10 shows 2 keywords that express one of the many ways in which the use of technology may be perceived; in this instance the list represents 6 keywords.

Keywords	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word usage count
Problem	4	3	0	0	1	0	0	0	8
Solve	3	3	0	0	1	0	0	0	7
Totals	**7**	**6**	**0**	**0**	**2**	**0**	**0**	**0**	**15**

Fig. A8.10 - Key words denoting technology as a problem-solving discipline

In total there were 15 KWIC counts for 'problem' and 'solve'; 7 of these were by D&T teachers, 6 by Humanities teachers, and two by D&T student teachers—Fig. A8.10. Note that all these groups represented the educational fraternity, and furthermore that no other group found cause to use the words 'problem' and 'solve', including the parents in technological jobs.

Human social needs

The ten keywords in Fig. A8.11 represents a distillation of sixteen words from Appendix 10, and they refer to technology in the context of the perceived human and social needs.

Keywords	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word usage count
Dependent	0	0	0	0	0	0	0	0	0
Food	0	2	0	0	0	0	0	0	2
Health	0	0	0	0	0	0	0	0	0
Home	0	0	0	0	0	0	0	0	0
Humanity/Man	2	4	0	0	1	1	0	0	8
Medical	0	0	2	0	0	0	0	0	2
Need	2	2	1	0	0	0	0	0	5
Social	1	0	0	0	0	0	0	0	0
Society	0	0	0	0	0	0	0	0	1
Totals	**5**	**8**	**3**	**0**	**1**	**1**	**0**	**0**	**18**

Fig. A8.11 - Key words denoting technology supporting human and social needs

Recalling that question 2 was open-ended, it may be seen from Fig. A8.11 that the words 'dependent', 'health' and 'home' were not at the first level of consciousness in the context of technology. However, it should be recalled that respondents were asked 'Can you describe *briefly* what is meant by technology?'

The link with humanity was made by D&T teachers, Humanities teachers, Technology student teachers, and Humanities student teachers with 2, 4, 1, and 1 uses respectively. Only parents in technology jobs made the link between technology and 'medical'.

Analysis of transcripts for question 3: This was concerned with the cross-curricular themes, and asked:

- *Have you heard of them?*
- *Which do you think should be in the curriculum?*

Responses to these 2 questions were captured side-by-side in the next 8 charts starting with Fig. A8.12 overleaf. Each chart shows a colour-coded legend for the 5 cross-curricular themes.

Responses by D&T teachers to cross-curricular themes

From Fig. A8.12 overleaf, it may be seen that cross-curricular theme numbers 1, 2, 4 and 5 were known to 7 of the 8 teachers. Education for Economic and Industrial Understanding was not known to 2 of the teachers.

The presence of themes 1, 2, 4 and 5 in the National Curriculum received seven 'votes' in the affirmative; there was one 'not sure' against each of the 5 themes, and one 'no' against theme 3 Education for Economic and Industrial Understanding.

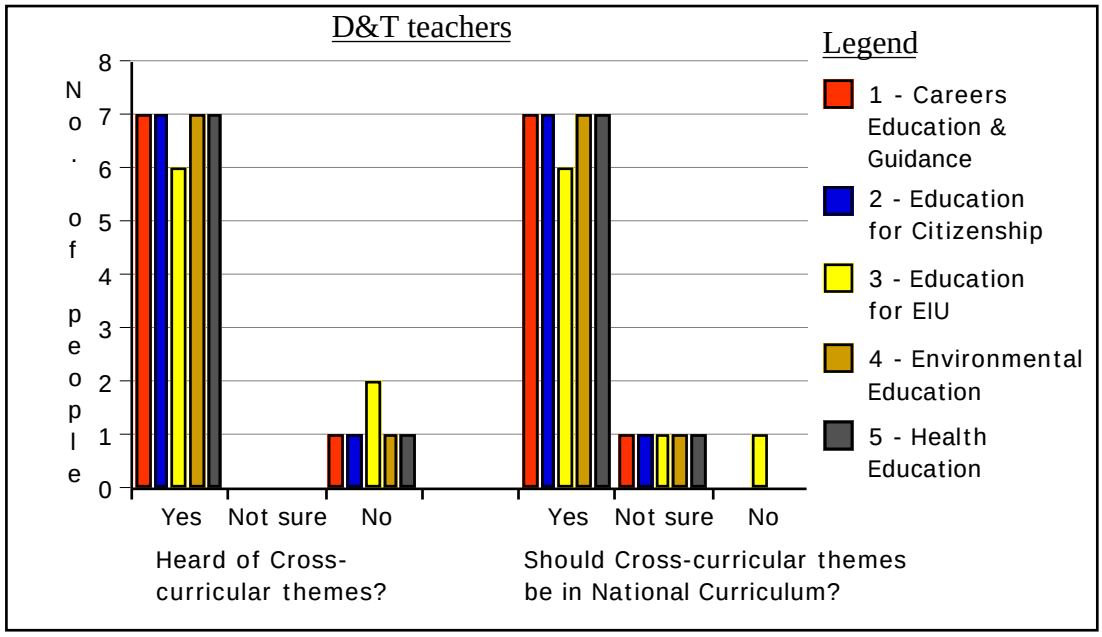


Fig. A8.12 - Responses by D&T teachers to cross-curricular themes

Responses by Humanities teachers to cross-curricular themes

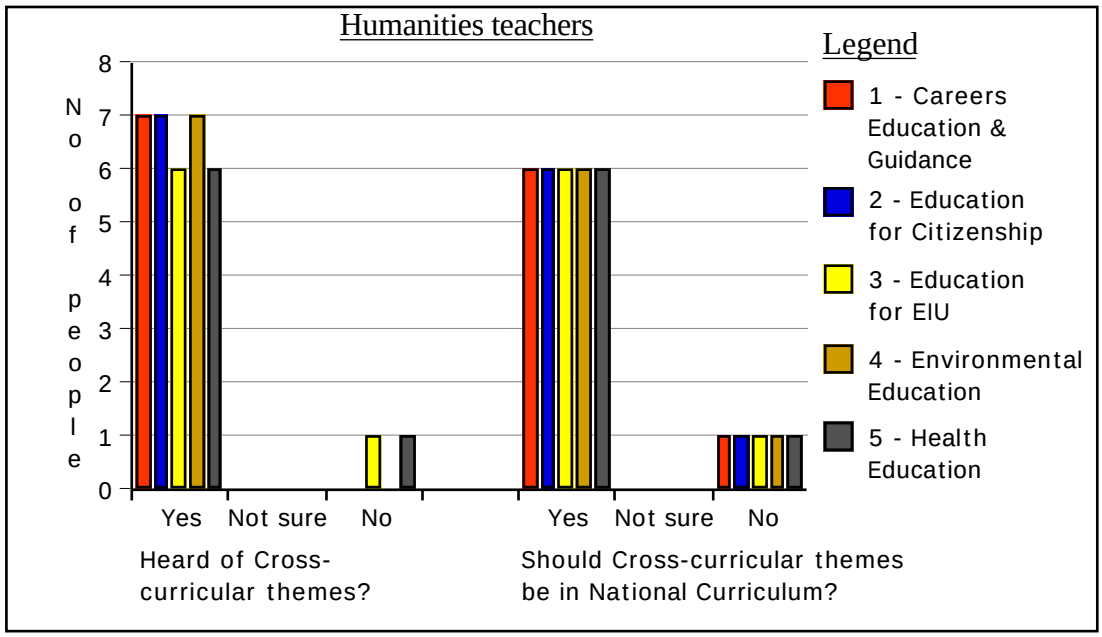


Fig. A8.13 - Responses by Humanities teachers to cross-curricular themes

There were only 7 in this group, and from Fig. A8.13, it may be seen that cross-curricular theme numbers 1, 2, and 4 were known to all 7 teachers. Themes 3 and 5 were each unknown on one occasion.

The presence of themes 1, 2, 4 and 5 in the National Curriculum received 6 'votes' in the affirmative; each of the 5 themes received one 'no'.

Responses by 'parents in technological jobs' to cross-curricular themes

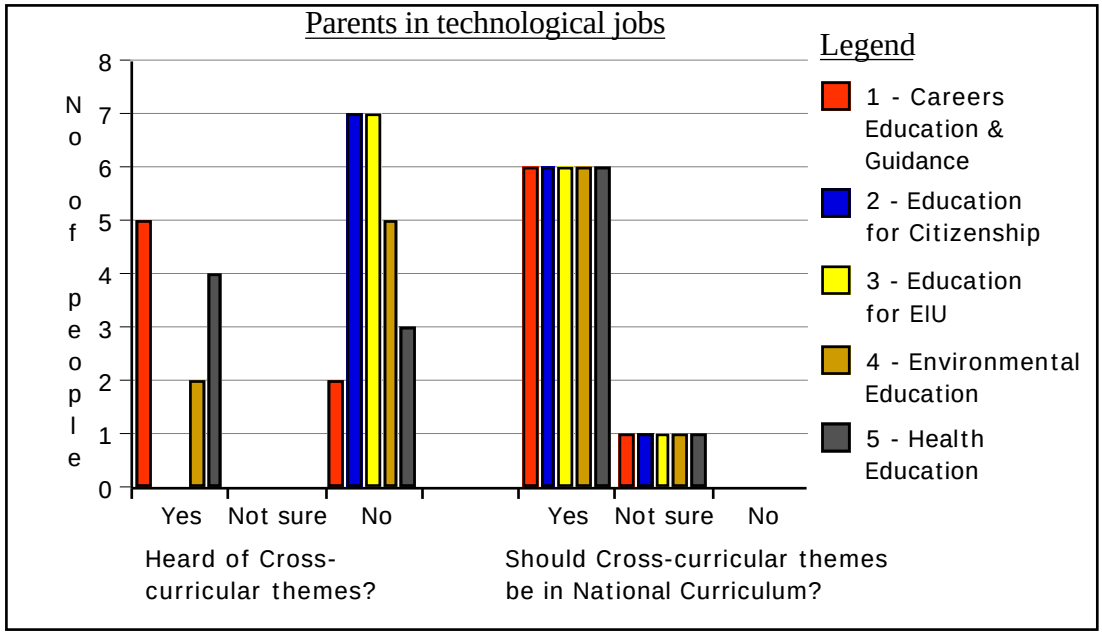


Fig. A8.14 - Responses by parents in technological jobs to cross-curricular themes

These 7 parents all had children in A-level classes. From Fig. A8.14, theme number 1 was known to 5 parents, but unknown to 2. Themes 2 and 3 were not known to any of the parents. Theme 4 was known by 2, but unknown to 5 parents. Theme 5 was known to 4 parents, but unknown to 3.

The inclusion of all 5 themes in the National Curriculum received 6 parental 'votes'; one parent was 'not sure' that any of the cross-curricular themes should be in the National Curriculum.

Responses by 'parents in non-technological jobs' to cross-curricular themes

This group of parents also had children in A-level classes. From Fig. A8.15 overleaf, 7 of the parents had heard of Careers Education & Guidance; 4 had heard of Education for Citizenship; 3 had heard of Education for Economic and Industrial Understanding; 4 had heard of Environmental Education, and 5 had heard of Health Education.

With regard to the presence of the themes in the National Curriculum, 7 parents thought that Careers Education & Guidance should be included; one was 'not sure'. 2 parents thought that Education for Citizenship should be included; 2 were 'not sure', while 4 said 'no'. 2 parents thought that Education for EIU should be included; 2 were 'not sure', and 4 said 'no'. Environmental Education and Health Education both received 4 'votes' for inclusion; both themes received one 'not sure' 'vote', and both themes received 3 'no' 'votes'.

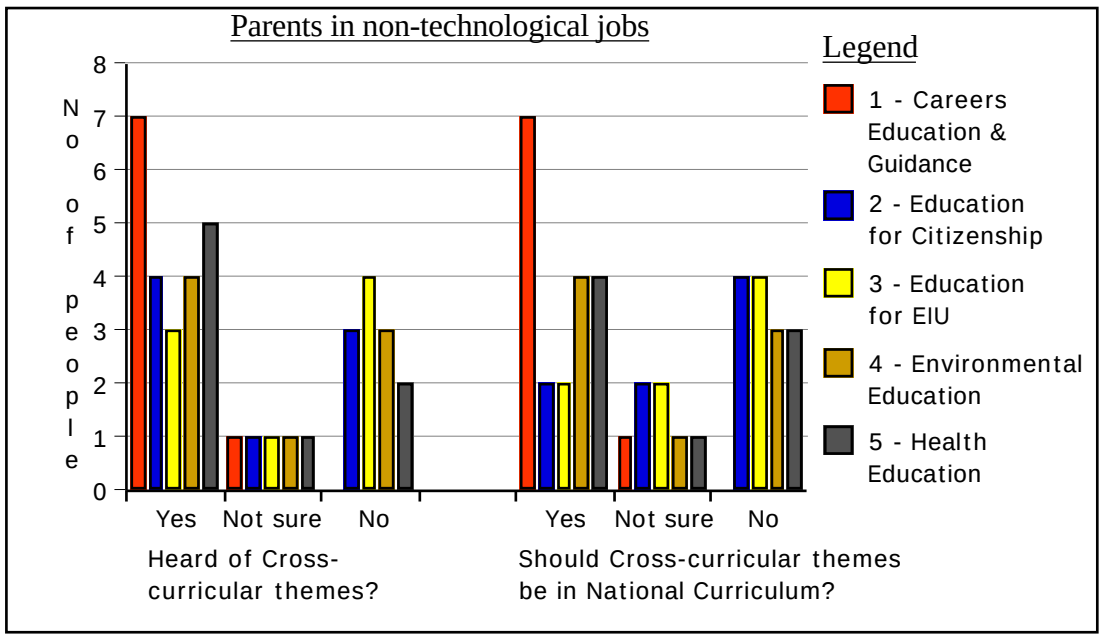


Fig. A8.15 - Responses by parents in non-technological jobs to cross-curricular themes

Responses by D&T student teachers to cross-curricular themes

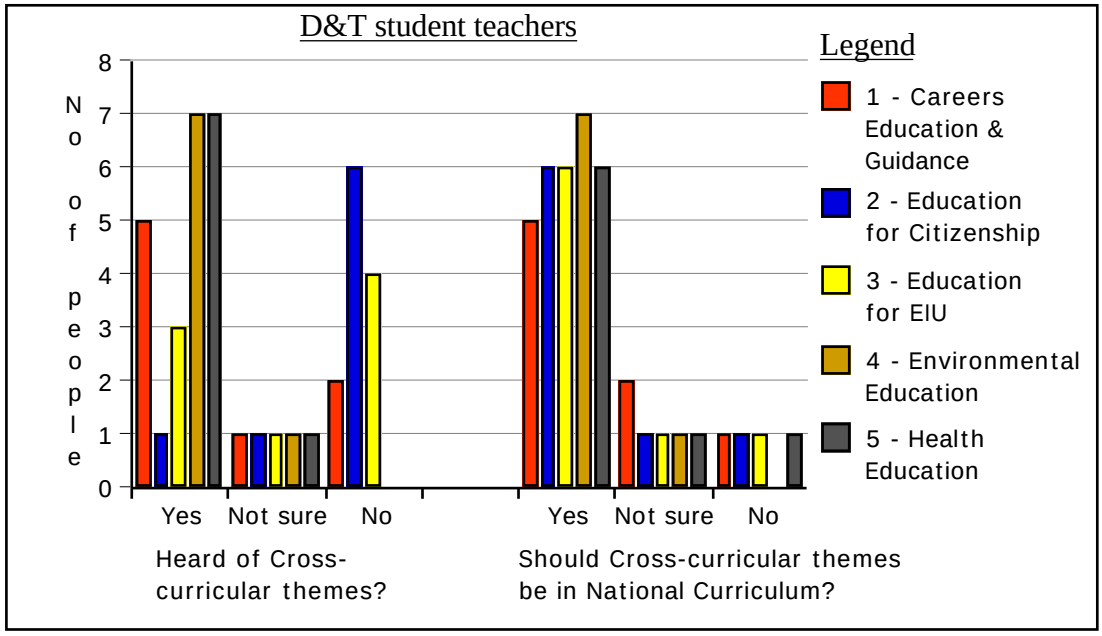


Fig. A8.16 - Responses by D&T student teachers to cross-curricular themes

From Fig. A8.16, 7 student teachers had heard of Careers Education & Guidance; one had heard of Education for Citizenship; 3 had heard of Education for EIU; 7 had heard of both Environmental Education, and Health Education.

With regard to the presence of the themes in the National Curriculum, 5 student teachers thought that Careers Education & Guidance should be included; 2 were 'not sure'. 6 student teachers thought that Education for Citizenship should be included; one was 'not sure', and one said 'no'. 6 students thought that Education for EIU should be included; one was 'not

sure', and one said 'no'. 7 student teachers thought that Environmental Education should be included, and one was not sure. Health Education was thought necessary by 6 student teachers; one was 'not sure', and one said 'no'.

Responses by 'humanities student teachers' to cross-curricular themes

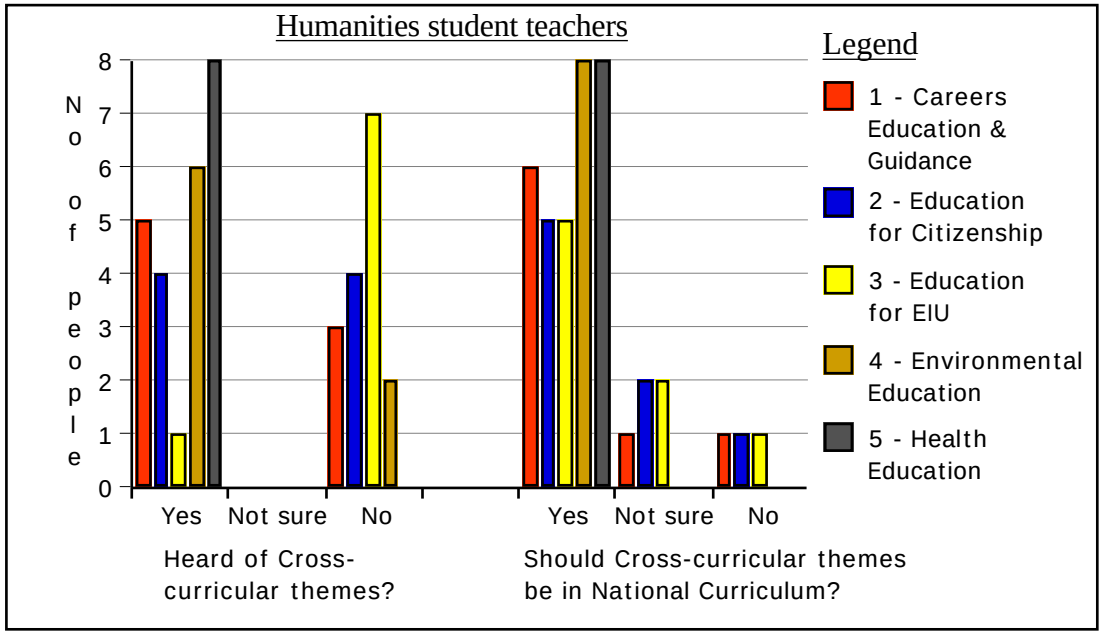


Fig. A8.17 - Responses by humanities student teachers to cross-curricular themes

Fig. A8.17 shows that 5 Humanities student teachers had heard of Careers Education & Guidance; 4 had heard of Education for Citizenship; one had heard of Education for EIU; 6 had heard of Environmental Education, and all 8 students had heard of Health Education. The corollary was that 3 students had not heard of theme 1, 4 had not heard of theme 2, 7 had not heard of theme 3, and 2 had not heard of theme 2.

6 Humanities student teachers thought that Careers Education & Guidance should be included in the National Curriculum; one was 'not sure', and one said 'no'. 5 student teachers thought that Education for Citizenship should be included; 2 were 'not sure', and one said 'no'. 5 students thought that Education for EIU should be included; 2 were 'not sure', and one said 'no'. All 8 humanities student teachers thought that both Environmental Education and Health Education should be included in the National Curriculum.

Responses by Technology A-level students to cross-curricular themes

Fig. A8.18 overleaf shows that 6 Technology A-level students had heard of Careers Education & Guidance; 2 had heard of Education for Citizenship; 2 had heard of Education for EIU; 5 had heard of Environmental Education, and 6 students had heard of Health Education.

Thus 2 Technology A-level students had not heard of theme 1; 5 had not heard of theme 2; 6

had not heard of theme 3; 3 had not heard of theme 4, and 2 had not heard of theme 5.

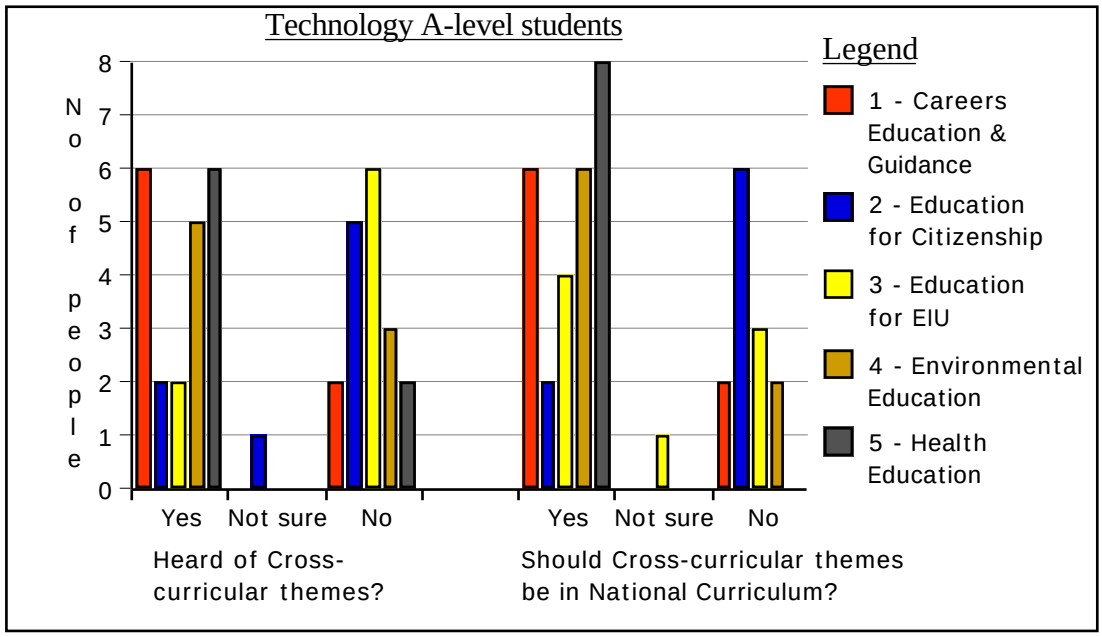


Fig. A8.18 - Responses by Technology A-level students to cross-curricular themes

Continuing the examination of Fig. A8.18, 6 Technology A-level students thought that Careers Education & Guidance should be included in the National Curriculum, and 2 said 'no'. 2 students thought that Education for Citizenship should be included, and 6 said 'no'. 4 students thought that Education for EIU should be included; one was 'not sure', and 3 said 'no'. 6 A-level students thought that Environmental Education should be included, and 2 thought 'no'. All 8 Technology A-level students thought that Health Education should be included in the National Curriculum. ***

Responses by Humanities A-level students to cross-curricular themes

Fig. A8.19 overleaf shows that all 8 Humanities A-level students had heard of Careers Education & Guidance; one had heard of Education for Citizenship; one had heard of Education for EIU; 6 had heard of Environmental Education, and 7 students had heard of Health Education.

One Humanities A-level student was not sure about theme 2, and one was not sure about theme 3. 6 Humanities A-level students had not heard of theme 2 nor theme 3. 2 students had not heard of theme 4, and one had not heard of theme 5.

7 Humanities A-level students thought that Careers Education & Guidance should be included in the National Curriculum, and one said 'no'. 4 students thought that Education for Citizenship should be included, one student was 'not sure' and 3 said 'no'. 5 students thought that Education for EIU should be included; one was 'not sure', and 2 said 'no'. 5 Humanities A-level students thought that Environmental Education should be included, one was 'not sure', and 2 thought 'no'. 7 Humanities A-level students thought that Health Education should be

included in the National Curriculum, but one was 'not sure'.

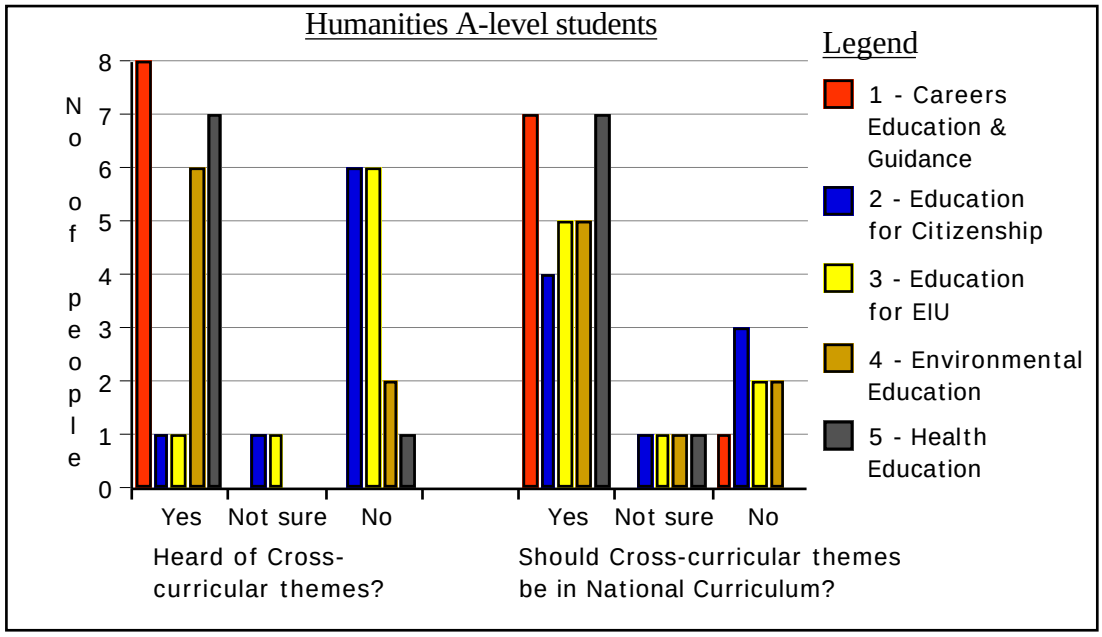


Fig. A8.19 - Responses by Humanities A-level students to cross-curricular themes

Fig. A8.20 overleaf provides a summary of responses for all 8 sub-groups, expressed as percentages to take account of the slight differences in group numbers. The purpose of this chart was to show the awareness of the 5 cross-curricular themes across all 8 groups; 35.7% was the lowest level and for Education for Economic and Industrial Understanding. The 2 highest were 80.8% and 80.4% for Careers Education and Guidance, and Health Education respectively. Thus it may be inferred that the awareness was essentially subjective, with little awareness of how we sustain ourselves as a society.

Sub-groups ↓	Responses ↓	Careers Education & Guidance %	Education for Citizenship %	Education for EIU %	Environ-mental Education %	Health Education %	Totals %
D&T teachers	Yes	87.5	87.5	75.0	87.5	87.5	85.0
	Not sure	0.0	0.0	0.0	0.0	0.0	0.0
	No	12.5	12.5	25.0	12.5	12.5	15.0
Humanities teachers	Yes	100.0	100.0	85.7	100.0	100.0	94.3
	Not sure	0.0	0.0	0.0	0.0	0.0	0.0
	No	0.0	0.0	14.3	0.0	14.3	5.7
Parents in technology jobs	Yes	71.4	0.0	0.0	28.6	57.1	31.4
	Not sure	0.0	0.0	0.0	0.0	0.0	0.0
	No	28.6	100.0	100.0	71.4	42.9	68.6
Parents in non-tech jobs	Yes	87.5	50.0	37.5	50.0	62.5	57.5
	Not sure	12.5	12.5	12.5	12.5	12.5	12.5
	No	0.0	37.5	50.0	37.5	25.0	30.0
D&T student teachers	Yes	62.5	12.5	37.5	87.5	87.5	57.5
	Not sure	12.5	12.5	12.5	12.5	12.5	12.5
	No	25.0	75.0	50.0	0.0	0.0	30.0
Humanities student teachers	Yes	62.5	50.0	12.5	75.0	100.0	60.0
	Not sure	0.0	0.0	0.0	0.0	0.0	0.0
	No	37.5	50.0	87.5	25.0	0.0	40.0
Technology A-level students	Yes	75.0	25.0	25.0	62.5	75.0	52.5
	Not sure	0.0	12.5	0.0	0.0	0.0	2.5
	No	25.0	62.5	75.0	37.5	25.0	45.0
Humanities A-level students	Yes	100.0	12.5	12.5	75.0	87.5	57.5
	Not sure	0.0	12.5	12.5	0.0	0.0	5.0
	No	0.0	75.0	75.0	25.0	12.5	37.5
Totals %	Yes	80.8	42.2	35.7	70.8	80.4	62.0
	Not sure	3.1	6.2	4.7	3.1	3.1	4.1
	No	16.1	51.6	59.6	26.1	16.5	34.0

Fig. A8.20 - Summary of responses by all eight groups to the question about awareness of cross-curricular themes

Sub-groups ↓	Responses ↓	Careers Education & Guidance %	Education for Citizenship %	Education for EIU %	Environ-mental Education %	Health Education %	Totals %
D&T teachers	Yes	87.5	87.5	75.0	87.5	87.5	85.0
	Not sure	12.5	12.5	12.5	12.5	12.5	12.5
	No	0.0	0.0	12.5	0.0	0.0	2.5
Humanities teachers	Yes	85.7	85.7	85.7	85.7	85.7	85.7
	Not sure	0.0	0.0	0.0	0.0	0.0	0.0
	No	14.3	14.3	14.3	14.3	14.3	14.3
Parents in technology jobs	Yes	85.7	85.7	85.7	85.7	85.7	85.7
	Not sure	14.3	14.3	14.3	14.3	14.3	14.3
	No	0.0	0.0	0.0	0.0	0.0	0.0
Parents in non-tech jobs	Yes	87.5	25.0	25.0	50.0	50.0	47.5
	Not sure	12.5	25.0	25.0	12.5	12.5	17.5
	No	0.0	50.0	50.0	37.5	37.5	35.0
D&T student teachers	Yes	62.5	75.0	75.0	87.5	75.0	75.0
	Not sure	25.0	12.5	12.5	12.5	12.5	15.0
	No	12.5	12.5	12.5	0.0	12.5	10.0
Humanities student teachers	Yes	75.0	62.5	62.5	100.0	100.0	80.0
	Not sure	12.5	25.0	25.0	0.0	0.0	12.5
	No	12.5	12.5	12.5	0.0	0.0	7.5
Technology A-level students	Yes	75.0	25.0	50.0	75.0	100.0	65.0
	Not sure	0.0	0.0	12.5	0.0	0.0	2.5
	No	25.0	75.0	37.5	25.0	0.0	32.5
Humanities A-level students	Yes	87.5	50.0	62.5	62.5	87.5	70.0
	Not sure	0.0	12.5	12.5	12.5	12.5	10.0
	No	12.5	37.5	25.0	25.0	0.0	20.0
Totals %	Yes	80.8	62.1	65.2	79.2	83.9	74.2
	Not sure	9.6	12.7	14.3	8.0	8.0	10.5
	No	9.6	25.2	20.5	12.7	8.0	15.2

Fig. A8.21 - Summary of responses by all 8 groups to the question; Should cross-curricular themes be in the National Curriculum?

A comparison of Figures A8.20 with A8.21 shows that the greatest movement was in the context of Education in Economic and Industrial Understanding, and from 35.7% to 65.2%.

Analysis of transcripts for question 4: *What do you think is meant by Economic and Industrial Understanding?*

The purpose of this question was to ascertain the extent to which the concept of 'earning our keep'—Graffy (1988:8) as a society was understood. As adults we know the importance of an income to set-up home—Owers (1999:5), but how effectively was that model transferred

to the national situation among these groups?

Society has four basic aims: 'survival', 'progress', 'caring and sharing', and the 'luxuries of life'—Graffy (1988:2). How well these aims are supported is dependent on the level of societal prosperity—Graffy (*ibid*). The perceived luxuries of one generation become the necessities of the next generation—Graffy (1988:5); the word 'luxuries' may be difficult, but the car provides a good example—see page 37.

So in the context of 'prosperity' for any society the creation of wealth, and its distribution is of paramount importance both at the regional and national level; Fig. A8.22 provides a good illustration.

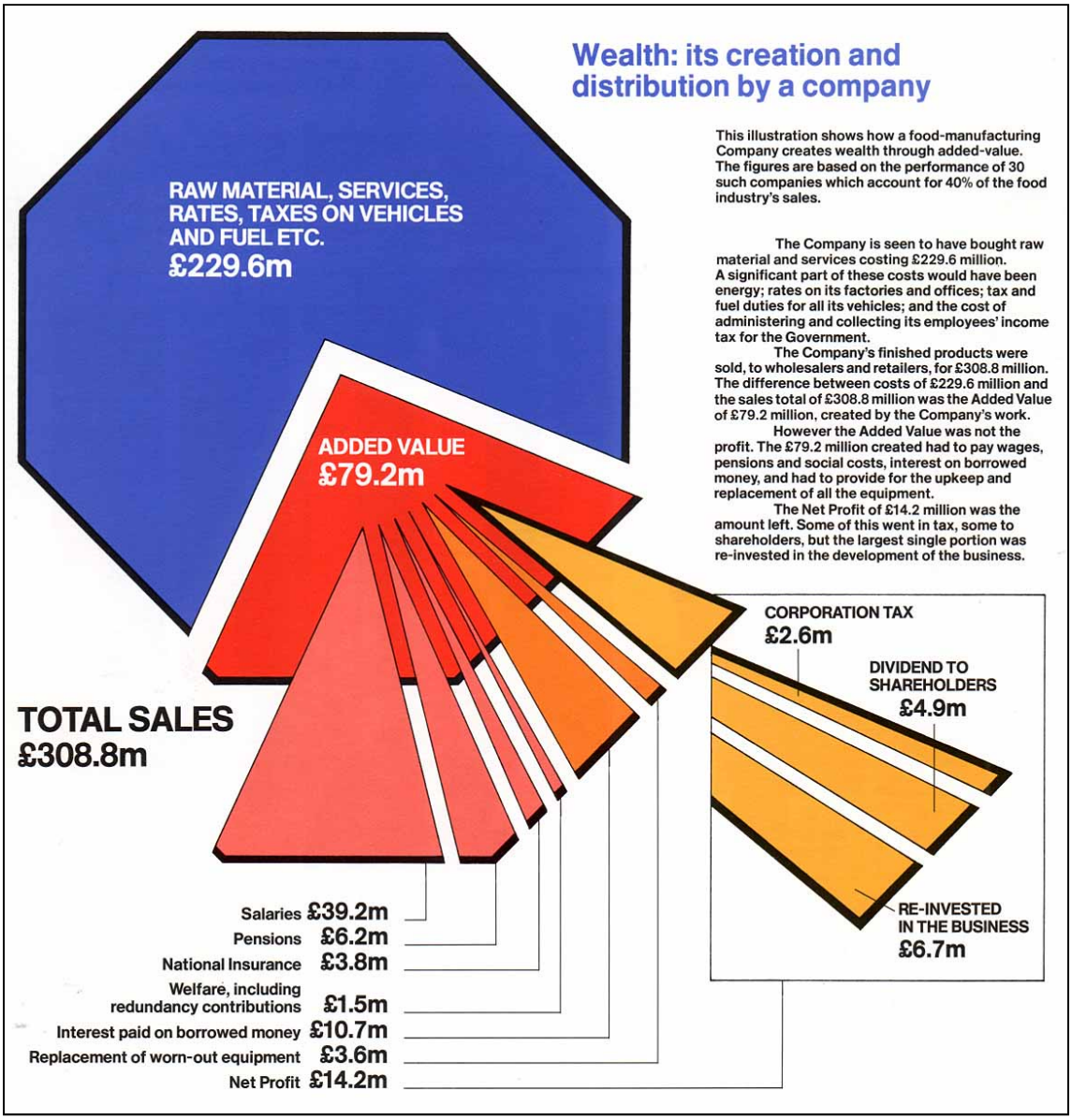


Fig. A8.22 - Example of wealth creation by a group of food-manufacturing companies see Graffy (1988:7)

Fig. A8.22 illustrates the socio-economic impact of a group of food manufacturers, showing the contribution made in so many ways through money flowing into the local community and the national economy, as well as the sources of employment. The corporation tax was also part of the Gross Domestic Product, and contributes to the general fund used by government to pay for all the services expected and demanded by society from the state.

So for the purposes of content analysis, the keywords for question 4 concentrated on themes to do with the perceived benefits of sustaining ourselves as a society, but the keywords were chosen to reflect how these 8 groups of people expressed themselves; there were differences. The keywords and their usage appear in Fig. A8.23.

Q4 analysis	T D&T teach-ers	H Human-ities teach-ers	T Par-ents in tech jobs	H Par-ents in non tech jobs	T Tech-nology student teach-ers	H Human-ities student teach-ers	T Tech-nology A-level stud-ents	H Human-ities A-level stud-ents	Key-word usage count
Keywords									
create		create							0
creates									0
creating									0
creation									0
earn	1								1
earning			1						1
earns									0
export			1						1
exporting									0
exports									0
home									0
import									0
imports									0
income	1								1
keep									0
life			1		1				2
lives		1							1
living	1			living					1
pay	2								2
pays									0
prosperity									0
services	1								1
society	1	society					1	3	5
survive							survive		0
survival									0
sustain									0
sustains									0
trade		1							1
wealth	1		1						2
wellbeing	1								1
									20
Totals	9	2	4	0	1	0	1	3	20

Fig. A8.23 - The use of keywords associated with the perceived benefits of sustaining ourselves as a society

Many of the responses to question 4 indicated some understanding, but fell short of the crucial role of industry as a source of wealth-creation integral within a local community. From Fig. A8.23, it may be seen that the overall grasp of the importance of sustaining ourselves as a society was poor, with only 20 uses of 31 keywords. Keywords shown in the table in place of numbers, illustrate examples where the word was not used in a context that indicated clear understanding of the concept of wealth-creation such as:

> 'The industrial understanding would be about how the technology perhaps is used to manufacture and create the goods in that economy.'

The next two examples, although expressed differently, demonstrate clearer understanding:

> 'I think it is an understanding of how countries actually earn their living, how they generate sufficient income to pay the wages of all the people in the service and other sectors. Its knowing how products are designed and made, and valued added, and how its accrued, how you actually take a raw material and actually in a social context generate value added to pay for all the other services that society needs.'

> 'Let's take them in turn. Industrial understanding - one thinks of manufacturing products for export. Economic in that you don't manufacture products merely for sale, its all for the purposes of economy, earning profit not only to maintain the wages we all work for, but to provide jobs within a town or a city, but also the profits which bring wealth into the country'.

The role of industry in society was clearly understood in the two examples above, but was missing in the following:

> 'Economic will obviously be living, day-to-day living, and industrial understanding is basically the work environment.'

Fig. A8.23 indicates that the D&T teachers had the best grasp of the role of industry in society, with a score of 9. In ranking order, parents in technological jobs were second with a score of 4.

Analysis of transcripts for question 5: *Here is a list of national curriculum subjects. Do you think EIU has relevance in any of these subjects, and if so which ones?*

The list contained eight subjects, as shown in the 1988 Education Reform Act, and is reproduced as follows:

1.	Art	Foundation subject
2.	Design & Technology	Foundation subject
3.	English	Core subject
4.	Geography	Foundation subject
5.	History	Foundation subject
6.	Maths	Core subject
7.	Modern foreign languages	Foundation subject
8.	Science	Core subject

The responses to this question were also recorded; the transcripts appear in Appendix 9, but the analysis is shown here. The perceived relevance of Education for Economic and Industrial Understanding within each of these eight curriculum subjects is captured as a bar-chart in Fig. A8.24 below. The chart shows the perceptions of Technology and Humanities teachers, and they make interesting comparison.

The perceptions of teachers:

Although there were only 7 Humanities teachers, they made a total of 49 curriculum subject selections as having relevance to Economic and Industrial Understanding. In contrast, the 8 Technology teachers made a total of 44 curriculum subject selections.

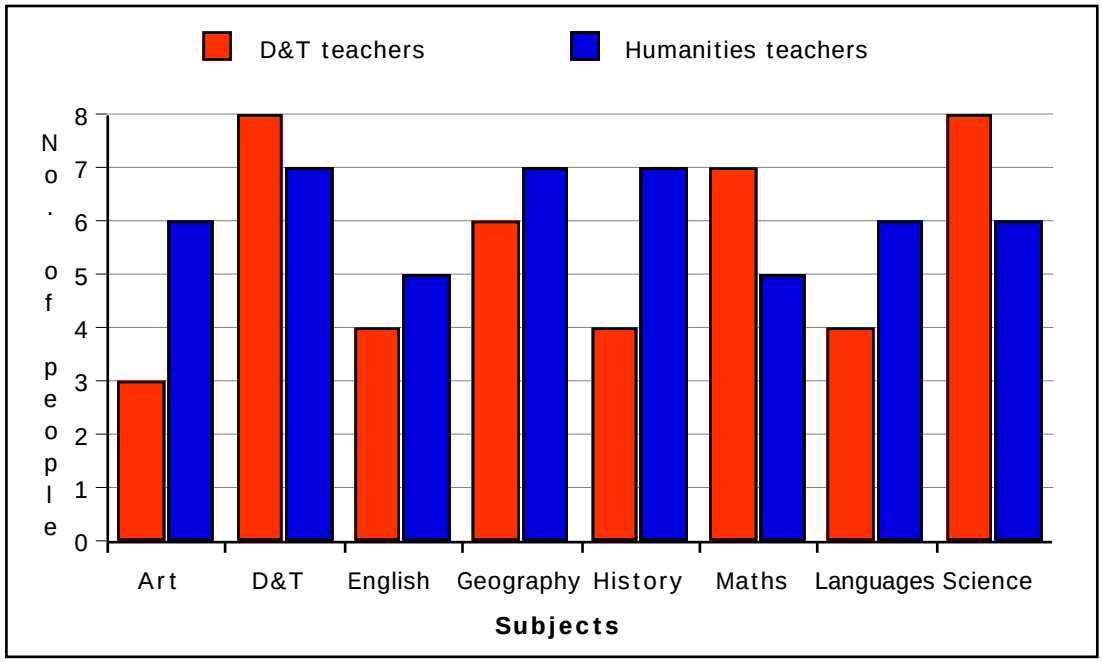


Fig. A8.24 - The perceived relevance of Economic and Industrial Understanding in the various curriculum subjects - a comparison between teachers

By inspection of Fig. A8.24, it may be seen that the Technology teachers perceived more relevance in D&T, Maths and Science than the Humanities teachers, but the Humanities teachers perceived more relevance in all the other five subjects in the context of Industrial and Economic Understanding. Both outcomes are causes for concern.

Given that technology has always been completely cross-curricular, there are further causes for concern. The first of these concerns relates to 'Art' in which D&T teachers scored 3 and Humanities teachers scored 6. The influence of Art on product design has been significant for many decades, and manufacturers commit significant resources to product appearance.

Since good communication is a fundamental requirement in all walks of life, the poor showing for 'English' is another cause for concern; D&T teachers scored 4 while Humanities teachers scored 5. D&T teachers also scored 4 for modern foreign languages or 50%, and Humanities teachers scored 6 or 85%.

The perceptions of parents:

Fig. A8.25 shows a comparison between parents in technological jobs, and parents who were not in technological jobs; the results present a number of causes for concern.

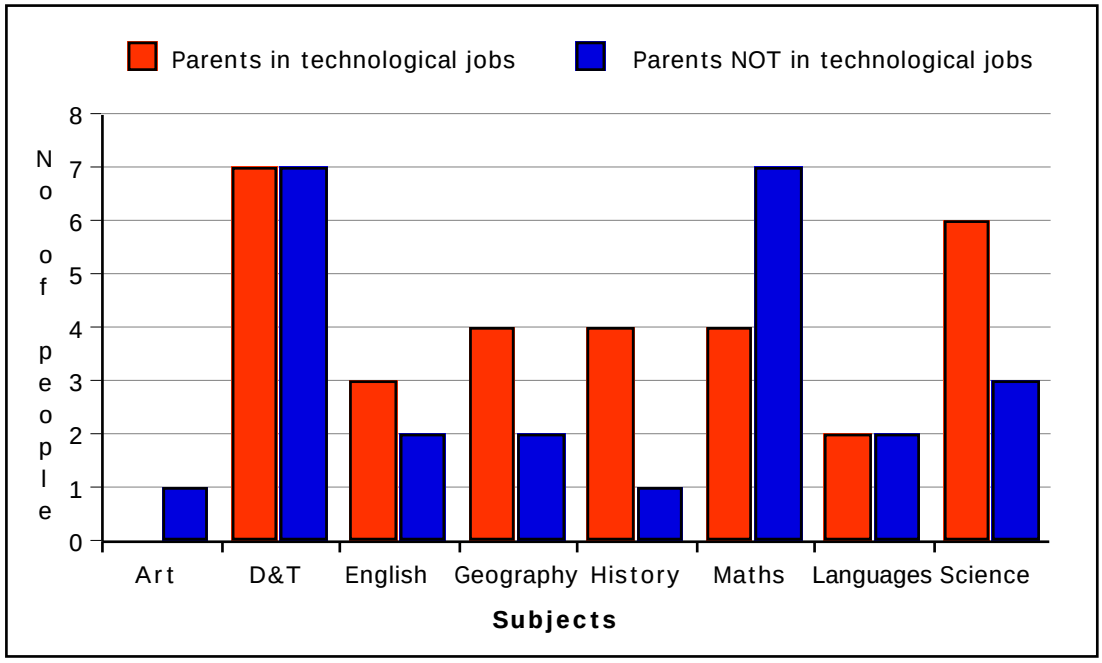


Fig. A8.25 - The perceived relevance of Economic and Industrial Understanding in the various curriculum subjects - a comparison between parents

Before commenting on Fig. A8.25, it should be recalled that there were only 7 recordings for parents in technological jobs, nevertheless there were some significant results. None of the parents in technological jobs perceived any relevance for EIU in Art, so once again there was no connection with product styling which is particularly important in the motor and domestic appliance industries.

Parents in technological jobs attributed more relevance in Geography and History than parents in non-technological jobs. The outcome for Maths was disappointing; parents in non-technological jobs scored 7, and attributed more relevance to Education for Economic

and Industrial Understanding than parents in technological jobs who scored 4.

The perceptions of student teachers:

Continuing the analysis of whether EIU has relevance in any of the curriculum subjects, Fig. A8.26 provides a comparison between D&T student teachers, and Humanities student teachers. By inspection, it may be seen that with the exception of Geography and History, the D&T student teachers attributed greater relevance to EIU in curriculum subjects than the Humanities student teachers.

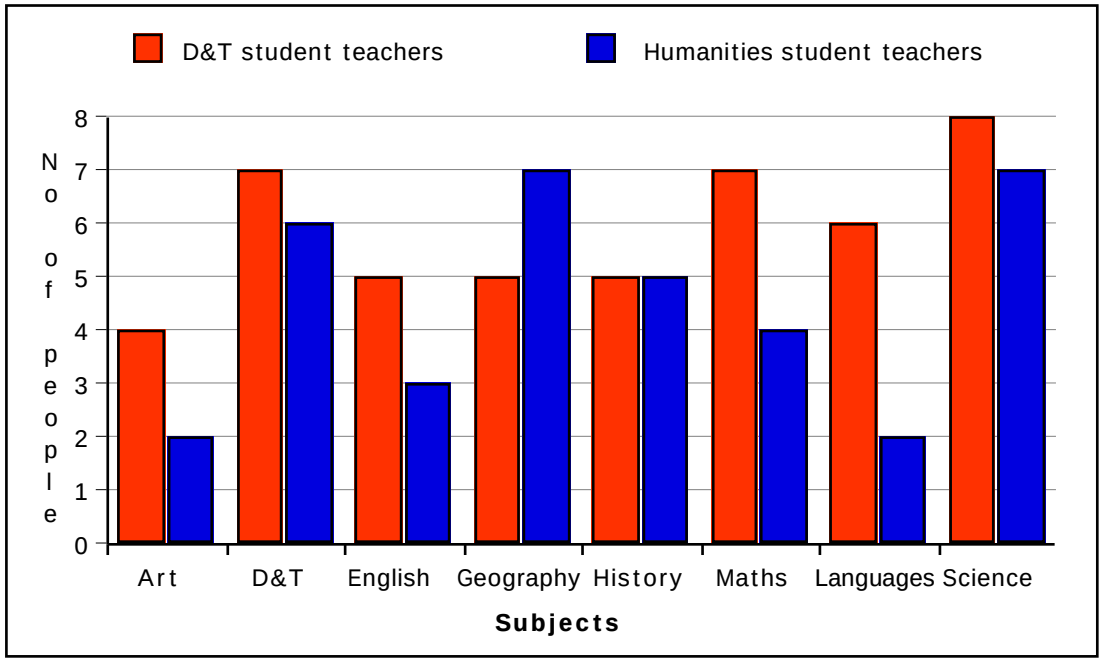


Fig. A8.26 - The perceived relevance of Economic and Industrial Understanding in the various curriculum subjects - a comparison between student teachers

With regard to 'Art' in Fig. A8.26, D&T student teachers scored 4, while Humanities student teachers scored 2, and as an outcome, was the antithesis of previous results. The D&T student teachers also rated communication more highly as shown by the results for English and Modern Foreign Languages; the scores were 5 and 3, and 6 and 2 respectively.

The perceptions of A-level students:

Fig. A8.27 overleaf records the collective perceptions of Technology A-level students, and Humanities A-level students.

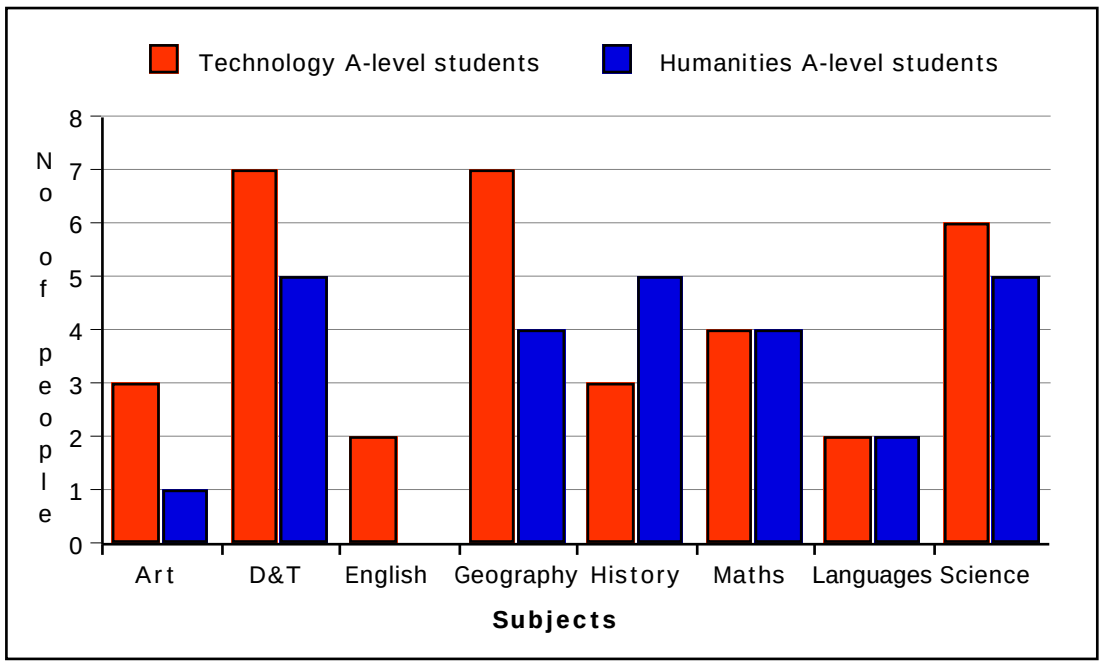


Fig. A8.27 - The perceived relevance of Economic and Industrial Understanding in the various curriculum subjects - a comparison between A-level students

From Fig. A8.27, it may be seen that Technology A-level students attributed more relevance than Humanities A-level students in Art, D&T, English, Geography, and Science, but overall the results were disappointing.

The perceived relevance of EIU for all groups by curriculum subject:

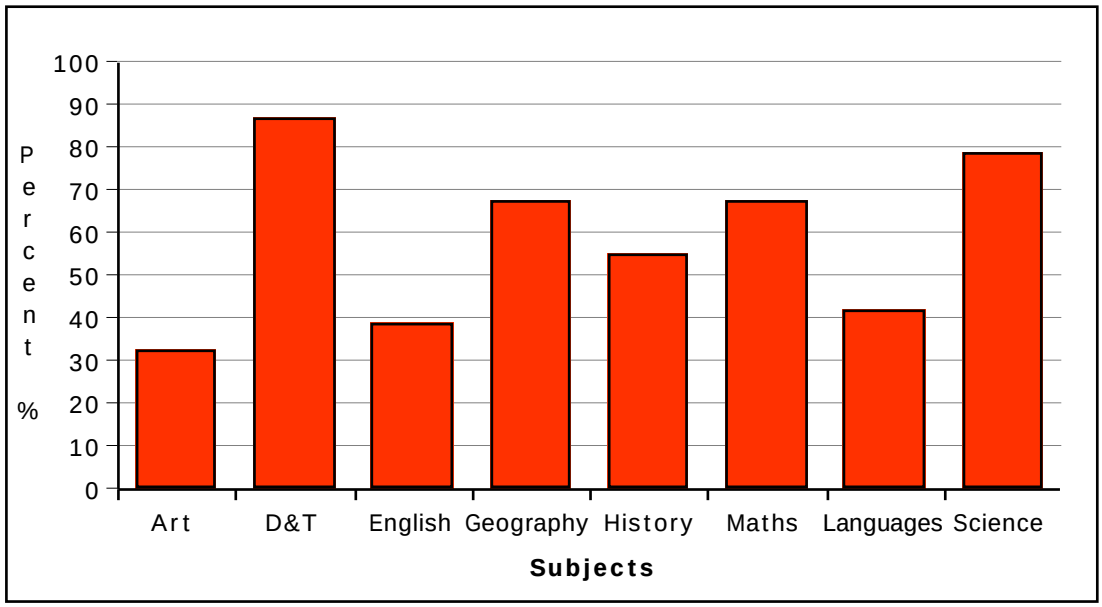


Fig. A8.28 - The aggregate perceived relevance of Economic and Industrial Understanding for all groups by subject

Fig. A8.28 captures the aggregate perceived relevance of Education for Economic and Industrial Understanding for all groups by subject. D&T had the highest score at 87%, and

this is to be expected. In ranking order, the remaining results were as follows: Science 79%, Geography and Maths 68%, History 55%, Modern Foreign Languages 42%, English 39%, and Art 32%.

In reality, all the results for all subjects should have been 100%.

The aggregate perceived relevance of EIU in curriculum subjects by groups:

Fig. A8.29 captures the overall perception by each group for all subjects, and since the 'Humanities teachers', and 'Parents in technology jobs' groups were only seven instead of eight people, the results were converted to percentages for easier comparison.

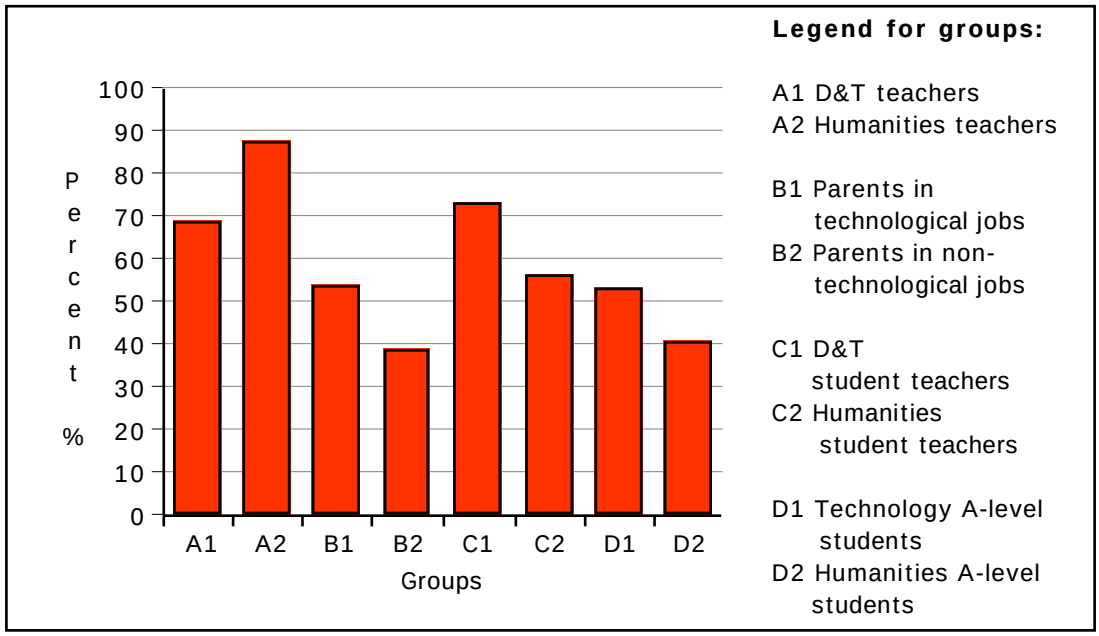


Fig. A8.29 - The aggregate perceived relevance of Economic and Industrial Understanding in curriculum subjects by groups

From Fig. A8.29, it may be seen that Humanities teachers (A2) perceived the greatest collective relevance for EIU in the eight curriculum subjects at 88%. D&T student teachers (C1) achieved 73%, D&T teachers (A1) 69%, Humanities student teachers (C2) 56%, Parents in technological jobs (B1) 53%, Humanities A-level students (D2) 41%, and Parents in non-technological jobs (D2) 39%.

Many of these results present significant causes for concern.

Question 6: *Can you see much evidence of technology around you?*

Responses to this question were analysed on a thematic basis, and summarised in Fig. A8.30 below.

Theme Ref No	T D&T teach-ers	H Human-ities teach-ers	T Par-ents in tech jobs	H Par-ents in non tech jobs	T Tech-nology student teach-ers	H Human-ities student teach-ers	T Tech-nology A-level stud-ents	H Human-ities A-level stud-ents	Theme totals
1	19	10	11	6	13	11	9	6	85
2	14	21	10	11	12	9	9	15	101
3	2	6	1	5	0	5	5	7	31
4	1	1	1	0	0	1	0	0	4
5	1	0	0	0	0	0	0	0	1
6	1	4	0	3	0	0	0	0	8
7	31	21	20	12	14	11	13	15	137
8	1	0	0	0	0	0	0	0	1
9	0	1	0	2	0	0	0	0	3
10	2	7	1	2	1	1	1	0	15
11	1	0	0	0	0	0	0	0	1
12	0	0	1	0	2	0	0	0	3
	73	71	45	41	42	38	37	43	390
People	8	7	7	8	8	8	8	8	62
Words	488	529	264	224	242	187	215	250	2399

Analytical themes:

1. Technology is everywhere
2. Technology as tools, artefacts, products, or systems to use
3. Progress or change through technology
4. People make technology
5. Pollution because of technology
6. Difficulty visualising technology
7. Could visualise technology
8. Technology governs people
9. Technology in consumer goods or to do with shopping
10. Dependence on technology
11. Hidden benefit(s) of technology
12. Issues to do with defining technology

Fig. A8.30 - Analysis of responses to question 6: 'Can you see much evidence of technology around you?'

The themes used for the purpose of this analysis appear at the bottom of Fig. A8.30; they were devised by close examination of all the responses. The idea that 'technology is everywhere' (theme 1) was well understood, since there were some 85 references. Theme 2 represented the concept of 'technology as tools, artefacts, products or systems to use', and there were 101 appropriate references, indicating a high level of awareness.

'Progress or change through technology' (theme 3) was referred to 31 times. Theme 4, the concept of 'people making technology' only appeared 4 times; so technology as a by-product of human activity was not easily identified.

For question 6, there was only a single reference to 'pollution because of technology' (theme 5). The issue of pollution will be seen to be more of a concern in response to question 8.

Theme 6, 'Difficulty visualising technology' was expressed on 8 occasions. Theme 7 'Could visualise technology' had the greatest showing across all groups with a total of 137.

'Dependence on technology', theme 10, was identified 15 times.

Question 7: *Do you think there are ways in which you personally have benefited from technology?*

Fig. A8.31 summarises the responses to question 7.

Response type	D&T teachers	Humanities teachers	Parents in tech jobs	Parents in non tech jobs	Technology student teachers	Humanities student teachers	Technology A-level students	Humanities A-level students	Response type totals
1	30	13	17	15	32	18	13	19	157
2	22	5	15	13	27	14	10	17	123
3	0	1	0	1	0	0	0	1	3
4	5	4	3	3	0	1	0	0	16
5	0	1	0	0	0	0	0	0	1
	57	24	35	32	59	33	23	37	300
People	8	7	7	8	8	8	8	8	62
Words	655	290	238	223	593	251	305	316	2871

Legend for types of answers:

1 Affirmative
2 Affirmative examples (Technology as tools, artefacts, products, or systems to use; dependence on technology; advance or change through technology)
3 Negative
4 Concerns, downsides, including the environment
5 Fear of technology

Fig. A8.31 - Analysis of responses to question 7: 'Do you think there are ways in which you personally have benefited from technology?'

For the analysis of responses to question 7, only five categories were required, offering a simpler approach as shown in Fig. A8.31. In their responses, the D&T teachers and D&T student teachers commented most freely with 655 and 593 words respectively; the aggregate for all eight groups was 2,871 words.

The D&T teachers and D&T student teachers also visualised greater personal benefit from technology than any other group with 30 and 32 instances respectively; these groups also offered the highest number of examples at 22 and 27. In reality, all groups have benefited significantly from technology, but this is not perceived.

There were three negative replies; one of the Humanities teachers responded 'Yes and no' to question 7. They were concerned about costs, and pollution and considered technology was 'a mixed blessing'. One of the parents in a non-technical job, and one of the A-level Humanities students replied 'No', both without any equivocation. All these people have benefited from technology, but the triangle of 'costs', 'benefits' and 'environmental impact' has to be addressed, and understood.

Question 8: *Do you think our society has benefited from technology?*

Fig. A8.32 summarises the responses to question 8.

Response type	T D&T teachers	H Humanities teachers	T Parents in tech jobs	H Parents in non tech jobs	T Technology student teachers	H Humanities student teachers	T Technology A-level students	H Humanities A-level students	Response type totals
1	22	14	11	9	17	11	13	12	109
2	10	4	2	5	10	4	16	7	58
3	0	1	4	3	1	2	0	2	13
4	16	11	13	6	7	10	2	10	75
5	4	5	2	0	1	0	0	0	12
	52	35	32	23	36	27	31	31	267
People	8	7	7	8	8	8	8	8	62
Words	501	363	497	208	425	270	298	393	2955

Legend for types of answers:

1 Affirmative

2 Affirmative examples (Technology as tools, artefacts, products, or systems to use; dependence on technology; perceived advance or change through technology)

3 Negative

4 Concerns, downsides, including environmental

5 Moral or ethical issues to do with technology.

Fig. A8.32 - Analysis of responses to question 8: 'Do you think our society has benefited from technology?'

From Fig. A8.32, it may be seen that the responses to question 8 from all groups amounted to some 2955 words; the highest sub-totals were for D&T teachers and 'parents in technological jobs' with 501 and 497 words respectively. The lowest sub-total was 208 words for parents in non-technology jobs.

Across all sub-groups, there were some 109 responses supporting the idea that our society had benefited from technology, and some 58 examples were given.

These sub-groups also produced some 13 negative or 'No' responses. The negative responses were supported by some 75 expressions of concern about technology—see Fig. A8.32. Grouping the concerns, they included:

- computers and technology adding to unemployment,
- compulsion to use computers,
- difficulties for people not versed in computer technology,
- pollution and the environment,
- misuse of drugs, television and videos,
- technology and educational issues,
- obsession with computers,
- decline in social relationships,

- causes laziness,
- too dependent on technology
- technological benefits taken for granted,
- the consequences of power failures [on computers],
- people prefer to sit in front of a computer than read a book,
- computers reduce the incentive to learn to write.

Referring again to Fig. A8.32, it may be seen that 'moral or ethical issues' were also a cause for concern, particularly among the more established sub-groups. 11 such concerns were raised by the D&T teachers, Humanities teachers, and parents in technological jobs; there was a single reference by a D&T student teacher, so making the total of 12. The concerns were expressed as follows:

- misuse of technology, for example in war, drugs, and videos,
- profiteering 'people who sell airwaves for money',
- 'technology being made to help to produce profit',
- 'Bill Gates worth more than Iraq',
- 'I don't think society is any happier',
- 'pollution or our misuse of technology which is often driven by money and profit',
- concerns about biology.

Question 9: *Do you think our society is dependent on technology? Where on a scale of 1 to 9 would you place any dependency?*

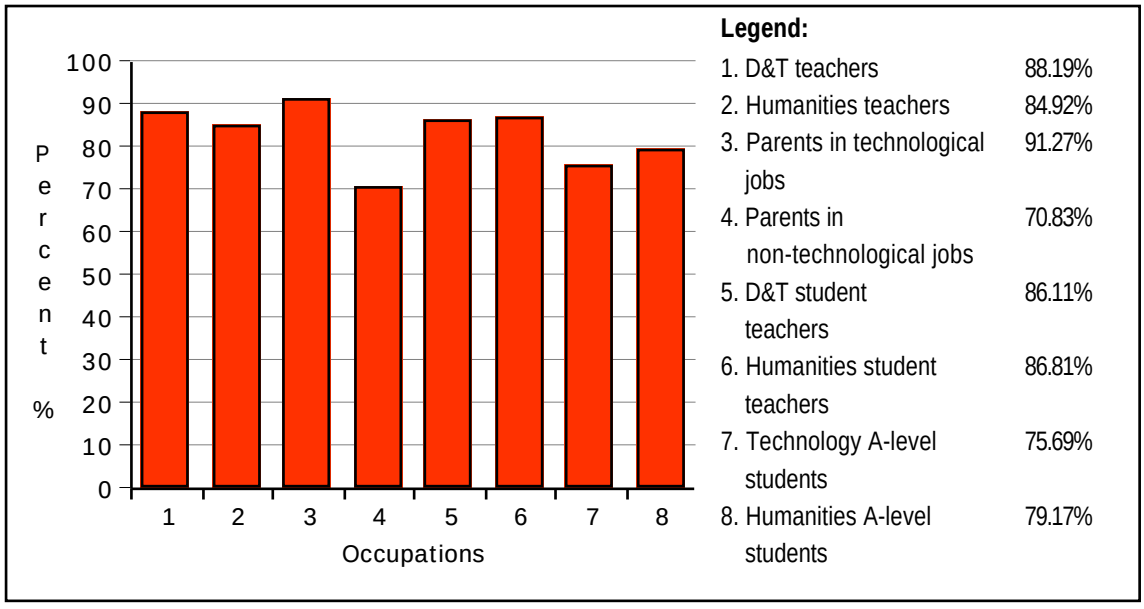


Fig. A8.33 - Analysis of responses to question 8: 'Do you think our society is dependent on technology?'

Fig. A8.33 shows the level of societal dependency on technology as perceived by the eight sub-groups in response to question 9. The results have been expressed as a percentage to reflect the differences in sub-group numbers. The highest level of dependency on technology was perceived by parents in technological jobs at 91%, and the lowest by parents in non-technological jobs at nearly 71%. Nevertheless, 71% indicated a high level of comprehension of the importance of technology in our lives.

Appendix 9 - Transcriptions of the 62 recorded interviews

The method of content analysis used in this research was discussed in Appendix 8. The individual recorded responses to the data-gathering questions are presented here by groups, starting with:

Question 2: *Can you describe briefly what is meant by technology?*

1/2. Transcribed responses to question 2 for D&T teachers

1. I would say that it is skills, knowledge and understanding that are used in some way to improve or design new artefacts, systems or environments.

2. Well, I see technology as the means by which we progress in everyday life really, and it affects everybody, it affects all subjects in school. It affects us whether we like it or not, and that's really what I feel technology is all about.

3. The primary thing is actually to do with designing and making and meeting human needs. That's a huge area, and it can be drawn from almost anything. So it is not just simply engineering, or the appliance of science, but all the social and other consequences of meeting human needs. That's a very broad definition.

4. Application of science, that is how I see it. We take the realities of life, or we take the realities of their ideas, and we make them meaningful.

5. It's about understanding the materials around us and how they can be used to make things that improve our quality of life. Also how things function and work. How technology is used in industry.

6. Practically using appropriate materials and techniques to solve life's problems.

7. Technology is the application of scientific principles to solve practical problems; produce practical solutions to problems. Personally I see it as an ability to be able to react to the world, your built environment in the world around you, by being able to deal with problems by designing and making practical outcomes. The practical outcomes are the most important aspects of the subject.

8. I always say it is by which things are made, how materials are made up and how items are actually produced, and the type of devices and mechanisms we use to produce an item. So we have to have knowledge about materials and mechanisms that we use to create an object or something to happen. So it's a process of making products to do a job, processes and systems to allow a job to be done. And to enable anything to happen like build a rocket, go to the moon, or down to creating a washing machine or a clock. To me technology is about the understanding of the materials and mechanisms available to us

and applying them to an activity whether it be pleasurable or producing something . . .; it's endless.

2/2. Transcribed responses to question 2 for Humanities teachers

1. I suppose it's now an umbrella term for all the food science, what would have been woodwork and metalwork, all those subjects involving anything as well with IT.

2. Technology in it's broadest sense is any means by which human beings use their environment, and the resources in their environment to make life easier or more advanced I suppose, more comfortable. It can be anything of that type, stones, bricks, branches whatever.

3. I think for me in the simplest terms technology is a tool, and it's any tool that is of man-made design or man-made use that actually helps humans go about their business whether it's leisure, work or whatever.

4. Combination of Design, IT and state-of-the-art work.

5. Briefly, probably not. Technology seems to be many things to many people. It seems to have been subdivided into IT and hard materials woodwork and metalwork kind of technology, and then there's also the food technology, textiles technology, the old Home Economics type thing. And I think in theory they share a kind of definition about process about identifying a need, designing things that meet that need and evaluating the design.

6. Using machinery, artefacts to solve problems. I've heard it said that technology is about problem-solving, but I would suggest that technology involves using machinery, artefacts, materials to solve those problems.

7. Using technological advancements to make learning easier. I don't really know. Computers. It's a practical thing, I would have said.

3/2. Transcribed responses to question 2 for parents in technology jobs

1. The way I think of it is being involved in innovative things, designing things, creating.

2. No I think is probably the quickest answer. I was trying to think what do I understand by technology—I am not sure I understand anything. It is one of those wonderful words that is fairly meaningless in it's usage. it's sort of obliterated by over-use. I mean I am an engineer. And engineering is the practical use of science, that is probably the easiest way of describing it. Technology is usually used as a general term to cover all those things which you need in order to carry out that function, which could range from designing the desk sitting here, or the chair, as a piece of technology, to computers, to the space shuttle, anything; it is just too broad a term to have any real relevant meaning.

3. The development of techniques using materials.

4. The appliance of Science in whatever chosen field.

5. Technology has many branches. In my particular technology it happens to be Radar, electronic engineering and computers which in it'self has a whole spectrum of sub technologies of microwave engineering, digital engineering, and fibreoptics. There is a wide spectrum especially in this particular industry which is Radar engineering. However we have technology in textiles, you have technology in chemistry, we have technology in the whole field of industry. In industry you are intended to make money, and the whole purpose of innovation is to make profit for the country one way or another. And we use technology. So technology to me means the application of Physics in mechanical principles to produce a saleable product.

6. That is a good question because it has many meanings. But technology to me is the end result of research and development for something to sell. But also technology is the use of whatever you have built for many many areas of work such as medical or defence. It is a word that paints such a broad picture - entertainment, medical research.

7. I regard technology as a modern means of doing things. To me it usually means electronics. That may not be the truth.

4/2. Transcribed responses to question 2 for parents in non-technology jobs

1. Well, the way we use computers, and machinery in our everyday lives.

2. Well, technology to me is the 90s, is the technology for advancement of everything, children in school, computers, learning.

3. I think it's all about the computer systems, screens (computer) and all that type of thing nowadays.

4. I would say resources that can forward information to you, and to make life easier basically. Well, obviously computers which seems to be the be-all and end-all the way things are going nowadays. That's the main thing.

5. Is it all to do with electrical things is it? My boy did Craft, Design and Technology at the Secondary school. That was like making models, and you had to do a plan of what you were going to make, and then you had to make it. And he did that for GCSE.

6. Oh dear! I always associate technology with computer systems basically. And when anyone mentions technology that's what I instantly think about, computers.

7. Something that's more advanced than what you're used to. Computers that take you further into detail of things.

8. I don't really know.

5/2. Transcribed responses to question 2 for D&T student teachers

1. Basically it's everything. Here it's Design and Technology through to Information Technology. But technology I see as everything that works basically. Any type of technology, washing machines, but I mean that's anything.

2. I classify technology by two areas. One which is I suppose direct use of computers, sort of an IT unit whatever. The other being what I call indirect use, washing machines or something along those lines. And I suppose things that perhaps you make as well. sort of carpentry type things, objects - the thing we are doing now which is a jack-in-the-box which is mottorised. That's how I sort of think of technology in my mind anyway.

3. I have to think about this. Just using our knowledge and things to help us in everyday life. To make life easier.

4. Well technology to me is Design and Technology or IT. It's something where you would use tools, be it screwdrivers, saws, where you work with materials, or computers and software.

5. Oh! I would say it was advancement for mankind, it's developing ideas and actually developing those ideas into things that you can use just to make life easier in a lot of ways.

6. It's everything around us. Technological developments influence everything. . . . Don't know, it's quite a hard question.

7. It is the idea of problem-solving with children and getting them to use practical skills, for example sawing or the computer in Design and Technology.

8. I think technology is in two sections. You have got the Design technology side and the Information technology side. Basically it's moving forward into the future. Technology as a whole is thinking ahead and planning.

6/2. Transcribed responses to question 2 for Humanities student teachers

1. Technology in schools basically takes two forms. Working on computers, IT, and actually making things, an extension of Art activities very often. And that's my understanding of it. Things that go to make my life easier basically, or usually.

2. I'm not sure whether I can describe it. I can give you examples television. I suppose things like amusement rides [entertainment], computers things like that. I don't know how to describe it really.

3. I suppose it's anything that makes something work. It's kind of mechanisms and . .. That's about as much as I can say I think.

4. IT, learning about computers, and then Technology and Design Technology. Designing things to work for the industry really.

5. Design; understanding how things work. Also included in that would be computers, Graphics, Design through computers. Understanding the way things work.

6. I would just describe it as making things. That's how I see it.

7. The using of computers and tools. I don't know.

8. Well, it seems to me sort of things for the future, linked with Science, computers definitely, things that make things easier for humans I suppose.

7/2. Transcribed responses to question 2 for Technology A-level students

1. I suppose technology is really objects that help peoples lives or that could be considered sometimes as futuristic objects or advanced technology, things that people are designing for the future, devices I suppose.

2. Well, I think it's the advances in using different materials to achieve jobs more efficiently, or different processes.

3. Technology is how we progress and improve the way we do things. I can't think of anything else.

4. Development of Industry - that's about it.

5. Designing, producing, building and stuff.

6. The way things are made, how they work and designed, and the processes through which they go from being designed to being in the market.

7. I suppose technology really is constructing things, researching into the production of what you are going to make. That's basically what I think.

8. It's the use of mechanisms, and mechanisms and equipment to aid people in daily resources and stuff. Just carrying out tasks.

8/2. Transcribed responses to question 2 for Humanities A-level students

1. It's the way they make things go further. Technology is the source that makes things aware to people like computers, and things like that. Things that go to make something. That's the way I see it.

2. computers, electrical equipment, things you are using instead of paper and pen, using things to record data.

3. The use of machinery, like computers.

4. Things we use really to make things a bit easier for ourselves. Like computers, radios and things like that. They help us in entertainment as well.

5. Technology is to do with everything, I think. Technology helps us to move forward, science and technology and developing.

6. I would say technical machinery to help with certain jobs rather than it being manual as in written [computers]. That's how I would describe it really.

7. Technology is advanced science. It commonly refers to equipment such as televisions, radios Hi Fi's, computers, and that make our life more convenient.

8. It's new developments, like software, hardware, computers. it's basically advances in our society.

Question 3: *Here is a list of cross curricular themes:*

1. *Careers Education and Guidance*
2. *Education for Citizenship*
3. *Education for Economic & Industrial Understanding [EIU]*
4. *Environmental Education*
5. *Health Education*

Have you heard of them?
Which do you think should be in the national curriculum?

1/3. Transcribed responses to question 3 for D&T teachers

1. Yes I have. All of them.

2. Yes, I've heard of 1 and 2, I haven't heard of the 3rd one I must admit, and I've heard of 4 and 5. Certainly I think Health Education, and we do some of that in our PSE programme

in school. Environmental Education is something that all pupils should be aware of and certainly again we do have some of that running through some of our subjects in school; certainly that's important. Education for Citizenship particularly as pupils get older. But I think all children from the age from 11 upwards should be aware of their role as a citizen, and certainly that's very good for their future education. And Careers Education and Guidance, we do a lot of that, certainly that should be there, yes, definitely.

3. All of them. They are all equally important. I would include all of them for pre and post 16.

4. Not specifically, I can see where they are going, but not as a particular document. I think the National Curriculum ought to have been written bearing in mind what other subjects do, but not necessarily for us to be directly teaching each others' areas. There have been some classic examples, haven't there, in Geography, lost some of their work to Chemistry; Chemistry didn't want to do it. It's now going back. We have one in technology of energy, and we don't actually teach it because we say to the boys you've done this in Geography haven't you - yes. Ticked, done. I think there are some things which are doubled-up, or tripled-up at times. And sometimes put in the wrong areas. I think that has come about simply because the people that have drawn-up the National Curriculum haven't looked at other people's work. Nobody took an over all view of Education.

5. Careers Education and Guidance I've heard of. I've heard of Education for Citizenship. EIU because at one time that was in the National Curriculum that as far as technology is concerned, probably still is. Environmental Education again that was more into the National Curriculum than it is now. Health Education I've heard of. Health Education, Careers Education & Guidance, and Education for Citizenship comes under PSE [Personal, Social and Education development] in it's greater form that I've heard. I know that I've been in schools where there have been specific careers lessons. To be very honest you would need to have it very well mapped out and time-tabled in order to make it really worth-while to take out of the existing curriculum. Putting it in PSE at least you can put in the parts that need to be there rather than try to pad it out to make it last a year or two. They should all be there in some form.

6. All of those.

7. Yes, well, I've heard of them all, yes. I've often wondered how we fit them all in, and how we identify them as we are supposed to.
   Yes they should appear somewhere; they should be identified I think. Many of these things are dealt with in D&T of course. Yes they all have a place in the National Curriculum, they are all things which are essential.

8. I've heard of them all. And they all should be there.

2/3. Transcribed responses to question 3 for Humanities teachers

1. All of them.

2. All of them. I have heard of them, and I think they should be in the National Curriculum.

3. Right I've certainly heard of all of those themes. I would say that all of those would be very quickly identified by me as themes that should be part of every child's education.

4. Yes. They should all be in the National Curriculum.

5. I heard of all of them except EIU. Which do you think should be in the national curriculum? That's a very difficult question. Should they be the NC as subjects in their own right, or should they be studied through other subjects? I can see a need for all of these things. I don't recognise all of these things as separate subjects. I see them as having links to a number of subjects. I don't think EIU would be the same as doing business studies or Economics, and I would argue that to some extent through History we do elements of what I would understand by EIU. I think History covers some elements of Environmental Education. I certainly think it covers some elements of Education for Citizenship, and there are elements of it in terms of what students say that fit into a kind of careers education. And I suppose you could argue that our developmental course on medicine fit's in with Health Education. So I wouldn't want to see any of these as individual discrete subjects, but I accept that these are important things which students ought to know about. The fine detail comes into how you define them and therefore where they all fit together, which has a number of grey ares.

6. Yes, Careers Education and Guidance; I used to be a careers teacher. EIU we do a lot in our Geography, Environmental Education we do a lot in our Geog. I've heard about Citizenship and Health Education - we do almost no Health Education, we do a little bit on citizenship.
   I can't see any reason for excluding any of them. I mean they are all part of being a citizen, either in terms of society or how they function in society.

7. Yes. They should all be in the National Curriculum.

3/3. Transcribed responses to question 3 for parents in technology jobs

1. Certainly the first, yes. No 3 Education for Economic and Industrial Understanding, Health Education, Environmental Education - No, and Education for Citizenship - No. Which do you think should be in the curriculum? I'm not sure.

2. I've heard of No. 5 Health Education. Environmental Education, and EIU - No. Education for Citizenship - No. Careers Education and Guidance - Yes.
   Probably all of them. EIU should definitely be in the curriculum if only to give the

student a better understanding of commercial awareness, and also I think it would help to give them an understanding of how technology is used in business. Education for Citizenship, well yes I'd like to see that because I think everybody should be a good citizen.

3. Health Education. I haven't heard of the others.
   I think all of them should be.

4. Not by name. No I haven't. I can understand the titles. I can see a need for this.
   Yes. Education for Citizenship - how to behave as a responsible . . . because there's social problems, and people have to be educated in how they should behave as an adult. How to become part of the country. Yes No.3. 4 yes. 5 yes. All five are essential.

5. I've heard of Careers Education and Guidance, and I have heard of Health Education. But I've not heard of the other three.
   I think all of them.

6. Careers Education and Guidance, yes. Education for Citizenship, no. Education for EIU no. Environmental Education, yes. And Health Education, yes.
   I think there's a place for all of them.

7. Well, Careers Education and Guidance, Environmental Education, Yes, Health Education, not so much Education for EIU, and not so much Education for Citizenship.
   Yes all of them.

4/3. Transcribed responses to question 3 for parents in non-technology jobs

1. The first and the last one.
   Well, the top one Careers Education and Guidance. That's for the future for when they leave school. Health Education . . . which is very useful. I haven't heard of any of the others at all.

2. I am not sure.
   Health Education I think is very important. And Environmental Education. And Education for Citizenship because we don't care enough about people. And then I think I would take Careers Education and Guidance, and then the third one Education for Economic and Industrial Understanding - in that order.

3. I've heard of Careers Education and Guidance.
   Environmental Education, Health Education, Careers Education and Guidance. The other ones, I'm not so sure about.

4. Only No. 1.
   Yes No. 1, really, mainly No. 1. I would say. No. 1 and possibly 4 and 5, I would say [in

the National Curriculum].

5. Very briefly.
   I think it ought to be discussed, yes.

6. I've not heard of No. 3. [EIU].
   Should definitely be Education for Citizenship No. 2, and No. 1, as compulsory I would have said.

7. Yes I have.
   Definitely No. 1, and No. 4.

8. Yes.
   Careers Education and Guidance, I would say, and Education for Economic and Industrial Understanding.

5/3. Transcribed responses to question 3 for D&T student teachers

1. First one I have. Second one I haven't. Third one I haven't. Fourth one I have, fifth one I have.
   Health Education definitely. Environmental Education definitely. I think the third one EIU should be. The second one should be as well. I'm not sure about Careers Education. I think 2, 3, 4 and 5 should be.

2. The 1st one yes. Not the 2nd one. I've heard of the 3rd one yes. 4th one yes, and the fifth one as well.
   I think 2 possibly 3, 4 and 5.

3. Some of them.
   Yes, all of them should be. By the time you leave school at 16 or 18 you should have done them all.

4. Environmental Education, and Health Education.
   Environmental Education. Education for Economic and Industrial Understanding, if as it sounds, might be useful.

5. Careers Education and Guidance I've heard of. Health Education, Environmental Education, and I have heard of Education for EIU but there isn't much of it around. No. 2, I haven't.
   All of them I think.

6. Some of them yes. No. 4 and 5.
   No.1 Careers Education & Guidance. Education for Citizenship I suppose, Environmental Education, and Health Education.

7. No. 1 Careers Education and Guidance, not directly but we have touched on it. Education for Citizenship no, never heard of it. EIU not at all. Yes for 4 and yes for 5.
   To be honest it sounds like they should all be in the National Curriculum, whereabouts is debatable, but they should all be in there somewhere.

8. Yes I've heard of most of them.
   Not generally in the Primary school. Maybe in the Secondary school.

6/3. Transcribed responses to question 3 for Humanities student teachers

1. Yes.
   At least 2 to 5. I'm not quite sure about 1.

2. Yes I've heard of number 1 and number 5. I think number 4 as well, yes.
   Health Education. Environmental Education a little bit I think. I think perhaps not any more than it already is. Careers Education and Guidance you get that in a secondary school and I think that's all right.

3. I've heard of Health Education, and Environmental Education. I haven't heard of Education for EIU. Education for Citizenship - I think I have an idea of what that entails. And Careers Education & Guidance I've come across.
   All of them I think.

4. Yes I've heard of the first one. Environmental Education yes, and Health Education yes. Health Education definitely, and Environmental Education. No. 3 I don't think is so important for Key Stage 1 and 2, as much as No. 4 and 5. Education for Citizenship, again I don't think it is as important for Key Stage 1 and 2. No I think for Key Stage 1 and 2 which are the years I am doing, I think 4 and 5 are the most important.

5. Some. Careers Education and Guidance. Education for Citizenship. Environmental Education and Health Education. Education for EIU, I can't say that I'm particularly familiar with that.
   All of them I would say.

6. I think I've heard of Education for Citizenship, and Health Education.
   Right No. 1 and No. 2, and 4 and 5. I'm not really sure about No. 3.

7. Some of them. Health Education. I don't think I've heard of any of the others.
   Well Primary level I'd have said probably No. 2, and No. 4. For Secondary No. 1 and possibly No. 3.

8. I haven't heard of the first one. Or the second. Or the third. Heard of the fourth and the fifth.

Well Careers Education and Guidance should be later. We wouldn't have it in the Primary School; Secondary School yes. Education for Citizenship, I think that might come under Religious Education in some way. Education for Economic and Industrial Understanding, that's for later as well, Secondary School. Fourth one for the Primary School definitely, and it's Geography linked, Science linked. Health Education yes that comes under the Primary School as well.

7/3. Transcribed responses to question 3 for Technology A-level students

1. No I haven't heard of them.
   Environmental Education, I think we need to become increasingly aware of the environment. Careers Education that could be taught maybe at the beginning of the curriculum or towards the end of Secondary school, or at the end of college to give people help so that they know where to go and what to do. Health Education; people are always saying we need to become more consciously aware of the damage they do to their bodies with food and things. Instead of telling them what they could do to help their body; it would be rather good instead of telling them they should do these things, maybe educate them in why they should do them. Industrial Understanding - that depends on whether they want to go into that sort of field, if they are going into accountancy, the economic side could be good, but it's not really good without industry, if you ever need it, and you may not have to come up against that sort of thing, it may not be worthwhile teaching them that.

2. Yes, I've heard of all of them.
   The ones I have taken part in are No 1, No 2 but that was only because I did law. That's it. No 3, I haven't done. No 4,we did some in GCSE science, and No 5 at times as well. Each one of them should be in the curriculum.

3. No.
   Some of them. Health Education, and Education for EIU, and Environmental Education as well.

4. Yes have heard of them.
   Careers Education and Guidance, I found that quite helpful. I don't know what Education for Citizenship is. All of them except for No 2, because I don't know what it is.

5. Yes, I've heard of No 1, not No 2, No 3 - no, No 4 yes, No 5 yes.
   No 1 should be in the National Curriculum, No 4 and No 5.

6. Heard of the first one; might have heard of the second on the news or somewhere. Not the third one; heard of the fourth and the fifth one I've heard of.
   I would say Health Education myself, and probably No 1 as well.

7. Yes, not all of them. Health Education, Environmental Education, Careers Education and Guidance, and that's it.
   Health Education [only].

8. Yes. Just Careers Education, and Health Education.
   The Careers Education would be good, to help you get a clear idea of where you are going, where you hope to go. I think they are all important like Health Education so that you are not endangering yourself and the environmental, that sort of works the two [together] with the environmental, so you know what's happening around you.

8/3. Transcribed responses to question 3 for Humanities A-level students

1. Yes, I think so, I've heard of all of them.
   Careers Education and Guidance. I think all of them should be really. Yes, all of them.

2. Yes. I've heard of No 1, not No 2, 3 no, 4 yes, 5 yes.
   1 definitely, 4 and 5 definitely.

3. We've got Careers Education and Guidance. That's the only one.
   I think all of them should.

4. I've heard of a couple of them yes. Careers Education and Guidance, and Health Education.
   I think the Careers Education is very helpful, especially when you get end of school, colleges, very helpful. I don't know about any of the others.

5. I've heard of the first one Careers Education and Guidance. I've heard of the 4th one Environmental Education and the 5th Health Education.
   Careers Education and Guidance, Health Education, and Education for Citizenship.

6. I heard of a few; I've heard of No. 1, No. 4, and 5.
   I think No. 1 should be. Yes, I think they should all be.

7. Some of them yes. Careers Education and Guidance, Environmental Education, Health Education. I've heard of the other ones but I'm not quite sure what they are.
   Health Education, Environmental Education, EIU, Careers Education and Guidance. Don't really think that Education for Citizenship is that relevant.

8. 1, 4 and 5. 2 and 3 I haven't heard of them.
   Health Education definitely because young people have got to be aware of what is going on with their health. I think No. 3 would be quite interesting for people doing business studies, give them more of an understanding of what is going on in life, with the economy.

Question 4: *What do you think is meant by Economic and Industrial Understanding?*

1/4. Transcribed responses to question 4 for D&T teachers

1. For pupils to actually understand what happens outside of school in industry, and how the economy is operating, and how that applies to industry as well.

2. Presumably that is preparing pupils for the world of work so that they know just what they will be facing in the future, I imagine. And certainly that is an important thing. We do give our pupils here some work preparation by giving them work experience and by having people in to talk to them. I think that is something that certainly needs to be done.

3. I think it is an understanding of how countries actually earn their living, how they generate sufficient income to pay the wages of all the people in the service and other sectors. it's knowing how products are designed and made, and valued added, and how it's accrued, how you actually take a raw material and actually in a social context generate value added to pay for all the other services that society needs.

4. From a pupil point of view, and I think we have to look at it from that aspect particularly, it's the dealing with the costs, that is the first one they can usually understand, and usually it's the costs of the materials. At A-level yes, you can start to bring in the real concept of energy costs, plant costs, labour costs, but earlier on I don't think that comes out. I think their minds are too young to grasp it. They often look at what a thing costs in the shop, they think I can make it for a fraction, but they are missing so many of the economic factors. The industrial understanding that's something we are having to come to terms with a lot more. This is very much in the new curriculum. We are having to take things apart, we are having to analyse them, see what is on the market, see what is good from it, see what is bad from it, and as they design their ideas we do have to look at it very much. Well, there you see this lovely plastic polymer moulded thing from the shop, we cannot make that, you cannot make that. The Head will not buy me a half a million pound piece of machinery to do that. So in that sense yes, we can start to bring in the industrial understanding of the way one offs, small batches, large numbers are made. How much they understand is a bit of a big question mark I think, because it is outside their experience. Industrial visit's would help. Arranging that sort of think tends to be difficult, not only finding it, and also the time. They often tend, if we do get them, to be Cook's Tours; it's a day out rather than seeing what is going on.

5. The understanding by the pupils of what goes on in industry, and in the wider economic sense rather than just the low key economics like profit and loss, so that you can look at production, you can look at why various charges have to be made, fixed and variable charges on goods, so that students can see in the background of how things are made, that there are decisions that have to be made even though perhaps to them it seems a silly decision. They have to be made for other reasons in order to make a profit, or to make something work, or to fit into a production system. So basically that sort of thing.

6. Economic being the outline of the economies and money in and out of a company, and an indication of how they make a profit, where costs are incurred, and an outline of different production techniques to show different benefit's of production practice, and clear the production and also the savings in other types of production. But also on the sales side as well. Marketing, shops. Industrial side of it. I think we should have an awareness of different industrial techniques particularly manufacturing, say steel, perhaps aluminium, say plastic production, to see where the raw materials are involved where they come, impact on other countries which comes onto the environmental side of it. Costs, different types of production from whatever you are wasting it, or whether you are forming it to the correct shape in the first place. Different types of finishing techniques, down to packaging for distribution as well.

7. An understanding of the role of industry to the countrys economic wellbeing. Production of the country's wealth. From our point of view, to be aware of resources and costings, and industrial practices.

8. An understanding of how industry works, what particular jobs and occupations there are in industry, and what effect that has on the economy. And how the economy works, and I think if people had proper education in economy, and understanding of economy and industrial practices or how industry works, I think we would have a better understanding and idea of what we want the government to do. It would give us a much better understanding of what should be happening in the world, and I think that's a very weak thing in British culture, and British education. The reason is that we have a government, so we don't know enough about that.

2/4. Transcribed responses to question 4 for Humanities teachers

1. I think an understanding of industry and the actual development of industry, and certainly as a Geography teacher I think there is a lot of relevance to us there.

2. In terms of economic understanding it would be the way in which goods and products in society are actually produced and distributed I would imagine. The means by which they are produced and distributed essentially, either through a market system (capitalist), or perhaps through a more planned or mixed system of economic organisation. The industrial understanding would be about how the technology perhaps is used to manufacture and create the goods in that economy.

3. I think that's really an understanding of how the country's industry works of things such as the base and super structure in a sort of Marxist perspective all those sort of areas, really how money is made and how people live and how we produce goods and generally that system and then the industrial understanding as well I would take to be a knowledge of the different types of industry such as tertiary industries, service industries etcetera.

4. An understanding of the economic base of the country and how firms operate and why decisions are made.

5. I would have thought that EIU means on one level an understanding of the way businesses work in terms of different jobs within industries, about how they change, how they develop. I think it's often used as a kind of euphemism for understanding the importance of economics and industry. I've got a feeling that we once were a manufacturing country, we no longer are and manufacturing would like schools to consider business as more important. There's often seen to be a divide between Education and the real world. To some extent lots of people are using terms like EIU to try to persuade people to close that gap, to make Education more directly linked to business and vocational education. I would have said there's a role in it for EIU for understanding what sort of industries there are in this country, how they changed, how they relate to other industries in Europe and the wider world. And how trade and industry together affect all areas of our lives.

6. Understanding the functioning of the economy, changes in that economy, how an individual works in that economy. How those changes impact on the individual, how the impact can work within those structures, and be able to look at the world around them in terms of economic aspects of retailing and industry, to actually understand what is going on and the impact of those changes.

7. It is actually incorporated in our economics course at GCSE, and relates economics to industry.

3/4. Transcribed responses to question 4 for parents in technology jobs

1. The idea behind it seems to be that the children should understand what drives business, and how that relates to the things that we normally do. The trouble with all these things, on a couple of them I have actually read through the National Curriculum document, and among those there are some great aims to start with which seem to get lost in the depths of the implementation. The underlying idea seems to be to give a view to the children of how business works, and also how industry it'self works in terms of it's economic performance, how the financial side works, the profit and the loss and all those sort of things. Doesn't seem to be a great deal that relates to technology. Everyone talks about science, and how important it is, but it's sort of divorced from everything real. At least in some of the schools on the business side they seem to try and teach them the economic realities, you know profit and loss, how you would finance a company. I mean looking at my own children who two, three of them did business studies, and they understand the business, they don't understand the technology that supports that business.

2. Well I think I've already said that; the importance of commercial awareness. Why do we have to build things to cost, to time, why do we have to make a profit. That kind of thing you know, the importance of not just meandering through a job, not just taking a very laid

back attitude. It's not the be-all and end-all of everything; it's what you come to work for.

3. To teach students the economics of production and the economic consequences of industrial changes or developments.

4. Let's take them in turn. Industrial understanding - one thinks of manufacturing products for export. Economic in that you don't manufacture products merely for sale, it's all for the purposes of economy, earning profit not only to maintain the wages we all work for, but to provide jobs within a town or a city, but also the profit's which bring wealth into the country.

5. Well, I don't really know, but if I was to guess, I would talk about the economics of manufacturing in this country.

6. The general population having an understanding of how the economy works in relation to industry and everyday life.

I understand by that the way the country operates, and its requirements in the modern world.

4/4. Transcribed responses to question 4 for parents in non-technology jobs

1. I don't think I could answer that one.

2. Economics is more like political, how the economy is running, and industrial is like the industry side of it. That's my perception of it.

3. I've got no idea really.

4. I've no idea, to be completely honest.

5. Again it's all about the world politics and things. Economics of industries, and politics of firms and what have you.

6. I have no idea.

7. Economic will obviously be living, day-to-day living, and industrial understanding is basically the work environment.

8. I can't really answer it. I don't know.

5/4. Transcribed responses to question 4 for D&T student teachers

1. Basically it's learning about life I would think, learning about how the world works.

2. I would interpret it as being sort of almost what makes a company tick. How you make money. Perhaps sort of best designs for different objects etc that will obviously sell, and sell to a popular market. Obviously the economic part of it being the money, and the making of money. Industrial understanding, again as I say the ideas of design in relation to that. That's how I would look at it anyway in my mind, right or wrong.

3. It's really hard to put into words, isn't it. Understanding business, and . . .

4. I suppose I thought it might be a wider knowledge of the economy, how things work. And industrial understanding, like perhaps having a knowledge of the workplace, business, and perhaps relating things we do in school to what would be in the outside world, rather than doing it as discrete subjects.

5. Well, from what I understand is meant by it, it's business studies, you're learning about the economy and the structure of companies, how they're run, the product lines, and the actual industrial understanding. I know that some people do have placements in industry from universities, because where I used to work there were people. I mean they used to do a study on speed of work, that sort of thing. So I know that's what I understand there's that sort of association, more of the academic coming into the industrial environment, and looking at the workings of it and trying to get some sense, but also that research the industrial base can use as well—it's sort of two-way.

6. I don't know. Would that be a sort of business education, to try and develop peoples' awareness of what goes on in the business world?

7. It's understanding the basics of money and business in terms of dealing with money, dealing with banks, dealing with shopping, and the way in which basic industries work through selling and the price mechanism, demand and supply and a bit about government as well. Just to give a brief understanding.

8. Is it just preparing children for what they are going to be seeing once they leave the school environment? Making them more aware of the issues that they might come across in general areas like technology.

6/4. Transcribed responses to question 4 for Humanities student teachers

1. To be able to understand the world at large, and how outside school, what they've learned fit's in with that. You need a knowledge of technology in industry to be able to make things. And the economy to be able to understand tables and things like that, basically.

2. Well, I suppose the economy of the nation and the different industries that happen in the UK. You know metals and all the different industries.

3. I think it's understanding the connections between what you do in Education and the wider world that you are going to be applying it in.

4. Understanding how industry works, and the economic system as in money, how money is distributed through the country.

5. I would take it to mean understanding the ways things work in commerce and industry.

6. Possibly I would think it could mean about the economics of the country, perhaps a bit of politics, and all that sort of thing, and how the country works. And how that links with what happens in jobs, and wages and all that sort of thing. Possibly.

7. An understanding of how the economy works, I don't know really. I suppose how different industries work and how the economy affects them.

8. No idea myself. Well, the way things work in industry. Things to do with money as well. Yes that's what I understand.

7/4. Transcribed responses to question 4 for Technology A-level students

1. Economic understanding I suppose is knowing the way the economy works. Knowing what's going on with interest rates, and how Britain's economy is doing; why the government do things to the economy, and the outcomes of the industrial [policy]. Must be the same for the industry really, just knowing how industries work, the different sizes, maybe car manufacture, maybe just clothes and different industries. Just knowing the basic means of what they have to do to survive.

2. Well, understanding of how our economy works, and the way it relates to industry.

3. Well, it's not just engineering and understanding engineering, it's the business side as well as the practical side, and the production of it.

4. I think it's to understand our economic and industrial work in the workplace, how it works and stuff.

5. That's where the price of something made affects the whole industrial production.

6. Understanding how the economy works, how things are valued as they are, and understanding the processes, how an industry goes about it's job.

7. Coming to terms with how the economy and industry serve society maybe, or education.

8. It's the economy around us, and way it works the industrial . . . the way it's moving the industries around us.

8/4. Transcribed responses to question 4 for Humanities A-level students

1. Being aware of the way the country is. . ., all the problems that we are having, understanding what they are, and how they work. Yes, I suppose that's it. How people work. What people do. How our economic structure is. How it works. That's what I see it as being.

2. Knowing how our economy works, and how industries work. Things like that.

3. The knowledge of the economy, and work in industry.

4. Understanding what's going on around you in the economy, industry and businesses, things like that.

5. Understanding the economic side of your society, and industrial side as well, industrial with working and developing technology, and the economic in the welfare side of it.

6. I think I'd put economic down to the economy, someone's understanding of that, and industrial as in industrial work. To help people to understand the nature of work in industry.

7. I presume economic meaning the economy, well our jobs, employment, things that relate to us in an economic way. Industrial understanding, industrial meaning that technology comes into it, how technology has advanced our economic society. What I understand is that how technology advances economics.

8. Basically understanding the economy and the way industrial society works, whether it be the history of the industrialisation right the way through to modern-day companies, factories, the way they have changed.

Question 5: *Here is a list of national curriculum subjects. Do you think EIU has relevance in any of these subjects, and if so which ones?*

1/5. Transcribed responses to question 5 for D&T teachers

1. Well certainly as part of technology, but I wouldn't say that all of EIU take part in technology. Possibly in Geography and to some extent in Science.

2. I would say it has a relevance in D&T. And in Science I guess; Maths - most people need maths whatever job they do. Those are the main ones I would think.

3. I think there is a relevance to all of them. I don't think there is a subject there that couldn't be included. I think there are some areas where it is easier in which to devise the context

in which to develop it and introduce it. But there's no subject there that couldn't actually be included as one aspect of the teaching. Clearly things like D&T, Science, Geography, Mathematics perhaps, are easier in which to find relevant context for students to understand the concept. But there's not a subject there that actually couldn't, as some part of their work, introduce the idea.

4. It must appear to some degree in Geography in the area where they deal with people, human Geography, that must come into it a bit. Maths could, but doesn't usually go outside it's academic sort of line. Science again should, but I would feel it doesn't again for the same reason. Tends to be pushed out by most of us I think by the pure pressure of time, and most of the syllabuses are too large. D&T yes, we do, we've got to, but as I was saying just now, I think we've got to be very careful as to the concept and the age of understanding ratio.

5. Yes it has relevance. It is relevant to D&T, and it is within the National Curriculum to a certain extent as far as production and manufacturing is concerned. And yes I believe it should be there. I don't know how well it can be examined as such, but . . . without having a lot more resources, or taking pupils out on a lot more visit's, which again needs resources but also needs extra time because you've got to take it out of something, you're not going to get a very deep understanding of EIU. Videos are helpful if there were any that are specifically orientated to that, then I'm sure it would be quite helpful at a reasonable price. But I don't know of any. We sort of take ones out of different places and we mix and match. Whether it comes into any of the others I don't know. Possibly Science. Possibly get some economics in Maths. But of course the higher up the National Curriculum you do get Economics and Business Studies anyway.

6. I think it should come into all of them. There is probably a much greater need of teaching it in a direct context of No. 2 D&T, and No. 4 Geography, but I personally find Industrial Archeology and History of Industry quite interesting as well. In History we could touch on it as well. Using Maths as well; Science comes into it as well as in D&T, which comes back to your original question, a very practical form of science.

7. Probably all of them to a degree. I would certainly pick out D&T, Science and Maths. Probably History. I think you could attach an element to all of them.

8. Definitely in D&T. History yes. Geography yes. . .. It could be put forward that it's very useful to have modern languages so that you can go from one country to another to be employed. Science I am sure would come into there. Maths, . . .probably perhaps 6th Form applications, certain children understanding statistics which they do in the 6th Form . . . English, one's ability to understand what information comes to you, so it is understanding there. D&T without a doubt. Art, as in design can be a tool for people to get information over, but I wouldn't have thought there was so much there.

2/5. Transcribed responses to question 5 for Humanities teachers

1. Here is a list of national curriculum subjects. Do you think EIU has relevance in any of these subjects, and if so which ones?

2. No 2 D&T, No 4 Geography and No 5 History; mainly those three.

3. Well certainly Art I would imagine to the extent that Art is not just something that is a creative process but something which helps in terms of the economy through advertising, graphic art, presentation of ideas, products that kind of thing. I would have thought that Art would have an integral part to play in that kind of process. And indeed in industrial product design; I think Artists would probably have an important part to play in that.
   D&T, well of course I would have thought that most classes involving D&T would benefit from some kind of industrial understanding, of why they are making things, what are they for, and again is there any market for this kind of thing.
   English, now that's a bit more difficult isn't it. But I would have thought that even in the English language curriculum you would have a vocabulary and a dialogue which could take place involving technological language in communicating ideas in a simple way. I would have thought that there would be something they could contribute.
   Geography, well it involves an understanding of other cultures perhaps, and other parts of the world and the problems they encounter. I think Professor Schumacher summed up many of their problems quite clearly in terms of the technology required for certain areas and the resources they have in those areas. 'Small is beautiful' I think was his motto. He is a Professor of technology, and he looked around the world at some technological problems that various peoples encounter in their physical environment, such as water extraction. And his idea was that you shouldn't throw large technology at them because it was usually inappropriate; you should use small local technology using local resources. That's what I was talking about technology, it could involve local wood, trees or whatever to construct an irrigation system which could be appropriate for that area. If it breaks down you don't have to send off to America for a giant part that might cost a fortune. So I think Geography and the sort of problems people face in their environments around the world, it would be very important together, for technology as well.
   History of course, what was the workshop of the world, well it was Britain wasn't it? Where did it all start - Shropshire? First steel, iron was smelted; Coleport (?) and places like that. Certainly, the Industrial Revolution where it all began, and unfortunately where it's all going a little bit wrong, is probably ideal history and the history of technology. I am certainly in favour of that kind of thing, and certainly the history of the economy of our society. Why is it that economists have got it wrong throughout the ages and we have not been able to distribute resources fairly and equitably, and that there are people lying in the streets of this country. The tax system is so skewed in favour of the rich that it is outrageous. These sorts of issues need to be raised. I think the National Curriculum has been politicised too much. It's been manipulated by the government to hide these things. I think that the History of our country in terms of the economy and technology is very important.

Mathematics, well I suppose that goes without saying. The fundamentals of most sciences is the language of Mathematics. I don't think I need say any more than that.
Modern Foreign Languages - well if you're going to work abroad as an engineer, it might be ideal. I think any job abroad in Europe would involve some kind of understanding of foreign languages. And the technological language is very important for students to learn I would imagine. Not just literature and art, but everyday common terms or phrases in German or French which might involve technology, or even economic terms.
And of course Science, it obviously goes without saying that science is an important part of technology in the sense that it provides the momentum for the movement of ideas in pure science, physics labs and things.

4. Right, well, looking down those I would say absolutely all eight again because I believe we are living in the real world and that if we are teaching any of these categories that we call our subjects, it needs to be linked to the real world and very much so all of those areas - if I take History, for example, a lot of History has to be seen from all different perspectives, and an Industrial and Economic one is certainly one of those.

5. I would say all.

6. I can see that there's a role to play in History in the sense that history is a broad church. I perceive a lot of different types of history, and the students should have an understanding of the diversity of history. And therefore I would certainly recognise in it's own right that economic history is certainly an element of history that needs to be recognised. Also social history, local history, many of which end up with strong economic and industrial base. I would see for example within a History Curriculum at Harwich that there is a role for some one to look at projects looking at the rise and decline of Harwich as a port, and looking at it's links with the continent. I also think that if you don't understand the trading links with Britain, you are not going to understand the British History. So I can see that in those senses, there are a number of roles for History to link with EIU. Geography, as I understand it, it makes the claim based on . . . [turned the tape] Well we are trying to explain Geography and EIU. I think many Geographers would take personal ownership of EIU. Of all these topics they would claim if this is important this is an essential part of Geography, and this is a reason for doing Geography. If there are other reasons, say natural resources kind of angle, but certainly Geographers claim that business why industry locates where it is, and it's importance and about trade links, and communication links and all the things which follow from that.
D&T in terms of a process of research, and solving technical problems would usually think it has got a role in going out into industry and showing how industry works, and how industry uses technology, so that projects like setting-up a production line. . . .
Art . . . . After that these things become increasingly tenuous.
It seems to me that there is a very clear link between Science and EIU in the sense that any industrial processes have a scientific basis, but it seems to me that the type of Science usually offered in schools is more theoretical understanding of what is happening.

The Modern Foreign Languages is an interesting one in as much as most foreign language teaching is based on leisure and tourism. It's what do I need in order to go to France on holiday . . . . But in fact now that we live in a multinational world and we have close links with European Union, you could argue that commercial languages would be more important, and if you went abroad I think they would see the use of language for those purposes. I'm not too sure what claim Maths might make.

7. Geography certainly, with it's retailing service industries, manufacturing and so on. I would imagine D&T it has to fit. The historical stuff looking at change probably. I can't see it not fitting into any of them. If at the very least there is a context in which they can develop their work, I mean we are supposed to be into context-based learning rather than doing it for the sake of it , and I would have thought they all have some relevance to EIU.

8. I would say that it is relevant in all of them. Yes all of them.

3/5. Transcribed responses to question 5 for parents in technology jobs

1. It certainly goes well with D&T. It has relevance certainly in History. It has relevance in Science. There can be relevance in Maths in terms of the application of the subject. Less so in Art, English and Modern Foreign Languages.

2. D&T - yes. Science, not any of the others, I don't think.

3. Well, it has very definite relevance to D&T, and to Science. I am trying to think of a reason why it shouldn't apply to all of them. I am failing to make a connection with some of them, with Art and English. It depends on what the Art content is. I'll leave it at that.

4. D&T. The application of Maths and Science is for D&T. You use Science and Maths to design. So you can't design unless you've got the Maths and the Science; the two come together. So I think 2 and 6 and 8 are wrapped together as far as I'm concerned. You can't become an engineer unless you're a mathematician first.
   You need English. The application of technology is industry, is applying the technology which of course are the scientific techniques using the principles of Physics, of Chemistry, of Science. Applying those fundamental principles to allow you to design a technical product. I mean it's not like a product like a plate or a table or a jug or a chair. But then again there is some technology in a chair. I mean if something . . . doesn't have to be a computer or a radar system. You take a chair, the science and physics in the design of a chair. It doesn't have to be something like a space shuttle or a fighter aircraft or some complex thing. So you can say that D&T is an extremely wide generalisation, and it's got many branches from which you spring-off. My particular field is a specific field of technology under which there is again a wide spectrum. So it definitely has a place within generally No 2, but you need 6 and 8 to do that. But you also need English to run parallel because you need to communicate. An engineer who can't read English is on his own. An

engineer is all communication - you know, ideas, you work together as teams. If you are unable to communicate properly you find yourself isolated.

5. I would say D&T certainly. Geography and History to some extent maybe.

6. I can see a place for it in 2, D&T. Geography. History about the background, Maths and Science. Certainly Foreign Languages, English are a basis for the other things too.

7. Certainly. Well obviously D&T, Geography, Science.

4/5. Transcribed responses to question 5 for parents in non-technology jobs

1. What about D&T, you would have to have a good understanding of that. Foreign languages. Maths that's very useful as well. Science that carries a lot of things as well. I suppose Art. Geography that comes into a lot of things. History is to do with past things, I don't think that would really come into it. I'm not really sure about English.

2. More in the D&T. maybe Maths as well.

3. Well Maths I should think, and D&T.

4. Possibly No. 2, and No. 6.

5. D&T, Maths, History, Science.

6. No. 2, No. 6, No. 7, and No. 8.

7. D&T, English.

8. I would say English, Geography and Maths.

5/5. Transcribed responses to question 5 for D&T student teachers

1. I think it does. Science I think it would do. Maths I think it would do. D&T I think it would do. And Art. *Laughter* - going through the whole lot! I think those are the main four. I think language would come into it as well, but I think those first four I named are the main ones.

2. Well the economic side of things, that's obviously to do with finance and things along those lines. Industrial understanding could come under Science. Perhaps if you were looking at things like I don't know perhaps - air bleach why does it work. Things along those lines and perhaps testing for qualities etc. I suppose the industrial side of things again maybe looking at Geography areas, how does it affect industries, supply of

materials. History again industry, and perhaps economics as well looking at why a certain company came about, is there a demand and along those lines. Modern Foreign Languages - I suppose you could sort of say it would crop up in industry occasionally. Art - off-hand I couldn't see how it would fit in straight away. I am sure however, given some thought, something could be brought in somewhere along the line; maybe linked with History looking at paintings of industrial scenes and so on. Obviously D&T you can see a clear relationship to it too. One would almost depend on the other. I suppose in one way or another you can see it cropping up in all the subjects.

3. Most of them really I think. D&T, English, Geography, Maths, History would come into it wouldn't it, and Science.

4. Geography, Maths, Science, and D&T. I suppose if you looked at it a wide sense all of them.

5. Maths, D&T, Science, possibly foreign languages. It depends on how [inter]national the company is, and if you are working for industry sometimes that modern language is appropriate you know German or French. No not the others [subjects].

6. Yes. Probably all of them. Science yes, languages yes, Maths yes, History I suppose, Geography, English and Technology. Yes all of them I would have said.

7. Maths due to the fact that with economics you tend to have Maths in economics somewhere; I tried to avoid it but you can't. English - use of essay writing and communication. Geography if you do location of industry you'd have Geography. History again you can do the historic aspects of industry, the great manufacturing industries of the past. Modern Foreign Languages again very important with us going into Europe you can use the idea of industry. Science with the manufacturing side of things.

8. D&T, should be Science.

6/5. Transcribed responses to question 5 for Humanities student teachers

1. Obviously D&T, Geography, History, Science, I think it covers an awful lot of the National Curriculum.

2. No not really. Science a little bit, with as I said the metals and industry. And yes you hear about raw materials and how they get processed. What happens in the different factories and so on. Yes you get that a little bit at GCSE, and at A-level Chemistry. I don't think it is in any of the others, no.

3. Certainly in D&T, History, and Science. I'm not so sure about Art, I think probably it's not particularly relevant in Art certainly in the way that I understand it. Or English. Possibly in Geography. And I can't quite see the connection with Modern Foreign Languages or Maths.

4. Well definitely Art, D&T. All of them really I would say, in some form.

5. Certainly in Science, D&T, Maths. In fact all of them really.

6. It's hard to link it with very young children I think. With older children, yes I think it would be good if they had an awareness of perhaps how the country worked or something like that. For older children, I suppose Maths particularly, D&T, Geography possibly in understanding about the whole world, and how it all works together. I'd leave it at those.

7. English, Geography, History, Maths, and possibly Science.

8. Well, there are industries based around each of these subjects. D&T seems to be more relevant. Geography, and Science. The rest I'm a bit vague about.

7/5. Transcribed responses to question 5 for Technology A-level students

1. Geography because when you have to study different countries you may need to know what the industries are in that country. Then you can understand why the culture is affected by the industry around them, and with the economy, this I suppose this could effect the people as well, and maybe in the rich country which is maybe Germany, parts of that are very rich, you can understand why their life style is different to people in say Bangladesh or somewhere like that. D&T - the industry side is very helpful. it's knowing different techniques, and the way they work, why people do certain things, in projects or maybe just the manufacturing side.

2. No 2, No 4 and 5, No 8, possibly No 1. That's it.

3. Well you've got to have all of those to have an understanding of the economy and industry. I think it all comes in.

4. D&T, English, Maths, Science.

5. 1, 2 and 6, No 4 and 8.

6. Definitely No 2, because as I said how things go from the design stage to on the market. So understanding the economy could most probably help there. Geography could help with industrial understanding because lots of industries have foreign trade. Maths I

suppose, yes that's helpful in everything really. Foreign languages most probably in the economy and industrial because of foreign links in industry that could be helpful. I'm not sure about science - maybe in science depending what kind of work you do.

7. Geography I think. Yes I think that's it, Geography.

8. D&T, I think that would be relevant. Geography, History, the way it's [EIU] developed, and to some extent Science, the way industry uses science.

8/5. Transcribed responses to question 5 for Humanities A-level students

1. D&T, I think it should, in an industrial meaning. Possibly History. I think it should be like historical of how we got there I suppose, and Science. Science and Maths. Maths should have economic stuff in it as well, definitely, and science I suppose. I don't know whether it should be a separate subject. If we are going to do things like this, I think maybe it should be a set subject. *Me - in it's own right?* Yes. I mean you can incorporate this [EIU] into all of them probably, but making it a separate subject you'd learn more, wouldn't you, obviously. *Me - you'd be able to concentrate on it more wouldn't you?* Yes. I wish we had been taught more things about how our community works, economics, technology stuff like that. I wish we had been taught a lot more, but we wasn't.

2. History, perhaps Modern Foreign Languages, that's about it really.

3. Geography, History, D&T, Science.

4. You learn about industry in History, and to a point in Geography. I mean in History you also do the economy in some countries. I think it is mainly those two really—History and Geography.

5. I do, in D&T, Geography and Science.

6. D&T, Maths, and Science as well.

7. I think Maths, Modern Foreign Languages, Science, D&T, Geography, and Art are the most relevant, yes. I don't think English and History have a lot to do with it.

8. It's definitely in History because when we were at school we did the process of industrialisation and how it went forward. 5, 6 - that's as much as I can see.

Question 6: *Can you see much evidence of technology around you?*

1/6. Transcribed responses to question 6 for D&T teachers

1. Quite a bit, yes. Technology is everywhere.

2. Yes, everywhere I think. Yes, everywhere. I think the machines we use to help us today. Progress that is made with the books we use, whatever. I think technology is all around us, definitely.

3. Oh! Huge amounts. I mean you can't look anywhere without seeing an example of man's intervention.

4. Personally yes. You can't help but fall over it. I think this is one of the classic situations. Those of us that are involved in it see technology in everything. Well you're leaning on a table. I'm sitting on a chair. I see technology in both of those. But so many people don't. Parents drive here in their cars, and they say "I don't see why my son should be doing technology. I don't see any point in technology". And you say how did you come in a car? Yes? Well it's one of the most sophisticated pieces of technology we ever use. I heard the other week, somebody said, I think it was from Ford, if every part of a car was only 99% efficient, the car wouldn't run. So our society is totally based on technology. Everybody is totally reliant on it. I see it everywhere.

5. Everything we look at is technology because people have manipulated those materials in order to make them as they are. Even looking at the school site, you have managed grass, managed trees, and therefore they need technology to manage that. There aren't many places that you'd say there's no evidence of technology at all. Unfortunately even on beaches these days you still find the evidence of the technology of the oil.

6. Generally, yes it's hard to identify individually at times, also modern products are so well made and packaged, that to actually see the higher technology that they are all using, different materials in different ways. When I'm talking about it to electronic students I refer in fact to electronics technology around us. They see technology in cars, the electronics in that and also various audio Hi-Fi systems in the home. I think people don't see much evidence of technology when they are young except what's around them. I see much more technology and try to explain it in terms of when I was their age the amount of stuff that was made of plastic was minute, and now it is very widely used. The benefit's are hidden; it is so common which is one of the points of technology to incorporate better materials and other techniques into products.

7. I would say everywhere.

8. We are just totally surrounded by it all the time. It is there all the time in everything we do. You get into your car, that's technology, you go down the road past some traffic lights, that's technology. You go and get money out of the bank, that's technology. It's absolutely everywhere; we are controlled by it all the time.

2/6. Transcribed responses to question 6 for Humanities teachers

1. Can you see much evidence of technology around you?

2. Constantly, constantly. it's very difficult to give examples, but I am constantly overwhelmed by the developments there have been in all elements. I mean the way we actually teach the children, the materials we use the visual aids we have got, and then looking at the equipment they are using down in the CDT subjects.

3. Yes. The whole of our society is based around technology; we could not communicate with people very easily from here to another staff room without a telephone. Obviously we are all getting more involved with computers and the Internet and such like.

4. I certainly can. If I talk in terms of work, I think the obvious thing that people think of when they say technology is computers and I think the very way that computers are now available in most classrooms. I think other things such as overhead projectors, and just the various tools that we actually use in our day-to-day work. For me the biggest effect of technology is at home because coming from a home which was very reluctant to use any modern appliances, when I became independent I was very very determined that I was not going to fall behind again. And so my house is quite full of domestic cooking technology and computer technology, although I wouldn't claim to be an expert, just television and media technology, satellites etcetera, and telephone systems, so definitely yes.

5. Yes, in terms of the number of computers, and the state of transport, and the state of cars, and in consumer goods.

6. I see more evidence of technology in my own house than I do in schools. When I go home my life is dominated by technology. If I didn't have a modern car and roads, then the chances of living 30 miles from where I work and commute everyday would be impossible. You're dependent on technology to make yourself a cup of tea. You prepare tomorrow's worksheets you're dependent on a computer, a modem, a printer, and all that kind of thing. You switch off from that and go to a gym and haul more computerised bit's and pieces around. The you watch television, and so on. Whereas if you walk into school most days what technology do I use. I use a photocopier, OHP and video. But if all those things were to go bust, I could still teach essentially with books, a board and some pieces of paper. I don't think that technology is all that evident in schools, because technology on the whole is expensive. We are not at the cutting-edge of using technology around the place [schools].

7. Generally, yes. I mean you drive a car, you see technology, you go down the high street and look in the shops you'll see technology in what is being made, society is at the moment heavily technology driven.

8. Well, again computers. The home environment, the school environment, there's a lot of technology used. Well constantly. I don't know Space Technology, technology on the roads, everywhere you look there is more technology being used. You only have to go shopping, it's used more in Supermarkets and everywhere really. It affects our everyday lives.

3/6. Transcribed responses to question 6 for parents in technology jobs

1. Most of the things we live with are the result of technology. Even the food we eat is the result of technology. There is little evidence of it in the sense that this is how it was produced, but there are an awful lot of products, I mean we have one sitting on the table [tape recorder] right now.

2. Yes. Banking for a start. Traffic control are the things that come to mind. Entertainment to a greater degree.

3. Yes. Pretty well everywhere.

4. All over the place. Everywhere. The whole of life in general, and in private life. We are completely surrounded by it. I mean technology has not suddenly happened now. There was technology in the time of Babbage when he invented his mechanical computer. That was technology to him. Our interpretation of the word technology is something which is evolving as an idea, and we are trying to relate it to what I think is technology, but then of course somebody from the 50s or the 20s or the 1600s would have an idea of technology. I mean a guy in the 1600s would look at a clock, a clock used for navigation on board a wooden sailing vessel, and he would look at that as the means of navigating the globe to interpret his position on the sea with respect to the stars. That to him was technology.

5. Yes. Well I think of modern cars, modern television and radio equipment that sort of thing, computers.

6. Yes I think everywhere these days. Most people have PC's [computers] in their homes.

7. Yes everywhere.

4/6. Transcribed responses to question 6 for parents in non-technology jobs

1. Would checkouts come under technology? That's all very clever. You just scan it and it comes up how much it is, that's all very clever. Can't really think of anything at the moment.

2. Everywhere you go there is computers. Tills are not the same as they used to be, are they? They're computerised as well. Everything has changed.

3. Yes, very much so. It's everything you do these days. It goes through your mind, modern technology, even drawing money out of your cash point, everything is there to hand quickly, you know done within a second or so, and you've got all this information. That's just in everyday experience. Everything you seem to do these days comes down to technology. Nothing is actually done physically in front of you and by hand. it's all worked out very quickly for you.

4. We have the computer screens that we use. I don't know. Telephones etc, your tape recorder.

5. Yes. Well it's underground wiring and telephone communications, all that sort of thing. credit cards.

6. Yes I can. If I think to, say, ten or fifteen years ago, just thinking about gadgets we use in the home, technology has influenced what we have in our kitchens basically.

7. Well I personally feel we are in the technology age. Everything around me involves technology.

8. Not really, no. No.

5/6. Transcribed responses to question 6 for D&T student teachers

1. Yes. I tend to see technology as everything. So I see it all the time. Technology at home, washing machines. Go into the refectory, vending machines, it's all technology.

2. Yes, considerable. I think you've only got to stand in the house to see an awful lot, videos, televisions; outside cars, and buildings of course. I think it surrounds us. We are heavily dependent on the products we produce through industry etc.

3. Yes everywhere. Television, Hi-Fi, shop doors, just general construction things, buildings.

4. I think it depends on your definition of technology really. I mean if you saw it as tools which help you, or as sustenance, it's everywhere.

5. Yes. Everywhere. Well, on the domestic scene you've got it in the kitchen, your microwave, your radio, your stereo. I mean your house is full of technological objects. Outside you've got your tracker bikes, in the environment everything just about, everything that manages traffic, the rail network, the transport system, lorries on the road transporting goods.

6. Yes. It plays a part in everything really. So yes.

7. That's a very vague question isn't it? Yes you can, everything you see around you is technology from the tape recorder to the safe to the cardboard box you've got up there.

8. All the time. In the home, all the technology that you find. In the school the computer, video, television. All different kinds of things. Anything really is to do with technology whether it's design or information.

6/6. Transcribed responses to question 6 for Humanities student teachers

1. Yes. Everywhere, computers are everywhere, and lots of different things, people are making things, specially in schools, there are always displays of things that have been made. Everything you look at has an implication for D&T as a whole. Things are always being improved, new models of different things, new models of cars, latest techonolgy.

2. Yes. As I say, there's televisions and computers, most things.

3. Yes, I think it's everywhere.

4. Yes, I can. Especially in this college. Technology even when you go into a supermarket, there is new technology there. In cars now there is new technology. Everywhere you go really.

5. Yes, I think certainly more and more so. Generally in everyday life, in everything you do, really.

6. I would think it is all around us, isn't it, technology. Yes I think it is everywhere. Cars, buildings.

7. Yes. Everyone has telephones, and televisions and radios, and things like that.

8. Well yes. More so than ever nowadays. There is always new inventions coming along. Definitely more computers in use in businesses. I do not think the technological world could function if things were taken away. It would not.

7/6. Transcribed responses to question 6 for Technology A-level students

1. Yes, all the time. Just look around here, there are phones over there which obviously are a very important part of life these days. Most people have a phone, most people have mobile phones. Technology is all around, it is always advancing. Fire alarms, they help people a lot, give people advance warning, without those, people could be just trapped in a fire, or have a fire advancing towards them and not know about it. Technology is all around.

2. Yes. Well everything is. There's not many things you can see that are completely natural in every sense, unless you look out of the window, trees and whatever. Basically I'd say everything.

3. Technology is everything.

4. It's all over the place. it's everywhere you go. Computers now mainly in education, basic things like phones. That is about it, really.

5. Yes computers, cars, buildings.

6. Yes, definitely. Technology in everything we do. Cars getting more technological, all the appliances we use around the home get more technologically advanced.

7. Yes. The microphone, tape recorder, telephone, lights. Yes that's about it, really; glasses maybe, technology.

8. Yes there is evidence of technology. Yes in general. Just technology the way we use, like cars and aeroplanes, and like all new technology, IT, computers.

8/6. Transcribed responses to question 6 for Humanities A-level students

1. Oh! It's everywhere, isn't it. Everywhere. Phones being made up, computers, everything really. Everything is being changed around and being made different, getting further.

2. Definitely, yes. With freely available computers at college. The Careers Centre is all computerised. Even where I work the tills are computerised, everything goes through very much technological. Obviously with the Internet coming in, and CD-ROMS and that; everything is turning from books to technology, definitely.

3. Yes. Most things are done on a computer. Nothing is really hand-made. It's all done on machines. So I would say there's quite a bit. Yes.

4. Yes, I mean, we have got lots of computers.

5. Yes. I think there is always technology around us. In this room, for example, the tape recorder you are using, the lights, the projector over there.

6. Yes in Technology Departments in the college. Computers, car manufacture, things like that where there is a lot of machinery.

7. Yes, anybody like I do has some form of technology, whether it is in my bedroom, ie my electric clock or whether I go to a dance or club, the electrified equipment. That's because down to really mundane things like cooking your food, you know there's technology

everywhere. And electrical goods.

Yes all the time, I mean computers, television, satellite, cable, they were talking about satellite dishes saying it is really advanced, now cables. There is just a big argument between all these big companies about who is the most technologically advanced. Everyone is saying they are, even to phones.

Question 7: *Do you think there are ways in which you personally have benefited from technology?*

1/7. Transcribed responses to question 7 for D&T teachers

1. Yes, I ride a mottorbike. That's pretty hi-tech. Certainly in the home having a dishwasher, a microwave, decent oven; yes that side of things too.

2. Yes, certainly in the home. I mean I do full-time job, I've had a family who are grown up now, but if I hadn't had some of the technological advances there have been, I don't think I'd have coped with all of that. So I use technology a lot in the home.

3. The answer is clearly yes, but more importantly at every conceivable level—personal, professional, psychological, socially, culturally. I would say there is no way I have not benefited from technology. I think that needs qualifying, but I understand that as well as the benefit's of technology there are also downsides as well. But currently, I would say the advantages and the benefit's of technology have certainly exceeded any drawbacks so far.

4. I've certainly benefited in my home. My home is a lot cheaper to run than many people's homes, simply because if something wants doing, I do it. I think that's an aspect that's been lost in the National Curriculum. About ten, fifteen years ago, there was a move within the subject to start teaching some of this almost DIY, but it's gone, it's been lost. I think that should be there. I think it's a viable, very important part of our education of a child to do things; mend the tap washer - such a basic operation to me, but for a lot of people it's a panic phone-call to a plumber in the middle of the night.

5. Yes, in virtually everything you do. If you think about the cars that you drive around in now, the materials you're using and the types of equipment you have at home or in school, the advancement of technology has certainly benefited me and benefited others. Lots of things that you can't afford and you look at, and lots of things you can't catch up on before you have to teach them.

6. Yes, all the time. I've got a computer myself which I bought partly for teaching, but I use it for other things as well. It's useful at saving time, for presentation of letters and so on. More on the hobby side of things I do sailing and use modern glues, epoxy resins and modern fillers which weren't around 20 years ago. Other things from technology are modern wallpapers and paints have benefited, and so has machinery the DIY stuff.

Modern sandpapers are better than old ones. Clothing has benefited an awful lot. Ordinary clothing seems to have fortunately gone back to using natural fibres which with appropriate technology still uses some artificial fibres for strength. I've got some clothing for sailing and outdoor use which is much higher tech breathable stuff which is a very warm fleece type things which weren't around a few years ago. In foul conditions it's much warmer, more comfortable.

7. Undoubtedly. I think everything we touch, everything we use is the result of technology as an aid to making life easier.

8. Time-saving devices. I mean just the mere fact of timing devices, in order that some activity can happen at the cheapest time of the day, or you can programme something to happen when you are not there. An answer-phone if you have a very busy social life, the technology would be very useful. Or if you had a business. A portable phone it is extremely useful. So I mean a lot to do with time-saving. Although the time-saving on the Stock Exchange and the speed with which it can happen there it has a bad result. Everything changes too quickly. With other things the communications are absolutely tremendous, ringing up Indonesia and getting through in under a minute or something, it's just absolutely amazing. And the fact that there is hardly any time-lag when you use the satellites it's tremendous.

2/7. Transcribed responses to question 7 for Humanities teachers

1, I think I am constantly benefiting, but I also realise how much in terms of my own development that I haven't had access to technology as I've gone along. So there is if you like a fear of technology through not understanding it; say computing is a classic example.

2. Oh yes, definitely.

3. Absolutely. As I've just said at home, I think in terms of making life easier and being able to work, the appliances at home make a massive difference to me and my wife both being able to work, and bring up children. Certainly at work as well, although I don't actually get to touch in a hands-on sense much technology, the very need that I need to produce lots of letters and documentation and things like that, although I hand that in to other human beings it's technology that actually quickly produces them and then distributes them as a means of communication in my work, so yes definitely.

4. Standard of living improved.

5. If it wasn't for the technology of dealing with diabetics I wouldn't be alive. So I'll smile and think I'll go for a definite benefit in the sense that I'm dependent on the drugs and the electronic monitoring of bit's and pieces. I don't want to live without all the technology in the home I previously identified.

6. Yes and no. The convenience of the washing machine, the dishwasher, the computer seems to provide quick ways of doing things, but it is never without cost. The pollution costs the extra time costs, and I've yet to see the actual savings of time and the benefit's with IT. It seems to generate more work. So my view on technology is that it is a mixed blessing.

7. Yes definitely.

3/7. Transcribed responses to question 7 for parents in technology jobs

1. Kept me employed for a number of years [yes]. I think we all benefit from technology. We live in an industrialised society. If we didn't have the technological background to that then we wouldn't have any of the things we have today. You can start with the food we eat, through to the cars we drive, the medicines, the whole range.

2. Yes, I think so. Around the home. Yes, I mean I don't have to get out of a chair to change my TV channel and that is the result of pure technology. My wife or myself, whoever is doing the cooking, cooks a lot quicker than my mother or grandmother did. Yes, life is easier through technology, I think. But I also think in some ways life is a darn sight harder because of technology.

3. Yes. Extending and improving access to information.

4. Standard of living, way of life [yes]. Only that I'm able to live, I've got a car takes me to and fro work. We are surrounded by conveniences, modern conveniences like washing machines, electric light bulbs, and heating.

5. Yes. It makes life easier.

6. Yes. It makes day-to-day life easier in many respects.

7. Well I must admit I do think the standard of living [yes], to the detriment of the environment though really. I mean we need to do something about that. But by and large the standard of living is increasing all the time, and that's using technology.

4/7. Transcribed responses to question 7 for parents in non-technology jobs

1. Well I used to be a check-out assistant, so I learnt all that type of thing. But I suppose most departments there might be slight technology involved.

2. Yes because you . . . things are done now to speed your life up. Life isn't easy-going any more. You go to a checkout and it's fast. You go shopping in Debenhams and it's all . . . anything quick. Credit-cards and everything, it's all done . . . The personal side of it has

gone that's what I think has happened. Well I do think that technology is a very good thing, but the personal side of it disappears.

3. Oh yes, in lots of ways. In everything really, banking, TV, video, computer games, and all sorts of things.

4. I certainly have since I've been at Sainsburys, yes. It's opened my eyes to a whole new world basically, with mechanised checkouts etc.

5. Obviously yes, but I can't think . . .

6. Yes, I would say so. Certainly things like our cars, they've improved with the use of new technology. You know, electric windows as an example, most useful, and again thinking about the home, remote controls on TV, the digital telephone network now as well; we can trace calls, that type of thing.

7. The basic things, home things for family life, improvements in the kitchen and household things that give you more time . . .

8. No.

5/7. Transcribed responses to question 7 for D&T student teachers

1. Quality of life really. As its [technology] developed, computers I would say, things in the home. I would say I have [yes].

2. Yes. I suppose the key point would be health. The first thing that comes to my mind is teeth actually, the care of and the technology that has brought about such advances in the care of teeth. Not only in toothpaste, but the equipment that the dentist may use. Even the material he may use for filling etc. Other things as well, technology, cars. You can get from A to B so quickly now, and communication as well. I mean in time perhaps there won't be a need for a university like this. You'd just sit at home behind your keyboard and communicate in that sense. So yes I would say you do benefit an awful lot. Probably far more in some ways than you usually realise.

3. Yes definitely. The IT side definitely. When I started this course, I was very wary of the computer. Now I'm quite confident to sit there, even if I get it wrong. And also, the making side which gives you the confidence to have a go, and understand how things are put together.

4. The biggest thing to me while I have been here is my computer. From an academic point of view, the way you can get so much information at your fingertips with the different technologies. There are other things I suppose . . . without going into a big definition of technology I suppose I couldn't get here if I didn't have my car [yes].

5. Well, I've personally benefited because I've worked in an industry that does do a lot of research and work that's technological. And if I hadn't got that job I wouldn't have got the money together to come in here, which means I wouldn't have been able to do teacher training. So to me that's benefited me. But on a more domestic front, like I said, you've got your stereo and things like that. Your leisure time, you've got those things to enjoy. And another thing is that if I didn't have a car I wouldn't be able to get here because I live in Sudbury, Suffolk. So I've got to drive 45 miles. And I wouldn't be able to go to Homerton because I'd have to be resident there. So my car has been valuable to me. So that's technology. I think just on the domestic front having machines that do things that allow me the time to come and do this [teacher training] [yes].

6. Yes, at school, you use computers at school, they're being developed all the time. But then things you rely on everyday at home, and in everyday life I suppose have been developed through technology.

7. Yes, it's given me greater understanding of how the world works, and importantly understanding of basic, no, an understanding of how . . . it's quite a tricky question, actually. Probably the biggest benefit I have is in the use of communication. I think most people would say that. Technology has increased our ability to communicate, to travel and to move around the world. Technology has also helped me to look at different ideas that perhaps in reality wouldn't be possible. For example, when I was doing A-level economics we were able to pretend we were the government which realistically you'd never be able to do. Whereas with the technology I was able to do that so it's a great way of modelling things. And with the practical technology again modelling things is quite good.

8. Yes, definitely, especially IT.

6/7. Transcribed responses to question 7 for Humanities student teachers

1. Oh yes, definitely. My college work is much better, because I've got a computer.

2. Yes, I have my own computer and that's helped me a great deal. And you know TV as well, radio.

3. Yes. I think in the modern world technology is integrated into our lives to a very great extent, and it seems it is becoming more and more so.

4. Typing essays out is quicker using computers. I don't know if I've necessarily benefited from technology, but it's something that's here now, and you have to know how to use it to benefit from it in life. [uncertain]

5. Yes, certainly without the computer . . . that would be the first thing that springs to mind. At the moment I don't think I could do without it. Although I think I could do a lot better

with it. So yes, I can think of benefit's. All the things I use at home to help me around the house, driving, everything really.

6. In the kitchen, . . . is medicine technology or is that more Science? I'm not really sure where the boundaries are. Well, it's medical technology. Medicines I would think as well, yes.

7. Yes, I would have said so. I mean certainly medically there's different tests they can do. Using technology that has benefited me, yes. Computers always useful for assignments.

8. Yes, I mean if you count word processors [computers] as technology, definitely. I wouldn't have been able to get half my assignments done with ease. Well anything you find in the kitchen, or cars, anything.

7/7. Transcribed responses to question 7 for Technology A-level students

1. Yes. Computers, really. They help immensely with work, you can type out a document and then when you know something is wrong, you can delete that bit whereas if you wrote it down, you would have to rewrite the entire essay. I suppose is does help in drafting. And many other ways, I suppose we don't really notice them at times.

2. Yes. Probably everything I do. Practically everything I do would be impossible without technology, I'd say.

3. Well, first of all I chose it because I had to do it at GCSE and I enjoyed doing it because it was a break from the normal academic subjects. But since then, as I've done it at A-level, I've learnt that it's everywhere, it's business studies, and it's maths and it's science, and it's art. It's basically all subjects rolled into one. But you can make something as well. So you get a chance to use your hands as well as design and use your imagination. That's why I like it, and I think I've benefited from technology [yes].

4. Yes. I've got a greater understanding of electrical equipment, engineering which is what I want to go into. Should help me.

5. Yes. I've learned how to make things and to design objects and to produce quick working drawings.

6. Probably. Around my home; lots of things I use to make my life a lot easier that wouldn't have been around years ago before they were developed by technology. And technological advancements in cars make it a lot easier for me to learn to drive.

7. Yes, TV, I like listening to music, computers, that's how I have benefited from technology really.

8. Yes, a lot. Yes, it's aided me in all the tasks that I've done, especially in college using the computers, and in general use of technology, yes, it's widely used.

8/7. Transcribed responses to question 7 for Humanities A-level students

1. Definitely, I mean with word processing, everything's easier, so much easier now. I mean to get into any job now you have to have computers or anything, and you need to have the meaning of it. They have made it a lot easier to use. And I suppose yes. I've benefited from that. Lots of other things like with school, you learn more through different things. At college they have computer programmes to help you do things; benefit from that.

2. No.

3. I suppose it makes things easier for people, so I suppose it makes things easier for me, but nothing I can think of.

4. Yes. Well like I said with computers, they're helpful. And also using programmes like Kudos which help you in careers, help to find out exactly what to do with yourself.

5. Yes, in the classroom. For example I've learnt a lot about technology in Secondary school, you know IT to computers and Craft Design and Technology [CDT].

6. I would say only by computers really, although that's been a big help at college [uncertain].

7. Yes, well it helps me to wake up early. Helps me to cook my food quickly. Cars are a form of technology. It's more convenient to travel in a car. Right now I'm topping-up some course work via a computer. So I think I've benefited in a number of ways from technology.

8. Definitely. I feel more secure now I've got my stereo that the face comes off, and I don't know someone might get in my car and steal it. I mean a couple of years ago it was a big stereo to carry out, now it's nice and small. With reference to computers it makes it so much easier when you're typing up work you can save it and then go back to it, and not think what was I doing, because you can know just by looking at it. Yes, definitely.

Question 8: *Do you think our society in general has benefited from technology?*

1/8. Transcribed responses to question 8 for D&T teachers

1. Yes, but there are also detriments in society with problems of new technology taking over in the workplace, unemployment caused by that, retraining because of new technology. Obviously pollution is a big problem, and that is down to technology. Really we need to be using the technology to be sorting these things out more than we do.

2. Yes, I think so, because you know there have been advances in medicine, things like that, which must be good for everybody, and in all the labour-saving equipment, you know, that sort of thing as well.

3. I think the answer is similar to No. 7. The answer is clearly yes, but again with qualifications, and again I think we are beginning to understand increasingly that as well as the benefit's there are also downsides. And there is more political will if you like, to address the downsides of technology and enhance the benefit's.

4. This is a lovely moral issue isn't it. Yes overall. Trouble is, Man is sinful. We often misuse technology. We've misused it in wars, we misuse our chemical technology in making drugs. We misuse the video. But yes, overall technology does enhance life. I think we need to look more closely at it. I think the car again is a classic example. A thing which has greatly benefited our mobility, our standard of living, but I think we are also poisoning ourselves with it. So I think we have to look very carefully at technology, we mustn't just just follow technology for technologies sake. The computer is another example. Some people will do jobs on computers which it is quicker to do by pencil and paper. They are simply hooked into computers; Oh, it must be done by computer.

5. Yes, it has, as a general answer. It's [society] also suffered from technology, but it certainly has benefited from technology in the fact that without it there would be lots of things we couldn't do.

6. Yes. Many products last longer, so there is less pollution in some ways from them. Can be a problem when things last too long. Things like cars have a very short life. Also footwear has changed a lot. Electronics on the leisure side of things has mushroomed enormously in TV and so on. On the admin side of society the use of computers has been a bad thing.

7. Undoubtedly, in the main. There are always drawbacks to some things I suppose. But in the main technology has been beneficial to our wellbeing.

8. Yes. I do. Well, I mean people's houses, the quality of the houses they live in, although they may not be my style of house. The way that people can live, and the sort of lifestyle they can have is very much due to technology. So if they look after what they've got, even if they don't own their own properties they can live in a very comfortable way by the use of technology. So I think society has benefited in that way.

2/8. Transcribed responses to question 8 for Humanities teachers

1. I am sure it has, but I think there are some situations where we . . . the job could actually be done in a far more straightforward manner, and we use the computer as a tool and in fact it complicates the system, time-tabling being a classic example.

2. Yes and No, I suppose. I think we have benefited greatly in many ways, but technology is often something which is not used in the best possible ways, and I think it is not always applied in the best ways. Think of things like television. I think that's often abused. It could be used much more in educational ways but it's not. It's abused for commercial reasons at times. And people who sell airwaves for money, they envisage what the maximum number of people watching rather than any other reason.

3. In general terms I think society has benefited from technology. There are a few concerns if we look at things such as the environment or education that was mentioned in one of those other lists, there are downsides of that where I think technology has to be backed with a sort of moral dimension and a sort of concern rather than just technology being made to help to produce profit. That's my only concern on that. But certainly the general comment would be yes society has [benefited].

4. Yes, definitely.

5. Yes I do. You can look at the old photographs of Harwich, and the old way of life and it's all very nostalgic. And there are times when it is nice to leave technology behind, and it's nice to disappear and get away from technology. But I wouldn't want to say good bye to it for good.

6. I don't think society is any happier, and I use that word 'happier' deliberately. Certain people have benefited, Bill Gates worth more than Iraq, but there are certain people who have benefited from it enormously. But I think there are costs and benefit's with it and I don't think that technology has produced satisfaction on it's own. I think those are moral ethical issues, and technology is not neutral but I don't think of it'self it has benefited [society].

7. Yes, I do.

3/8. Transcribed responses to question 8 for parents in technology jobs

1. That one could take a year to answer. There are a large number of pluses, there are also a large number of minuses in the equation. We have benefited in the short term. I was a little surprised last night. There was the Green Party political broadcast. I don't know if you saw that. It equated the life of the earth to the last 45 years I think it was, and I think agriculture was invented 6 hours ago and the industrial revolution started an hour ago. And we are now living with the consequences of that one hour. It is going to cause us a lot of problems in the future. We have not reached the end of the road with the problem side of it.

2. Yes. I think it has, but not as much as it could. I think it can be misused.

3. Yes.

4. I'll have to think about this carefully; very carefully. I think I could say there are no definite clear answers here, but more not or no than yes. For example you have a generation of young people in schools who have been exposed to the convenience of calculators, computers, but they fail to understand mental arithmetic and manual Maths. Doing Maths that I learned at school. I mean when I left school I was lucky to have a slide rule. That was the state-of-the-art of calculating engines I was permitted to have. Which meant that the actual work I put in in understanding mathematics was all performed in a manual manner. Therefore I was able to get a much stronger grasp of things like Maths. Whereas now it is made so easy that if a child doesn't have a calculator, it's lost. Oh! Use log tables. Don't know how to do that. Use long division or multiplication; I don't know how to do that. Give me a calculator, I'll do it. Our society has benefited materialistically, but whether that's good for the development of mankind I'm not sure. Technology is destroying the environment at the moment, I mean pollution or our misuse of technology which is often driven by money and profit. People sell petrol for petrol engines for profit. And unless the profit's greatly drop, they will not push all of their investment into alternative electric or means of transport which are non-polluting. While they are still making profit's from polluting technologies, it will slow down alternative technologies. Only when they cease to make profit's will they look for other means.

5. Those that know how to use it, yes.

6. Yes and No. Again certain aspects of technology have made life a lot easier for people, but there is a downside: the effect that things have had on the environment. Maybe different social skills too, people don't communicate in the same way that they did previously.

7. Yes, but as I say, I do think we need to have a serious thought where we are going particularly with Biology.

4/8. Transcribed responses to question 8 for parents in non-technology jobs

1. Well, the general public going shopping, you know with scanning everything must be a lot quicker than having to put prices in the till all the time like we did years ago. I mean people moan and groan when there are queues, don't they. They don't want to stand there for the best part of an hour or so queuing.

2. No. It's made us too selfish. We don't have enough time for each other.

3. Well I suppose we must have done, but . . . I'm sure of it really yes. Life must be a lot easier now.

4. Not in all aspects, no. For's and against's probably. I don't know. Say 60% 'for' and 40% 'against', I would say.

5. Yes, I would say so, yes. It's progressed.

6. Yes, I would say that it has, although it does tend to make us lazy as well. We tend not to use our brain quite as much as we might have done. Just the use of calculators for one, I mean I'm hopeless at adding up in my head now because I always use a calculator. So there is a negative side. But on the whole yes, it's progress.

7. On the whole, yes.

8. I would think yes our society has benefited from technology, but . . .

5/8. Transcribed responses to question 8 for D&T student teachers

1. Yes, again in the same way. it's the quality of life, quality of information, that kind of thing.

2. Again, going to the health side of things yes, definitely. Obviously with communications again, yes we've benefited an enormous amount. People who are disabled have also benefited, like the deaf and the blind etc. However, as with all things there are down sides as well. You can get transport things, pollution problems etc. But I think a fine balance between the benefit's and the downsides.

3. Yes. I think we've benefited from technology, but some people are losing their jobs because of some technology. So although we have benefited from it a lot, and it's made our life easier, there's the other side of it as well, where people are suffering as well. People are losing jobs.

4. Yes. I'd say it has, but I think in a lot of fields without the development of technology there'd be a lot of things that perhaps haven't been discovered, or can't research into.

5. Yes. Again, it's because it has given people the freedom to look and do other things. Whereas before they may have been tied down to doing jobs or being in situations that technology helps to release you from. You know it just gives you that time to do things.

6. Yes, from how computers have developed, again, everyday things I think have helped to develop society, yes.

7. Yes I do, because technology in communicating, being able to get to different parts more easily now than say 15 - 20 years ago. Communication skills are even better now because of the introduction of the Internet and being able to get to other parts of the world sending mail. There are, though, disadvantages to technology . . . because it will only go to a point

and then there'll be a backsurge and you're going to find there'll be a lot of . . . , and I personally think there'll be a lot of unemployment due to the fact . . . what's happening now, a lot of jobs now . . . I know because I've got a lot of friends who are actually employed as computer specialists who feel quite guilty because they are doing people out of a jobs. So there is a slight downside to technology. It can be good to a point, but there are situations where I think the person would do just as good a job, and provide the service as well which is why . . . to do with teaching, I don't think they'll have computers teaching people, because you need that human face.

8. Yes definitely to progress forward.

6/8. Transcribed responses to question 8 for Humanities student teachers

1. Oh that's a dodgy one. There's two ways of looking at that. I have lots of different discussions with . . . Yes it has, because it's made life easier. But it's made things difficult for people who aren't very well versed in technology because they are finding the job situation an awful lot more difficult. I have to say it's computers and technology that have probably aided unemployment to an extent. That's a dodgy situation. My views are that it has not helped the situation.

2. Yes I do. But I do think things like TV diminish social relationships, because it does make you stay at home. It encourages you not to be so social, and I suppose computers have the same sort of thing. There has to be a balance, I think.

3. Yes.

4. Well it's got to keep up with the rest of the world. I think things get done quicker. Things are more precise. Well, yes I suppose it has. I know there are 'for's and against's' though. I don't know. I don't know.

5. Yes, yes. I think there are perhaps some downsides. On the whole I think we have a great deal.

6. Yes. Computer technology for example. As well as the others I've already said.

7. Yes, I think it has benefited us, but there are downfalls as well. Personally, I think people are a lot more lazy for it. And there are times when we take it for granted. We have a power cut or something and everything goes to pot, doesn't it.

8. Yes. Yes I do, and the above as well. And communications have benefited too. So therefore yes.

7/8. Transcribed responses to question 8 for Technology A-level students

1. Yes. All societies have benefited from technology. It makes life a lot easier. Cars really, that's one of the first technological advances. People use them now to conduct their business. They can move things around quickly, help people to get to other destinations. I suppose it could be helpful in a lifestyle as such, help you get to different places instead of walking such a great distance. Many other things in technology really - society has benefited, because I don't think they could do without it [technology] now. computers help people conduct their business, do things a lot faster. computers all around at the moment, they just basically control everything. There aren't many things left now which don't have a computer helping them in some way.

2. Yes. In the same way really. Practically every aspect of our society has benefited from technology.

3. I think without technology we wouldn't have any future, we wouldn't get anywhere. We would just be stuck in the same position where we are. There's no way that we could improve.

4. Yes, I think we have gained a lot in the know-how of computers, and the development of them.

5. Yes. People designing things everyday, designing things better, through new technology. Things such as computers, they are increasing in power everyday, cars are getting better, buildings are being built better.

6. Yes it has I suppose. It's made our lives a lot easier, but I suppose it's getting away from doing hard work ourselves, I think we are relying a bit too much on it. But it does help.

7. Yes. The economy basically from the ease of computers being able to process loads of . . . quicker, and also employment.

8. Yes, the way just what I said for 7 really. The way it's a lot more efficient using technology.

8/8. Transcribed responses to question 8 for Humanities A-level students

1. Oh definitely, with like putting men on the moon, and finding out what's out there. Everything really, I mean planes are quicker, whole of society is better really, I think.

2. In some ways. I think that it's easier recording data definitely, so you can actually see the writing, you can type it, so when you're writing out course work it's nicely presented. But I do think it takes a lot away from actually learning to write. Because especially with a computer, I think computers will become so widely used. I think it [computer] takes away the personal aspect from writing a lot of the time. And also I think people don't read as much as they used to. I think that computers are used as an easy way. I mean I love

reading, so it's something I'd rather do. But I think computers have taken over from . . . whereas people used to sit and read a book, they now sit in front of a computer. I think it's taken away from other things that are more benficial to especially education and more general cultural interests.

3. Yes. Things are produced a lot easier and safer, and in bigger amounts.

4. Yes, I think so. I really can't think of anything.

5. Yes, because I think that for our society to move forward, technology has got to develop.

6. In many ways it has in the production, I would say. But I suppose a lot of people would argue that jobs have been lost through it. Some things now involve less people when there is more technology involved. I think overall it has helped to progress things.

7. I've got a very liberal view towards that. Yes I think society as a whole has benefited by technology in terms of industry, but at the same time I think it has actually . . . as well as benefiting our society we've had a side effect, it's actually ruined our environment. I think it has benefited our society.

8. Yes and No, because I mean when you look at the news and you see that there are some people. . . there's like a lot of computerised robot taking over jobs, Ford's and stuff, and people being laid off, I mean it's making it easier and more efficient, but it's also putting people out of work. So I think it's like a 50/50 answer. Yes and No.

Question 9: *Do you think our society is dependent on technology?*
Sub-question: *Where on a scale of 1 to 9 would you place any dependency?*

1/9. Transcribed responses to question 9 for D&T teachers

1. Yes in general I think so.
   That really depends on who in society you are looking at, because I think that different groups have different dependencies. I think that some of the pupils I teach have a very high dependency on technology. Whereas perhaps in a less well-off area they may have a lower dependency on technology; say 5.

2. Yes I guess it has become so definitely, yes.
   I think it is very high, I would say 8 or 9.

3. If you mean by 'our society' western industrial society, I think the answer again is clearly yes. If technology was withdrawn, we would be at a very low level materially, and socially and every other way. The best thing that technology has done for us really, it's very much like the Roman and Greek times, has freed us up and given us the time to pursue other intellectual pursuit's, and so society has progressed. If we were at subsistence levels we

wouldn't have progressed intellectually and culturally anywhere in life as far as we have done, largely because technology has given us the freedom and the time to do it.
In terms of our society, I would say 8 or a 9.

4. Absolutely, but totally unaware of it in a lot of cases.
   I think it has got to be up at the top. I think it's got to be 8 or 9. Particularly the developed world. Obviously parts of Africa, deserts places like that it's got to be the other end, because they only use the technology that they make themselves. In the western world, the developed world I think we are totally dependent on it.

5. I've been talking today to 5th years, sorry year 11's, in preparation for their exams and trying to do some revision, and reminding them that 150 years ago how would they have existed without plastics, because they would have to, there being only natural resins and cellulose to a certain extent, but nothing to what they've got now. They were going through the list and realising what they could and couldn't wear, what they could or couldn't listen to, and what they could or couldn't do, and they were suddenly realising that the majority of their life is dependent on plastics. And that's purely technology based industry developing slowly from 150 years ago.
   I would place it 8 to 9 because we could exist, but we couldn't exist in the way that we are doing at the moment. Our society would have to change totally if technology was some how dispensed with. Then again technology isn't only high technology, so any manipulation of materials would still cause a primitive society a very high dependency on technology.

6. I don't think society would exist in quite the same way without the current use of technology, without electronics to help. It's changed the number of people working in certain offices, reduced them by quite a lot. We have the same sort of thing at times, but many more people involved in administration.
   Fairly high, probably towards the 9 because I think if you lost some technologies it would bring quite big changes in social structure and employment of people, which would change society.

7. Almost totally now I would imagine, yes.
   I would say for in modern society we are probably nearer 9.

8. Well I mean life-styles are set up to use it. Therefore you fashion things round it. I think for instance the video recorder has been a very useful tool. OK television is, but I also think that with the tool of the video, one has been able to be very selective about what you want to watch, and what you want your siblings to watch. So I think that if you look at it from that point of view we are dependent on it and use it and we use it as a recreational activity very much in the home. And it has been pointed out that children are more sedentary than they used to be because then there is something to give them information, it may not be just pure entertainment. They are happy to sit down and listen to something, absorb information, or use a computer game, as opposed to going outside and kicking a

ball. Also parents, if they have lots of children or a busy life-style they use these things in order to educate, entertain their family/children. So I think they do. . . I think one does become dependent on it, expect a money machine to be there to be available for you to use. You don't want to go in there during banking hours, because they are exactly the same hours you have. But you are dependent on technology in a washing machine. You know you don't do it by hand, that sort of thing.
For city people, town people they I think rely on it a lot. You know it might be 7 or 8. But I think "country people" who have chosen to live out in the countryside are in a slightly different aspect. I mean this a mass generalisation, I think they are less dependent on it. I mean for instance being a technology teacher where I live in a village we get power cuts at certain times. So we make sure that we are set-up just in case we have a power-cut. So if we did we could exist for quite a long time without using electricity or gas or oil. So I mean you set yourself up accordingly. That's perhaps an awareness of technology. You know if you live up in the north of Scotland you'd be prepared for such things. I don't know whether that's because the teacher I am or it's because of the person I am. I would think they are less dependent on it . . . say 5 and the others say perhaps 8**.**

2/9. Transcribed responses to question 9 for Humanities teachers

1. I think nowadays it probably is Yes. Certainly looking at the youngsters. They all seem to have ready access to all types of Hi-Fi's, computers and so forth. I think it stops their imagination a great deal
   Probably about 7 at the moment.

2. Yes I think it is very much so. People going into hospital or wherever are completely dependent on computerised machines which monitor their life and all the rest of it; like supplies of oxygen and such like. Many doctors rely to great extent on that, medicine, getting to work. Be impossible without technology, you know if you lived 50 miles away from where you work, you couldn't get there within a day or two if you didn't have a modern means of transport.
   In terms of our society I would say 8.

3. Yes. I mean absolutely. Now that we don't actually make a living off the land ourselves, now that we are not self-sufficient, and we are not in subsistence production, the very fact that we have to come to work most of us in a car, means that we are dependent on that technology, the technology of maintaining roads, of oil production being available so very much so. Yes, I think we would grind to a halt.
   I think I've got to go all the way for 9 in our current society. I mean if we are talking about Britain then 9.

4. Yes.
   9

5. Yes.
   8 or 9. As a society we are totally dependent on technology.

6. Oh yes. In Britain today, transport technology, communications technology, in education we are increasingly technology dependent. When I started teaching 18 years ago, and I think of the lack of technology, and my view on technology is when technology comes along, people look at it and say how can I use it rather than say what do I need let's develop the technology.
   In general for society up on the 7, 8, 9 at the moment. If for instance transport technology went society would collapse because everything is built on that communications technology, and what happened in Yugoslavia—when in war those linkage technologies went the society collapsed. The technology of war was so great imposed on a society which wasn't able to handle it, but it destroyed it, so yes it's very dependent on technology.

7. No I don't.
   Say about 4.

3/9. Transcribed responses to question 9 for parents in technology jobs

1. Absolutely.
   9.

2. Yes, more than it should be.
   I think probably the 7.

3. Yes.
   9.

4. It is now. Yes I do.
   We are greatly dependent on technology. In a modern society like we have in England, if you were to suddenly take away electric power, the mottor car, the things we rely on a day-to-day basis the average family would be in chaos. They wouldn't know how to survive. Yet you look at families in 3rd world countries they treat these as not so essential. They are used to living without, they would survive. But I think a lot of families. . . if you were to suddenly take away the technology which we use everyday, they'd be forced to. . . I'd put 9.

5. I suppose in a way it is, actually, yes.
   I would say 7.

6. Yes, I think it has become dependent.
   Between 7 and 8.

7. Yes.
   Well to be quite honest, particularly in this day and age, you've got to be up at the 9.

4/9. Transcribed responses to question 9 for parents in non-technology jobs

1. [No answer]
   5

2. Yes I do, because everywhere you go people have got mobile phones. They can't live without a computer. They can't talk to each other now without some form of abbreviation zipped into that machine. The youngsters are not human. If they can't play a Game Boy or they can't play a Sega. Or even if they've got a proper home computer, they must have games on it. And why? it's not meant for that, you write your story on it, and leave it alone. My husband always says it's a wonderful thing; I don't think it is.
   I think it's No. 6.

3. Definitely now. I don't think we could go back to being. . .
   About 7 I should think.

4. It appears to be going that way, yes.
   In the society we are living in at the moment, I would say 7.

5. I think probably yes, a fair bit. It would collapse around us, it would make life a lot harder for people.
   7/8 or even 9.

6. Yes, I would think it is by now, definitely when you think of hospitals and all the technology used in hospitals; we're very dependent there, yes.
   It's got to be up at about 8, I would have thought.

7. Yes, I think it has become that way.
   I suppose about half-way, about 5.

8. Oh yes, I would think so. Yes.
   5.

5/9. Transcribed responses to question 9 for D&T student teachers

1. I think it's becoming dependent, yes. The way things have developed now I think we would find it very hard going back to square one. Yes, I think it would be very difficult.
   I'd say 7.

2. Yes, most definitely. There's no question of that.
   Society as a whole? I would say is about number 8, if not number 9.

3. Yes it is.
   It's quite high really, in this day and age. I think you are talking 7 or 8.

4. Yes.
   6.

5. Yes I do. Yes because I think everything is inter-dependent. If you haven't got the technology on the farm, you're not going to produce as much food, and if you haven't got enough food, then it's going to affect the way the whole society is run. If you haven't got transport, you cannot get your goods around. If you haven't got energy which is an important technological advancement, you can't make things, you can't do things. So I think without these things, they are all inter-related. If one breaks down you notice it don't you.
   I would say 9.

6. I suppose some aspects of it are yes, are dependent on technology.
   I would have said somewhere about 6 or 7.

7. At the moment . . . well we are and we aren't. We are in the sense that without it we'd be . . . well, yes, we are. We'd be completely lost without technology. To be honest, we wouldn't be here now if we hadn't invented the wheel. And the wheel was the first stepping stone on the technological . . . so yes. We wouldn't be here today if we didn't have technology. So yes we definitely depend on technology.
   9 no question about it.

8. Yes. We've progressed to such a state now that technology's very important. It's responsible for a lot of things.
   8, I think we are very dependent.

6/9. Transcribed responses to question 9 for Humanities student teachers

1. It is becoming so.
   Probably about 7.

2. Our society is, yes, I think so.
   I would say probably about 8.

3. Yes, and becoming more and more so.
   Well at least 8.

4. It is so now. I would say it is now.
   I'd say 8.

5. Yes, I think we can't escape it now.
   8.

6. Yes.
   I would say 9.

7. Yes, I think it is.
   Probably about 7.

8. I think we are now. Maybe too dependent because when things go wrong it sort of stops for a while.
   It depends on which part of the world you are in I suppose, but between 7 and 8.

7/9. Transcribed responses to question 9 for Technology A-level students

1. Yes. Really every single aspect somewhere. Maybe not right in the beginning, nor right at the end, but in the middle I suppose, technology has to be used. Even farmers see how they work on the land, they still have to use their tractors, which is technology, help them work the land make good use of it with tractors. But nowadays they have such huge fields, and to get the crop in so quickly because they need the money, and have to use tractors just to help them do it.
   I'd say 7.

2. Yes. Everything we do would just fall apart if there wasn't technology.
   9.

3. Well no because you've got to have a balance of everything, but I think that if we didn't have technology then that would be a great loss.
   It would be quite high. I'd probably say 7, 8, 9.

4. I think it has become a lot more dependent of late. I wouldn't say it was dependent though, not particularly.
   I'd say about 5.

5. Yes.
   I would say 7.

6. Yes. I don't think much of our businesses could run without all the technology we have at the moment; they'd be a bit stuck. There's a lot of work they have to get through. It doesn't half help them to cope the technology.
   For the more important jobs I suppose it would be quite high like 7 to 8.

7. Yes.
   About 5.

8. Yes very much so.
   Round about 6, round about 7.

8/9. Transcribed responses to question 9 for Humanities A-level students

1. I suppose it is really. It must be dependent on some sort of technology. Otherwise you wouldn't get anywhere without it. You would still be back in the dark ages.
   8 - I think it's quite high.

2. Yes I do. Definitely because I think with more new industries coming in, I think definitely. They are so dependent on their computers that if their computers shut down somehow, then the whole country would go haywire. The telephone systems went down with their computers or Gas Board or whatever I think the whole country would be in. . ., or that area, would definitely be in disaster. So I think we are very dependent on technology.
   About 7 I'd say.

3. Wouldn't say it was totally dependent, but to some degree yes.
   5.

4. I think so now. Yes they have become [dependent] because it's there now and we know how to use it. I think a lot of people would be lost without it.
   I'd say it's about 8 to 9.

5. Yes.
   7 or 8.

6. Yes. I think it has progressed enough that we do rely on it now.
   I would say probably 6.

7. Very much so now. Yes. In terms of everything becoming . . . wherever you go for a job, they'll ask you if you have any understanding of computers, if you can drive a car. Yes I think that we are very dependent on technology.
   I think something in the neighbourhood of 8. I'm quite reliant on technology, yes.

8. Definitely.
   Say about 7.

Transcribed by Stan Owers—1999-2000

Appendix 10 - Tabular summary of key-word responses to question 2

Can you describe briefly what is meant by technology?

Keywords	Key words in curric doc's	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word useage count
Advance		0	0	0	0	0	0	0	0	0
Advanced		0	1	0	1	0	0	1	1	4
Advancement		0	0	0	1	1	1	0	0	3
Advances	√	0	0	0	0	0	0	1	1	2
Advancing		0	0	0	0	0	0	0	0	0
Aid		0	0	0	0	0	0	1	0	1
Anything		2	2	2	0	1	1	0	0	8
Appraise	√	0	0	0	0	0	0	0	0	0
Art	√	0	1	0	0	0	1	0	0	2
Artefacts	√	1	2	0	0	0	0	0	0	3
Build		1	0	0	0	0	0	0	0	1
Building		0	0	0	0	0	0	1	0	1
Business	√	0	1	0	0	0	0	0	0	1
Businesses		0	0	0	0	0	0	0	0	0
Capability	√	0	0	0	0	0	0	0	0	0
Change	√	0	0	0	0	0	0	0	0	0
Chemical		0	0	0	0	0	0	0	0	0
Chemistry		0	0	1	0	0	0	0	0	1
Colour	√	0	0	0	0	0	0	0	0	0
Comfortable		0	1	0	0	0	0	0	0	1
Computer	√	0	0	0	2	1	1	0	0	4
Computers	√	0	1	2	8	2	7	0	6	26
Computing		0	0	0	0	0	0	0	0	0
Construct		0	0	0	0	0	0	0	0	0
Constructing		0	0	0	0	0	0	1	0	1
Construction	√	0	0	0	0	0	0	0	0	0
Control	√	0	0	0	0	0	0	0	0	0
Convenience		0	0	0	0	0	0	0	0	0
Convenient		0	0	0	0	0	0	0	1	1
Country		0	0	1	0	0	0	0	0	1
Craft		0	0	0	1	0	0	0	0	1
Crafts		0	0	0	0	0	0	0	0	0
Craftsmanship	√	0	0	0	0	0	0	0	0	0
Create		1	0	0	0	0	0	0	0	1
Creates		0	0	0	0	0	0	0	0	0
Creating	√	1	0	1	0	0	0	0	0	2
Creative		0	0	0	0	0	0	0	0	0
Creatively	√	0	0	0	0	0	0	0	0	0
Creativity		0	0	0	0	0	0	0	0	0
Defence		0	0	1	0	0	0	0	0	1
Depend		0	0	0	0	0	0	0	0	0
Dependent		0	0	0	0	0	0	0	0	0
Design	√	1	3	0	1	4	3	0	0	12
Designing		2	1	2	0	0	1	2	0	8
Develop		0	0	0	0	0	0	0	0	0
Developing		0	0	0	0	2	0	0	1	3
Development	√	0	0	2	0	0	0	1	0	3
Developments		0	0	0	0	1	0	0	1	2

Keywords	Key words in curric doc's	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word useage count
Digital		0	0	1	0	0	0	0	0	1
Easier		0	2	0	1	2	2	0	1	8
Easy		0	0	0	0	0	0	0	0	0
Economic	√	0	0	0	0	0	0	0	0	0
Economics	√	0	0	0	0	0	0	0	0	0
Economy	√	0	0	0	0	0	0	0	0	0
Efficient		0	0	0	0	0	0	0	0	0
Efficiently		0	0	0	0	0	0	1	0	1
Electrical	√	0	0	0	1	0	0	0	1	2
Electronic	√	0	0	1	0	0	0	0	0	1
Endless		1	0	0	0	0	0	0	0	1
Energy	√	0	0	0	0	0	0	0	0	0
Engineer		0	0	1	0	0	0	0	0	1
Engineering		1	0	5	0	0	0	0	0	6
Enterprise	√	0	0	0	0	0	0	0	0	0
Enterprising		0	0	0	0	0	0	0	0	0
Entertainment		0	0	1	0	0	1	0	1	3
Environment		1	2	0	0	0	0	0	0	3
Environmental	√	0	0	0	0	0	0	0	0	0
Environments	√	1	0	0	0	0	0	0	0	1
Equipment		0	0	0	0	0	0	1	2	3
Everybody		1	0	0	0	0	0	0	0	1
Everyday life	√	1	0	0	0	1	0	0	0	2
Everything		0	0	0	1	4	0	0	1	6
Fibreoptics		0	0	1	0	0	0	0	0	1
Fitness for pur	√	0	0	0	0	0	0	0	0	0
Food	√	0	2	0	0	0	0	0	0	2
Form	√	0	0	0	0	0	0	0	0	0
Forward		0	0	0	1	1	0	0	1	3
Future	√	0	0	0	0	1	1	1	0	3
Futuristic		0	0	0	0	0	0	1	0	1
Generic		0	0	0	0	0	0	0	0	0
Hardware		0	0	0	0	0	0	0	1	1
Health	√	0	0	0	0	0	0	0	0	0
Home	√	0	1	0	0	0	0	0	0	1
Human		2	1	0	0	0	0	0	0	3
Humanity		0	0	0	0	0	0	0	0	0
Humankind		0	0	0	0	0	0	0	0	0
Humans		0	1	0	0	0	1	0	0	2
Idea		0	0	0	0	1	0	0	0	1
Ideas		1	0	0	0	2	0	0	0	3
Imagination		0	0	0	0	0	0	0	0	0
Improve		2	0	0	0	0	0	1	0	3
Improvements		0	0	0	0	0	0	0	0	0
Improves		0	0	0	0	0	0	0	0	0
Improving		0	0	0	0	0	0	0	0	0
Industrial	√	0	0	0	0	0	0	0	0	0
Industry		1	0	3	0	0	1	1	0	6
Information		0	0	0	1	1	0	0	0	2
Innovate		0	0	0	0	0	0	0	0	0
Innovates		0	0	0	0	0	0	0	0	0
Innovation		0	0	1	0	0	0	0	0	1
Innovations		0	0	0	0	0	0	0	0	0
Innovative		0	0	1	0	0	0	0	0	1

Keywords	Key words in curric doc's	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word useage count
Intellectual	√	0	0	0	0	0	0	0	0	0
Invent		0	0	0	0	0	0	0	0	0
Inventive		0	0	0	0	0	0	0	0	0
Invents		0	0	0	0	0	0	0	0	0
IT	√	0	3	0	1	2	2	0	0	8
Knowledge	√	2	0	0	0	1	0	0	0	3
Leisure		0	1	0	0	0	0	0	0	1
Life	√	3	1	0	1	3	1	0	1	10
Life's		1	0	0	0	0	0	0	0	1
Live		0	0	0	0	0	0	0	0	0
Living		0	0	0	1	0	0	0	0	1
Machine		1	0	0	0	0	0	0	0	1
Machinery		0	2	0	1	0	0	0	2	5
Machines		0	0	0	0	2	0	0	0	2
Made		2	2	0	1	0	0	1	0	6
Make	√	2	2	2	3	3	2	1	4	19
Making	√	3	0	0	1	0	2	0	0	6
Man		0	2	0	0	0	0	0	0	2
Mankind		0	0	0	0	1	0	0	0	1
Manual		0	0	0	0	0	0	0	1	1
Manufacture		0	0	0	0	0	0	0	0	0
Manufactures		0	0	0	0	0	0	0	0	0
Manufacturing	√	0	0	0	0	0	0	0	0	0
Market	√	0	0	0	0	0	0	1	0	1
Marketing		0	0	0	0	0	0	0	0	0
Markets		0	0	0	0	0	0	0	0	0
Material	√	0	0	0	0	0	0	0	0	0
Materials	√	5	2	1	0	1	0	1	0	10
Mathematically		0	0	0	0	0	0	0	0	0
Mathematics		0	0	0	0	0	0	0	0	0
Maths	√	0	0	0	0	0	0	0	0	0
Mechanical		0	0	1	0	0	0	0	0	1
Mechanisms		3	0	0	0	0	1	2	0	6
Medical		0	0	2	0	0	0	0	0	2
Metalwork		0	2	0	0	0	0	0	0	2
Microwave		0	0	1	0	0	0	0	0	1
Modern		0	0	1	0	0	0	0	0	1
Nation		0	0	0	0	0	0	0	0	0
National		0	0	0	0	0	0	0	0	0
Need		0	2	1	0	0	0	0	0	3
Needs	√	2	0	0	0	0	0	0	0	2
New		1	0	0	0	0	0	0	1	2
Physics		0	0	1	0	0	0	0	0	1
Plan		0	0	0	1	0	0	0	0	1
Planning		0	0	0	0	1	0	0	0	1
Plans		0	0	0	0	0	0	0	0	0
Practical	√	4	1	1	0	1	0	0	0	7
Practically		1	0	0	0	0	0	0	0	1
Precision		0	0	0	0	0	0	0	0	0
Problem		0	1	0	0	1	0	0	0	2
Problems	√	4	2	0	0	0	0	0	0	6
Process		1	1	0	0	0	0	0	0	2
Processes	√	1	0	0	0	0	0	2	0	3
Produce		2	0	1	0	0	0	0	0	3

Keywords	Key words in curric doc's	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word useage count
Producing		1	0	0	0	0	0	1	0	2
Product		0	0	1	0	0	0	0	0	1
Production		0	0	0	0	0	0	1	0	1
Productivity		0	0	0	0	0	0	0	0	0
Products	√	1	0	0	0	0	0	0	0	1
Profit		0	0	1	0	0	0	0	0	1
Profits		0	0	0	0	0	0	0	0	0
Progress		1	0	0	0	0	0	1	0	2
Progresses		0	0	0	0	0	0	0	0	0
Prosper		0	0	0	0	0	0	0	0	0
Prosperity	√	0	0	0	0	0	0	0	0	0
Purpose		0	0	1	0	0	0	0	0	1
Quality	√	1	0	0	0	0	0	0	0	1
Radar		0	0	2	0	0	0	0	0	2
Research		0	0	2	0	0	0	0	0	2
Researching		0	0	0	0	0	0	1	0	1
Resources		0	1	0	1	0	0	1	0	3
Safe		0	0	0	0	0	0	0	0	0
Safety	√	0	0	0	0	0	0	0	0	0
Saleable		0	0	1	0	0	0	0	0	1
Science	√	2	1	2	0	0	1	0	2	8
Scientific	√	1	0	0	0	0	0	0	0	1
Sell		0	0	1	0	0	0	0	0	1
Shape	√	0	0	0	0	0	0	0	0	0
Skill		0	0	0	0	0	0	0	0	0
Skills		1	0	0	0	1	0	0	0	2
Social		1	0	0	0	0	0	0	0	1
Society	√	0	0	0	0	0	0	0	1	1
Software		0	0	0	0	1	0	0	1	2
Solution		0	0	0	0	0	0	0	0	0
Solutions		1	0	0	0	0	0	0	0	1
Solve		2	2	0	0	0	0	0	0	4
Solving		0	1	0	0	1	0	0	0	2
Spatial	√	0	0	0	0	0	0	0	0	0
Structure		0	0	0	0	0	0	0	0	0
Structures	√	0	0	0	0	0	0	0	0	0
System		0	0	0	0	0	0	0	0	0
Systems	√	2	0	0	2	0	0	0	0	4
Techniques		1	0	1	0	0	0	0	0	2
Technological	√	0	1	0	0	1	0	0	0	2
Technologies		0	0	1	0	0	0	0	0	1
Technology	√	5	8	15	5	13	3	4	5	58
Textiles		0	1	1	0	0	0	0	0	2
Texture	√	0	0	0	0	0	0	0	0	0
Thinking		0	0	0	0	1	0	0	0	1
Tool		0	2	0	0	0	0	0	0	2
Tools	√	0	0	0	0	1	1	0	0	2
Understand	√	0	0	2	0	0	0	0	0	2
Understanding		3	0	0	0	0	3	0	0	6
Understands	√	0	0	0	0	0	0	0	0	0
Use		2	2	3	1	5	0	1	2	16
Uses		0	0	0	0	0	0	0	0	0
Value		0	0	0	0	0	0	0	0	0
Values	√	0	0	0	0	0	0	0	0	0

Keywords	Key words in curric doc's	D&T teach-ers	Human-ities teach-ers	Par-ents in tech jobs	Par-ents in non tech jobs	Tech-nology student teach-ers	Human-ities student teach-ers	Tech-nology A.level stud-ents	Human-ities A.level stud-ents	Key-word useage count
Woodwork		0	2	0	0	0	0	0	0	2
Work	√	1	2	1	0	1	4	1	0	10
Works		0	0	0	0	1	0	0	0	1
World		2	0	0	0	0	0	0	0	2
	68	87	69	74	38	67	41	33	39	448
		87	69	74	38	67	41	33	39	448
Words in text		389	243	356	183	272	181	149	165	1938

Appendix 11 - Education/Industry Link initiatives

In the face of a curriculum that was perceived to be incomplete, many intiatives were introduced by minority groups that offered a service to education, and many with government backing. The details shown here come from two sources:

- A publication entitled 'School/Industry Links: A Directory of Organisations', and
- Literature or leaflets published by the initiatives.

The first of these two sources was prepared for the Department of Education and Science, the Department of Trade and Industry, and the Welsh Office by the Central Office of Information, and published in 1988. The foreword states:

> The Industry Year *1986* campaign laid the foundation for a positive change in the anti-industry attitudes which can still be found in our society. The Industry Matters campaign is carrying forward the momentum which Industry Year generated. A new spirit of better mutual understanding between schools and business has been forged, as demonstrated not just by the number but also the by the quality of new partnerships between schools and employers. But there is still much to do. We want every school involved with local industry and commerce because it is central to our policy that pupils' experiences at school should have increasing relevance to adult life and the world of work.
>
> The organisations listed here are to be commended for their efforts. We hope that this expanded and updated directory will help the development of new and stronger links between schools and industry to the whole community. We urge teachers, governors and employers to make use of the wide range of activities and materials which the contributors to this directory can make available.
>
> Signed jointly by:
> Rt Hon. Kenneth Baker, MP, Secretary of State for Education and Science,
> Rt Hon. The Lord Young of Graffham, Secretary of State for Trade and Industry,
> Rt Hon. Peter Walker, MP, Secretary of State for Wales.

The foreword provides evidence that the Government were trying to make education more relevant. The Directory of School/Industry links listed:

- contacts by region in the whole country,
- contacts in Central Government, and resources available from them, and
- independent organisations offering a service to education.

A brief selection from the Directory appears below. A selection of initiatives not in the directory are included in this list, the details extracted from published information. All these organisations offer a dedicated service to education:

1 Association of British Chambers of Commerce; the aims included:

+ … to encourage links locally between industry and commerce and schools, which will ensure the entry into employment of adequately motivated and trainable young people.

2 Banking Information Services (BiS) was a specialist education unit, with a remit to develop partnerships between education and the banking industry to their mutual benefit. Their third aim was:

+ to encourage the integration into the curriculum of provision for Economic and Industrial Understanding, and especially the management of personal and business finance;

3 British Association for the Advancement of Science; the aims included:

+ The popularisation of science and stimulation of discussion about science and technology and their social consequences.

4 British Gas Education was a dedicated department within British Gas plc and responsible for liaison with education in the widest sense. Through its programme of support for education, British Gas aimed to:

+ help raise awareness of the importance of industry to the national economy; in particular the contribution made by the Company;

5 British Institute of Management.

6 Building Experiences Trust is concerned with preparing young people to respond effectively to the challenge of the Built Environment. One of the aims was:

+ to help young people become visually literate, and articulate in the subject of their surroundings;

7 Careers Research and Advisory Centre Ltd (CRAC), is a link organization working at the interface of education and business and concerned with supporting both in the development of quality partnership activity. CRAC's aims included:

+ enhance young people's knowledge and understanding of industry and commerce;

8 Civil Engineering Careers Service

9 Confederation of British Industry; the aims included:

+ … To encourage schemes which bring about a closer understanding between schools and all levels of education and industry.

10 Department of Education and Science

11 Department of Employment

12 Department of Trade and Industry

13 Eastern Region Teacher Education Consortium (ERTEC) comprised six higher education establishments and The Engineering Council. The initiative, one of 18 successful bids out of 128 for 'Enterprise in Higher Education' funding, began a five year programme in 1990.

From the beginning, ERTEC planned an innovative programme of staff and student teacher secondments and placements in industry, alongside the development of more enterprising approaches to teaching and learning, and new course components. The purpose was to create a new generation of teachers with an understanding of the national economy and of the way industry and commerce work - teachers who were at home at a sales planning meeting or in a factory, as well as in a classroom.

14 Engineering Careers Information Service; the aims included:

+ To provide careers advice and information covering the whole spectrum of careers in the manufacturing engineering industry.

15 Engineering Council; the aims included:

+ To increase public awareness of the role of engineering in society, and to demonstrate the direct and beneficial impact good engineering has on everyday life.

16 Enterprise Awareness in Teacher Education (EATE), was established in 1989 to ensure that issues relating to enterprise, economic and industrial awareness were built into all approaches to initial teacher training (ITT). The aims included:

+ the promotion of staff development within all colleges of teacher training so that issues relating to enterprise, economic and industrial awareness are incorporated into all courses for trainee teachers;
+ the development among young people of a range of skills, competences and attitudes wider than the traditionally academic, and which have direct currency in contempory society;
+ active co-operation between the key elements of education and industry in any local community;

17 Geography Schools Industry Project (GSIP) started nationally in 1985 with a central team at the University of Oxford. There were 19 LEA based groups involved in the first phase of the project (1984-89), comprising more than 140 schools participating in curriculum development. These groups worked with local industry and the local community. A second phase commenced in 1989, with some 24 participating LEA's. The aims included:

+ Developing pupils' capabilities to use and apply knowledge, understanding, skills and attitudes, and undertake enquiries and action in relation to issues affecting their own lives. Such issues will relate to their roles as consumers, producers and citizens **…**

18 Industrial Experience; the aims included:

+ To provide opportunities for young people to spend six months in industry or commerce between leaving the sixth form and going into higher education.

19 Industrial Society helps organisations become more effective, productive and customer orientated through a more committed and motivated workforce. The Society does this by running courses and conferences and advising organisations in all sectors including Education. The aims included:

+ To increase understanding of the necessary place of industry and commerce in the creation of the nation's wealth, and the need for a positive and open-minded attitude to industry and commerce.

20 Industry Matters was an enterprise hosted by the RSA[3] as part of the 'Thanks to Industry 1986' campaign. The educational aims included:

+ 'link all secondary schools, and as many primary schools as possible, with local companies, industries and individual employees. The main aim will be to develop mutual understanding and to concentrate on curriculum development'—Nicholl and Selfe (1985:1.1).

21 Institute of Directors; the aims included:

+ To ensure that there are good links between schools and business so that the future business leaders of tomorrow are not deterred from careers in business, industry or commerce.

22 Institution of Electrical Engineers; the aims included:

+ To create a greater understanding and awareness of the electrical and electronic

[3] The Royal Society for the encouragment of Arts, Manufacures and Commerce

profession among schools.

23 Institution of Mechanical Engineers; the aims included:

+ To create an improved awareness of the mechanical engineering profession among schools.

24 Mini-Enterprise in Schools Project (MESP); the aims include:

+ provides a specialist support service to develop 'enterprise awareness' in education;
+ helps pupils understand the concept of 'enterprise';
+ enables pupils to learn about the structure of companies and how they work;
+ provides a structured basis for understanding the local economic and/or community infrastructure;

25 National Electronics Council; the aims included:

+ To provide information on the current and future roles of the electronic and information technology industry. …
+ To create links and contacts between representatives of industry and education, for the benefit of pupils.

26 SCIP - After the Ruskin College (Oxford) speech in 1976, by the then Prime Minister James Callaghan (now Lord Callaghan), one of the initiatives proposed was the Schools Council Industry Project. This was accepted, and the project started in 1978. Subsequently it was changed to Schools Curriculum Industry Partnership thus retaining the SCIP acronym. The aims of SCIP included:

+ to enable young people, irrespective of ability, age, gender or race, to participate effectively in a rapidly changing society;
+ to enable young people to develop qualities of personal initiative and enterprise;
+ to develop and sustain quality partnerships between education, industry and the wider community;
+ to promote economic and industrial understanding (EIU) in all key stages of the National Curriculum;

27 SATRO - Starting in 1971, a network of more than 40 Science and Technology Regional Organisations was established. SATRO's operate throughout the United Kingdom under the guidance of the Standing Conference on Schools' Science and Technology (SCSST); this is an independent national organisation established to promote the development of science and technology in schools.

The SCSST was formed in 1971 on the initiative of HRH The Duke of Edinburgh and a group of distinguished educationalists and industrialists, and has a mission to excite

young people about science and technology, industry and engineering.

28 Society of Education Officers; the aims included:

+ Professional body providing advice to its members.
+ To encourage a better understanding and closer working relationship between education and industry.

29 Standing Conference on Schools' Science and Technology; the aims included:

+ To promote developments in schools which enhance young peoples understanding of Science, engineering, industry and technology.

30 Teacher Placement Service: 'The aim of the TPS is to ensure that a placement in business is built into the career profile of every teacher as an essential aspect of professional development. This will only be achieved if the Service delivers a quality experience which provides identifiable benefits to teachers, company, school and above all pupils' - Peter Davies, National Director for the TPS 1989.

31 Technical Vocational Education Initiative - an initiative announced by Prime Minister Margaret Thatcher (1982:271) for implementation as a pilot scheme September 1983. TVEI was then 'a major [national] initiative to give young people aged 14-18 wider and richer education so that:

+ more seek and gain skills and qualifications of direct value at work;
+ they experience a balanced education involving modern approaches to technology;
+ they apply their skills and qualifications to real-life problems;
+ there is an emphasis on initiative, motivation, enterprise and other areas of personal development;
+ they get planned work experience and are better prepared for the world of work;
+ industry, commerce and public services have confidence in the curriculum.'

The Technical and Vocational Education Initiative found a lot of support, and not least because of the positive aims. However, there were concerns about creating a 'divided curriculum' that perpetuated 'Victorian views of knowledge and social class'—McCulloch (1994:60).

Although the TVEI budget amounted to £1 billion, it was always a bolt-on initiative, and therefore most unlikely to change the mainstream educational philosophy and culture.

32. Technology Enhancement Programme (TEP) was initiated as a pilot trial in 1991 for a period of three years. The programme 'was intended for students in the 14–19 age range following design and technology courses and brings together the teaching of technology, science and mathematics.' It was sponsored by the Gatsby Charitable

Foundation, and managed by The Engineering Council. During the pilot phase, the TEP worked collaboratively with 70 schools across the country—see Neighbourhood Engineers Education Briefing, Autumn 1994.

By 1999, more than '1200 secondary schools and colleges across the UK were part of the Technology Enhancement Programme'—issue 17, TEP News *and* Views.

TEP make available an extensive range of high-quality teaching/learning materials.

33 Understanding British Industry (UBI) began in 1977 as a project of the Confederation of British Industry (CBI) Education Foundation. UBI had three aims:

+ to improve understanding of industry, commerce and wealth creation among teachers of secondary school pupils.
+ to help teachers to influence school curricula and examinations, bringing the lessons taught in school more into line with the needs of adult life.
+ to improve understanding of the education system among people in industry and business.

From the time UBI began, the secondment of teachers to business was a top priority. In 1988 the Department of Trade and Industry produced a White Paper making teacher placements in business one of their major programmes and with the money to back it. After a 'pilot' programme, the Teacher Placement Service (TPS) began in May 1989 as a national service and was managed by UBI as part of The Enterprise and Education Initiative.

34 Understanding Electricity was the educational service operated by the Electricity Association on behalf of the major electricity companies in the UK and Eire. The purpose of the service was to make available to teachers and pupils, in primary and secondary schools, information and learning material about the nature of electricity, its production, distribution and consumption, and the part it plays in modern life. The aims included:

+ Assist teachers to implement the electrical content of the National Curriculum;
+ Provide support for Industry/Education liaison;

35 Understanding Industry: the aims included:

+ To provide 16-19 year-old students with a better understanding of industry and commerce; and to do this in some depth in the school timetable.
+ To involve teachers in the development of UI as a curriculum resource.
+ To involve business managers in their local schools.
+ Understanding Industry is a national organisation with over 30 Regional Organisers and is the only education/industry liaison organisation which specialises in putting

managers in front of students in curriculm time.

+ Through its eight-part course Understanding Industry aims to demonstrate to those staying on in education (the future opinion-formers) how a company operates and why successful companies are necessary to create the nation's wealth.
+ Understanding Industry maintains that it is vital for *all* students, regardless of their eventual careers, to understand these processes.
+ UI is not a series of lectures on industry and commerce, nor is it a recruiting exercise.

Appendix 12 -
"Knowledge 2000" - Conference on the Knowledge Driven Economy
Held Tuesday 7th March 2000

Programme & Speeches:

Speakers:		Topic
Stephen Byers	Secretary of State for Trade and Industry	The importance of the Knowledge Economy
David Blunkett	Secretary of State for Education and Employment	The development of skills through education
Tony Blair	The Prime Minister	The Knowledge Economy - Access for all
Antonio Guterres	Portuguese Prime Minister	The European perspective
Digby Jones	Director General - CBI	Fit for the Future
John Monks	General Secretary - TUC	Investment in people
Chris Humphries	Director General, British Chambers of Commerce	Skills/Training and the Changing Labour Market
Tony Dubbins	General Secretary, Graphical, Paper and Media Union	Closing the performance gap
Sharon Reed	Managing Director - FrameStore	Creativity; innovation; use of technology
Eric Newton	Managing Director - John Heathcoat & Co Ltd	Global competition, Research and Development, Continuous improvement and environmental awareness
Richard Holroyd Cathy Tinston	Head of Training, HSBC North West Regional Officer, UNIFI (HSBC)	Development of key skills in the workplace
Pat Macdonald Val Pugh	Human Resources Manager, Littlewoods National Officer, USDAW (Littlewoods)	Working in partnership to attain common goals

Appendix 13 - Knowledge, educational philosophy and the health of manufacturing industry

By 1870, the output *per capita* in Britain was the highest in the world; 'life was very hard for most people', but the 'average working man and his family had a real income', better than his equal in other countries—Ackrill (1987:3). 'About 40 per cent of all … traded manufactured goods … were made in Britain'; by 1880, the value of Britain's exports exceeded that of Germany, her 'exporting rival', by over 'two and a half times'—Ackrill (*ibid*). For any country, exports of manufactured goods provides an indicator of the health of manufacturing industry, as well as entrepreneurial drive, and such industry is a primary source of wealth creation.

The Great Exhibition of 1851 celebrated 'the supremacy of British technology'—Ashby (1958:50). 'British manufacturers … won most of the awards in all classes of exhibits'—Hazeldean (1986), Appendix 2. But it was the 'high noon' for British industry—Rolt (1970:148). Britain's industrial prowess would never be the same—Rolt (1970:177).

The Industrial Revolution was first experienced by Britain; it began about the middle of the eighteenth century, and by 1850 Britain was the workshop of the world—Rubinstein (1993:1). The Industrial Revolution began first in the UK because of a new convergent synthesis. Although some 'ingredients' could be found in other parts of the world, the 'British combination was unique'—Ackrill (1987:4). The primary 'ingredients' included:

- 'Natural resources: Water, Coal, and Iron,
- Brick-clay and Timber,
- Agriculture and its Products,
- Population Growth,
- Skills and Inventiveness,
- Capital,
- Social Mobility,
- The Domestic Market,
- Export Markets'—Ackrill (1987:4-9).

The Industrial Revolution was underpinned by entrepreneurial drive, and inventiveness that produced a continuous stream of new and evolving technologies—page 66. The UK became the workshop of the world simply because of its export performance; this once-happy state of affairs, and the UK's subsequent decline, are all too clearly captured in Fig. A13.01 below.

Note: Trade statistics have traditionally been based on Customs documentation. With the completion of the European Single Market at the end of 1992, Customs declarations for goods traded between EC Member States were abolished and a new system for the collection of intra-EC trade statistics came into force. (The system for compilling trade with countries outside the EC, based on Customs declarations, continues unchanged.)—Central Statistical Office June 1993.

Exports of manufactured goods expressed as a percent share of total for 11 main manufacturing countries
Note: Canada not shown to allow formatting within page confines.

Year	Total $ Bill'n	UK share	D share	B/L share	France share	Italy share	N'lands share	Sweden share	Switz'd share	USA share	Japan share	Ref's
1899	3.1	33.2										1
1913	6.5	30.2										1
1929	11.9	22.9										1
1937	9.1	21.3										1
1948	18.6	29.3										1
1950	20.1	25.4										1
1955	33.99	19.9	15.4	6.4	9.3	3.3	3.8	2.6	3.5	24.4	5.1	2
1960	52.55	16.5	19.3	5.8	9.6	5.1	4.0	3.1	3.3	21.6	6.9	2
1965	83.01	13.8	19.2	6.3	8.8	6.8	4.4	3.3	3.2	20.3	9.4	2
1970	154.3	10.6	19.9	6.2	8.8	7.2	4.4	3.4	3.0	18.6	11.7	3
1975	391.7	9.1	20.3	5.8	10.2	7.5	4.9	3.5	3.1	17.7	13.6	3
1980	837.5	9.7	19.9	5.7	10.0	7.9	4.6	2.9	3.3	17.0	14.9	4
1985	864.1	7.9	18.7	4.6	8.5	7.8	4.1	2.9	3.0	16.7	19.7	4
1989	1521.1	8.2	20.4	5.2	9.1	8.3	4.5	2.9	3.2	15.8	17.6	4
1993		6.0										5

Ref. 1 The British Economy Key Statistics 1900—1970 Table N, The London and Cambridge Economic Service
Ref. 2 Monthly Review of External Trade Statistics, Annual Supplement No. 1, 1980, Table E2. Prepared by Government Statistical Service
Ref. 3 Monthly Review of External Trade Statistics, Annual Supplement No. 9, 1988, Table E2. Prepared by Government Statistical Service
Ref. 4 Monthly Review of External Trade Statistics, No. 177, October, 1988, Table E2. Prepared by Government Statistical Service
Ref. 5 The 6% figure for 1993 was quoted by Michael Heseltine and reported in The Times November 24 1993. Heseltine was comparing 1913 at 31% with 1993 at 6%.

Fig. A13.01 - World trade in manufactured goods 1899 to 1993

Fig. A13.01 summarises the total of world trade in $ Billions of manufactured goods by the 'eleven main manufacturing countries' (mmcs), showing their shares (Canada omitted, to contain table within page). For the UK, analysis reveals a number of serious concerns:

- in 1899, the UK had a 33.2% share that fell to 6% by 1993,
- in 1955, the UK's share was 19.9%, Germany (D) had 15.4%, the USA had 24.4% and Japan had 5.1%,
- by 1989, the shares for the UK, Germany, USA, and Japan were 8.2%, 20.4%, 15.8% and 17.6% respectively,
- between 1955 and 1989, the total world-wide export trade rose from $33.99 to $1521.1 billions, but the UK share declined substantially from 19.9% to 8.2%, and was the only country to experience such a loss.

These data in Fig. A13.01 are plotted as percent change over 1955 for the period 1960 to 1989, and the curves appear in Fig. A13.02 below (Note: The values for Italy and Japan are so high that they run off the graph scale; hence these two countries are omitted). From Fig. A13.02, it may be seen that the UK has the lowest curve, and thus the worst performance; just one of many causes for serious concern.

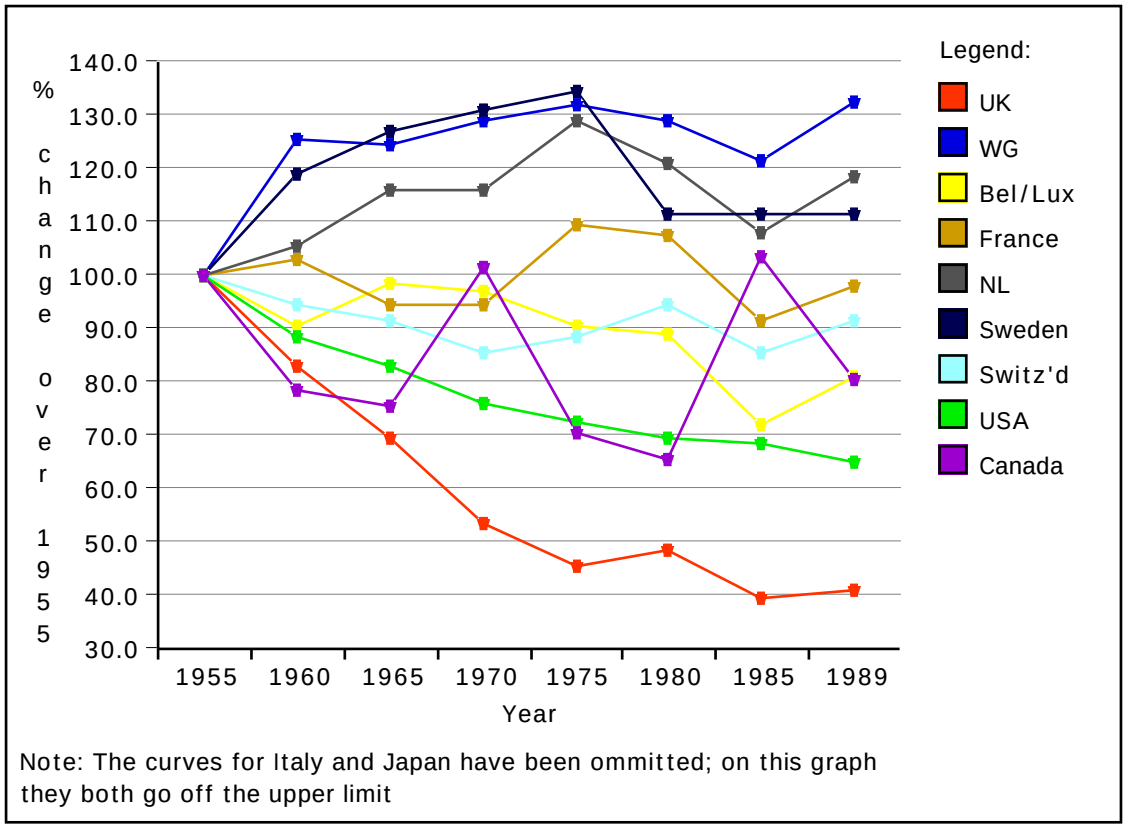


Fig. A13.02 - Exports of manufactured goods as a proportion of 1955 level - %

While the second column of Fig. A13.01 shows the total value of world trade in monetary terms, it seriously masks the paradigm that every society barters (trades) according to its knowledge, productivity, and capability—see also p28. So trading success influences the quality of economic survival for any society that has become industrialised, and is very much dependent on the quality, productivity, and capability of its technology—in other words its standard of living is governed by its demonstrated skills.

For the 'mediaeval Londoner', manufacturing industry was a primary source of income; he 'lived by producing and selling objects of demand rather than by financing others or carrying goods'—Fay (1950:123). Through 'foreign trade', 'capital was accumulated' which funded 'further expansion of … trade', and 'the building of great houses in town and country, the improvement of the land, and the increase of industry'—Fay (1950:127).

'The Industrial Revolution was financed from the profits of foreign trade'—Fay (1950:127). Hence the early fabric of much of our society, the built environment, was made possible through wealth created by the Industrial Revolution. However, 'although industry gave us an empire and made Britain for a while the most powerful nation on earth, we took the rewards while disparaging the means'—Redhead (1986), see Attachment 4.

Appendix 13.01 - Knowledge, invention and product development

In manufacturing, during the Industrial Revolution, 'many of the improvements in production, … were made not by theoretical and mathematical calculations, but by practical men on the spot trying this and that until they found something that worked'—Ackrill (1987:6).

'British workmen' became famous overseas 'for their practical cleverness'—Ackrill (1987:6). 'Important discoveries' were made without understanding 'why the process worked', leading to an 'admiration of the practical man, rather than the theoretician … a dangerous attitude as technology became more sophisticated'—Ackrill (*ibid*).

However, there was another interpretation:

> 'Already in the 19th Century British workers were thought to be more restrictive in their attitudes and more resistant to change than workers abroad, especially in America and Germany … . One contributing cause may have been the craft tradition, embodied in craft unions, and reflecting the *gradual* historical evolution from workshop to factory in Britain, in contrast to the more sudden arrival of modern manufacturing in countries that were later starters industrially'—Mathews *et al* (1982:114).

Although in 1851 the Great Exhibition celebrated the UK's industrial prowess, it was seen as 'a pageant of complacent self-congratulation'—Ashby (1958:30). The International Exhibition of 1867, showed an alarming decline of industrial supremacy; 'Britain took only ten of ninety prizes'—Barnett (1986:99).

This dire 'performance' created shock waves, prompting the House of Commons to appoint a Select Committee, 'the first of repeated … official analyses of defective British education and training for technological success that were to follow over the next century …'—Barnett (1986:99)—see section 07.04.06 Report of a Select Committee - 1868, p120 this thesis. But 130 years later, an educational philosophy which recognises the importance and contribution of industry and technology in our daily lives is still being sought.

As discussed on page 217, Industry Year *1986* was just one of the initiatives introduced in an endeavour to bring about change in society as well as in education. In support of the initiative, the RSA[4] produced a video film with the title 'Thanks to INDUSTRY', and it was made available to schools. One of the points made in the film was:

> 'Some Japanese researchers recently looked for the origin of the 100 most successful post-war industries, and they discovered that the ideas for more than half of them came from Britain'—Redhead (1986), see Attachment 4.

[4] The Royal Society for the encouragement of Arts, Manufactures and Commerce

However, did our society create any wealth from the inventions? Reporting on the 'Year of Invention Awards' held on Monday 8 February 1993, Arnold writes:

> 'Howard Davies, Director-General of the CBI, gave two cheers for British Industry, which he said was hot on invention but cold on product development.'

Arnold also reported:

> 'In a recent survey of the 22 top OECD countries, Britain came twentieth for product development. Japan, of course, came top. Why is it, I asked Mr [Takio] Fuji, [general manager Toshiba Europe] later, that the Japanese are so much better at product development than anyone else? He said that in Japan engineers had a complete education, not just engineering but product development, marketing and managing as well. But most important of all, they enjoyed a much higher social status than engineers in Britain, who are considered inferior to scientists and doctors.'

'It's quite true. Engineers are under-rated here'—Arnold *The Observer* 14 February 1993.

Appendix 13.02 - Health of manufacturing industry - other recent indicators

Fig. A13.01 provides one measure of the health of manufacturing industry in the UK, but what about other measures and trends?

Year	Japan	GB	USA	Germany	France
1990	1761	2129	7310	2695	944
1991	1815	2486	9036	2867	1094
1992	1717	2618	11869	3104	1274
1993	1916	2813	12535	3459	1517
1994	2290	3212	14798	4294	1631
1995	2700	3425	16588	5054	1808
1996	3861	3440	20828	5695	2307
1997	4845	3939	22736	7436	2496
1998	6098	4383	28356	9112	3322
1999	7255	4741	29463	10897	3633

Source: Patent Cooperation Treaty (PCT), published by World Intellectual Property Organization (WIPO)

Fig. A13.03 - Patent applications by the leading industrial nations since 1990

Fig. A13.03 above provides a summary of patent applications by the top five countries who participate in the 'Patent Cooperation Treaty'; they provide an indicator of inventive performance which was one of the hall-marks of the Industrial Revolution:

> We were so inventive and so successful that by 1851, the year of the Great Exhibition, we were able to celebrate our world leadership in industry—Hazeldean (1986), see Appendix 2.

The PCT is a service run by WIPO[5] based in Geneva—Fig. A13.04. In July 2000, there were 108 PCT member countries. The information for Fig. A13.03 was provided by Steve van Dulken, Patent Documentation Manager at the British Library.

Fig. A13.04 below presents the figures in Fig. A13.03 plotted as graphs. The plots track the percentage change over the status in 1990, and these data were used by *The Times Higher Education Supplement* 28 July 2000, illustrating 'UK plc's ailing research industry …'.

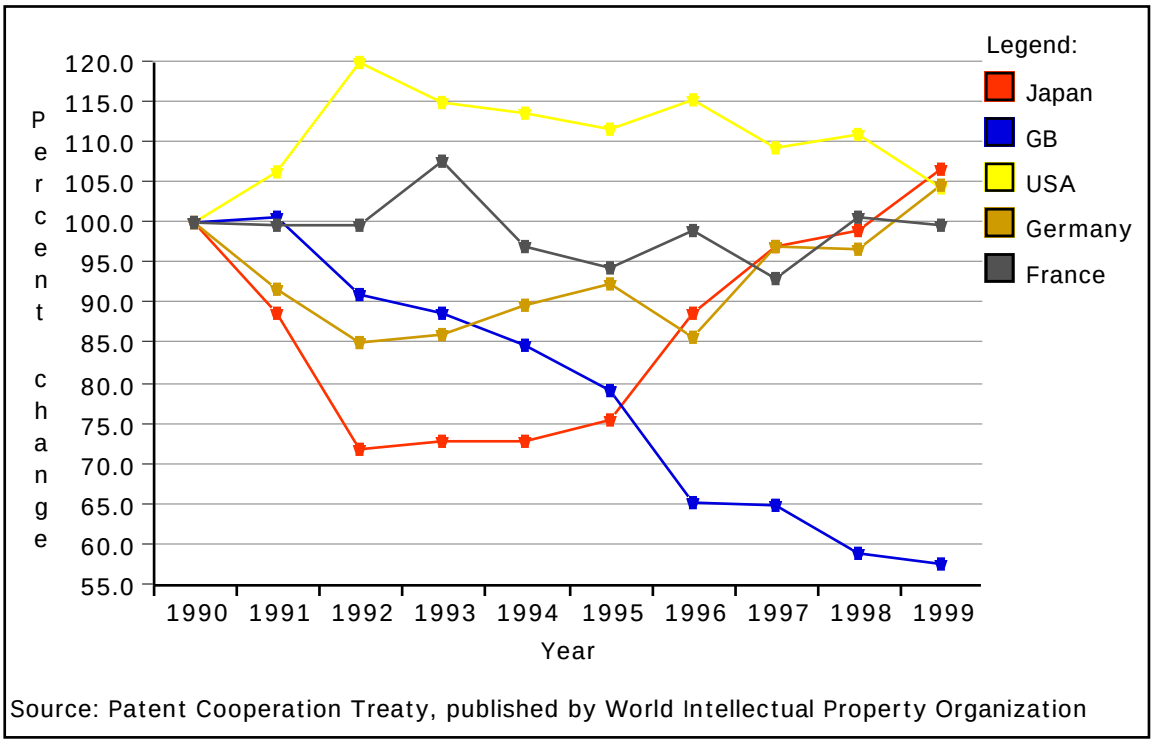


Fig. A13.04 - Percentage change in patent applications since 1990 by five leading industrial countries

van Dulken at the British Library argues that the chart '… reflects the economic problems Germany and Japan have experienced, and their recovery, and Britain's appalling decline'—see Derwent website[6]. Britain's appalling decline is graphically illustrated in Fig. A13.04.

So after being the workshop of the world in 1850—Rubinstein (1993:1), examination of Fig. A13.01 shows that from the early 20th Century, the UK experienced significant industrial and economic decline. Fig. A13.04 shows that our inventive performance, as a society, continues to decline, but what is the economic impact? Fig. A13.05 below shows the Gross Domestic Product (GDP) for the same five industrial countries. This information was downloaded from the DTi website in September 2000; their source was the OECD[7].

[5] http://www.wipo.org/
[6] http://www.derwent.com/
[7] Organization for Economic Cooperation and Development

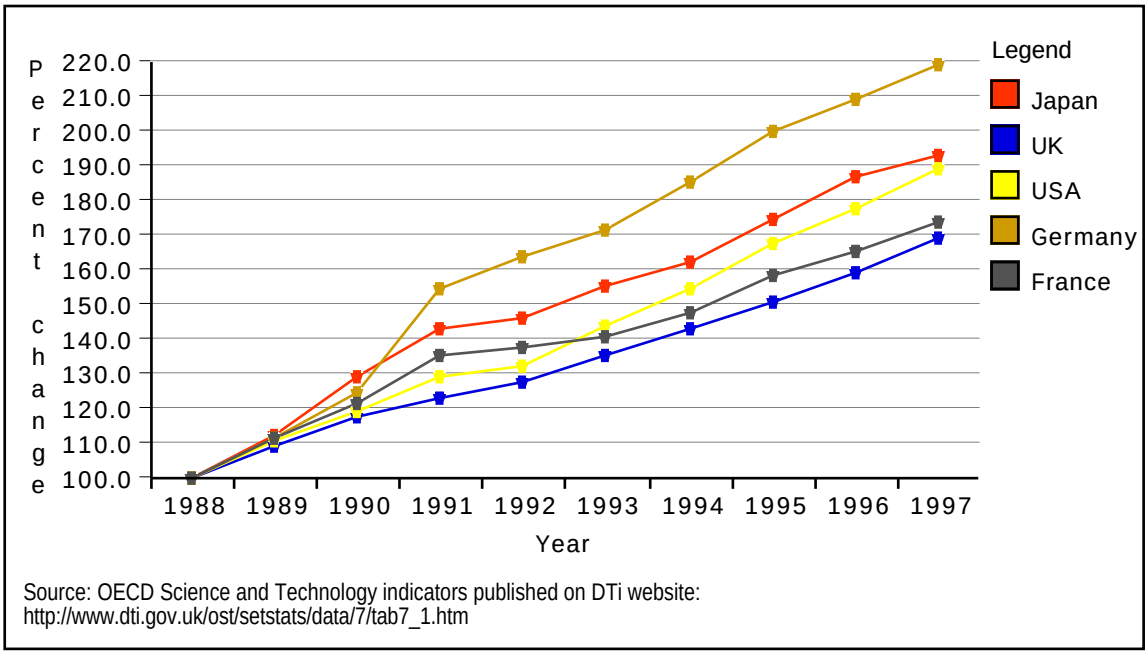
Gross Domestic Product (GDP) (6) (£ billion at ppp) (7)

Year	Japan (4)	UK	USA (5)	Germany (1)	France (2)
1988	1056.0	479.1	2807.5	560.2	488.7
1989	1186.0	522.4	3106.8	623.6	544.0
1990	1326.2	562.7	3345.2	699.8	592.8
1991	1507.1	589.8	3625.7	865.6	661.0
1992	1543.4	612.6	3715.2	917.7	671.6
1993	1643.9	647.2	4041.9	958.9	686.3
1994	1712.0	685.8	4339.7	1038.3	720.3
1995	1844.2	722.9	4713.3	1122.4	775.6
1996	1973.6	764.6	4987.5	1171.6	810.0
1997	2040.8 (e)	812.1	5315.4(e)	1229.0 (e)	850.9 (e)

Source: OECD databank (March 1999) via ONS.
Notes:
1 There are breaks in series for all data between 1990 and 1991, and for GERD between 1991 and 1992.
2 For government and business enterprise data there is a break in series between 1991 and 1992.
3 There is a break in series between 1990 and 1991, and 1993 and 1994.
4 Data for Japan are adjusted by OECD.
5 Excludes most or all capital expenditure. There is a break in series between 1990 and 1991 for GERD.
6 The measure of GDP used is at market prices.
7 Amounts are converted to £ sterling using the purchasing power parities (ppp) developed by the OECD.
8 The annualised percentage growth rate is shown.
p = provisional.
e = estimate.
Source DTi website: http://www.dti.gov.uk/ost/setstats/data/7/tab7_1.htm

Fig. A13.05 - Comparisons of Gross Domestic Product between five countries in £ billions

The trends in GDP shown in Fig. A13.05 become more visible as graphs. Fig. A13.06 below shows the percentage change for the same five countries since 1988, and disclose that the UK has the lowest rate of growth in GDP among these major industrial competitors.



Source: OECD Science and Technology indicators published on DTi website: http://www.dti.gov.uk/ost/setstats/data/7/tab7_1.htm

Fig. A13.06 - Growth in GDP for five countries in percentage terms over 1988

The OECD data on the DTi website included R&D expenditure in the business sector, and this is reproduced in Fig. A13.07 below.

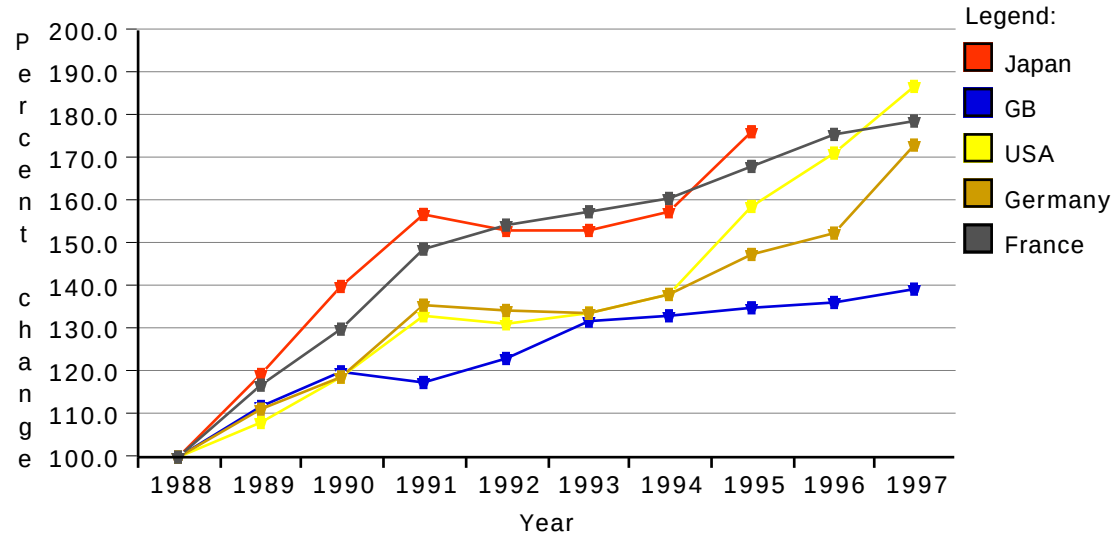
R&D performed in Business Enterprise Sector (BERD) (£ billion at ppp) (7)

Year	Japan (4)	UK	USA (5)	Germany (1)	France (2)
1988	20.4	6.9	55.8	11.6	6.6
1989	24.4	7.7	60.3	12.9	7.7
1990	28.6	8.3	66.1	13.8	8.6
1991	32.0	8.1	74.3	15.7	9.8
1992	31.3	8.5	73.4	15.6	10.2
1993	31.3	9.1	74.8	15.5	10.4
1994	32.1	9.2	77.2	16.0	10.6
1995	35.9	9.3	88.5	17.1	11.1
1996		9.4	95.7 (p)	17.7	11.6
1997		9.6	104.4 (p)	20.1 (e)	11.8 (p)

Source: OECD databank (March 1999) via ONS.
Notes:
1 There are breaks in series for all data between 1990 and 1991, and for GERD between 1991 and 1992.
2 For government and business enterprise data there is a break in series between 1991 and 1992.
3 There is a break in series between 1990 and 1991, and 1993 and 1994.
4 Data for Japan are adjusted by OECD.
5 Excludes most or all capital expenditure. There is a break in series between 1990 and 1991 for GERD.
6 The measure of GDP used is at market prices.
7 Amounts are converted to £ sterling using the purchasing power parities (ppp) developed by the OECD.
8 The annualised percentage growth rate is shown.
p = provisional.
e = estimate.
Source DTi website: http://www.dti.gov.uk/ost/setstats/data/7/tab7_1.htm

Fig. A13.07 - Comparisons of R&D performed in Business Enterprise Sectors of five industrial countries in £ billions

The trends in expenditure on R&D in the business sector, as shown in Fig. A13.07, become more apparent as graphical plots—Fig. A13.08.



Source: OECD Science and Technology indicators published on DTi website: http://www.dti.gov.uk/ost/setstats/data/7/tab7_1.htm

Fig. A13.08 - Comparisons of R&D performed in Business Enterprise Sectors of five industrial countries, showing percent changes over 1988

Referring to Fig. A13.08, the expenditure on R&D in the UK's business sector was lower than France, Germany, Japan and the USA. Futhermore, the slope of the curve for the UK was the lowest. The government's concern over this issue was reported as follows:

> The Department of Trade and Industry yesterday gave warning that UK companies risk losing out to foreign competitors if they do not dramatically increase investment in research and development—Doran, *The Times*, September 15 2000.

Figures A13.01 to A13.08, may be summarised as follows:

- exports of manufactured goods – between 1955 and 1989, the total world-wide trade rose from $33.99 to $1521.1 billions; the UK share declined substantially from 19.9% to 8.2%; the UK was the only country to experience such a loss—see Figures A13.01 and A13.02.
- patent applications – between 1990 and 1999, both Japan and Germany experienced a decline, but they recovered; the UK was the only country with a continuing downward trend—see Fig. A13.04.
- Gross Domestic Product – between 1988 and 1997, the UK had the lowest rate of growth in GDP—see Fig. A13.06.
- R&D in business enterprise sector – between 1988 and 1997, the UK had the lowest rate of expenditure—see Fig. A13.08.

Clearly, these inferences present very serious causes for concern. Two extracts from the 'Knowledge 2000 Conference' (see page 218) capture those concerns:

> David Blunkett — 'The knowledge economy is clearly a reality and not a slogan, but it doesn't yet impinge on the consciousness of the millions of people who are interested in whether they have got a job, whether their kids are getting a decent education, ….'

> Antonio Guterres — 'Innovation and knowledge are increasingly becoming the decisive source of wealth and also the main source of difference between nations, ….'

The 'Knowledge 2000 Conference' was yet another attempt to refocus our culture.

Appendix 14 - The 'anti-technological culture' debate

In his critique, Edgerton[8] stresses the polarised nature of the debate, listing some 140 references—(1996:73-86). Among the group who argue that an 'anti-technological culture' does exist in Britain, Edgerton cites Snow[9], Weiner[10], Barnett[11], and many others. In the opposing group, he cites Collins and Robbins[12], and Rubinstein[13]—(*ibid*).

In The Rede Lecture of 1959, C P Snow (later Lord Snow), argued that there were two cultures:

> Literary intellectuals at one pole—at the other scientists, and as the most representative, the physical scientists. Between the two a gulf of mutual incomprehension—sometimes (particularly among the young) hostility and dislike—Snow (1965:4).

> In fact, those two revolutions, the agricultural and the industrial–scientific, are the only qualitative changes in social living that men have ever known. But the traditional culture [Literary] didn't notice: or when it did notice, it didn't like what it saw. Not that the traditional culture wasn't doing extremely well out of the revolution; the English educational institutions took their slice of the English nineteenth-century wealth, and perversely, it helped to crystallise them in the forms we know—Snow (1965:22).

At the scientific end of the spectrum however, there was a further divide. Pure science was and is respectable, and applied science (engineering) 'was an occupation for second-rate minds'—Snow (1959:32).

> Pure scientists have by and large been dim-witted about engineers and applied science. They couldn't get interested. They wouldn't recognise that many of the problems were as intellectually exacting as pure problems, and that many of the solutions were as satisfying and beautiful. Their instinct—perhaps sharpened in this country by the passion to find a new snobbism wherever possible, and to invent one if it doesn't exist—was to take for granted that applied science was an occupation for second-rate minds. I say this more sharply because thirty years ago I took precisely that line myself—Snow (1959:32).

> It is dangerous to have two cultures which don't or can't communicate—Snow (1965:98).

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[8] Edgerton, D, *Science, technology and the British industrial 'decline' 1870–1970*, 1996, University Press, Cambridge [CUP].
[9] Snow, C P, *The Two Cultures and the Scientific Revolution*, 1959 and later eds., CUP.
[10] Weiner, M, *Engilsh Culture and the Decline of the Industrial Spirit 1850–1980*, 1981, CUP.
[11] Barnett, C, *The Audit of War*, 1987, 1988, 1990, Macmillan Publishers Limited, London.
[12] Collins, B and Robbins, K (eds), *British Culture and Economic Decline*, 1990, Weidenfeld and Nicholson, London.
[13] Rubinstein, W D, *Capitalism, Culture, and Decline in Britain 1750–1990*, 1993, Routledge, London.

Weiner, writing as Jones Professor of History at Rice University, Houston, and an outside observer, in his 'Preface' states:

> In the course of writing a quite different book on British social thought in the late nineteenth and early twentieth centuries, I became aware of a distinctive complex of social ideas, sentiments, and values in the "articulate" classes, embodying an ambiguous attitude toward modern industrial society. In the world's first industrial nation, industrialism did not quite seem at home.

Barnett (1990:xi) writes:

> … to uncover the causes of Britain's protracted decline as an industrial country since the Second World War. For industrial strength supplies the fundamental factor in total stratgey, the essential basis of a nation's power and its material well-being alike. The book locates the causes of the British eclipse not in the events and policies of the postwar era, but in the British record during the war itself — for total war submits nations to a ruthless audit of resources, talents and failings: human, social, cultural, political and technological no less than military. In the cases of France, Germany and Japan this audit was bluntly manifested in the fact, impossible to ignore, of outright defeat and occupation. In the case of Britain the audit of war remained hidden by the outward facade of victory, the propaganda about the scale of the national effort, and the deceptive inflow of American aid under Lend–Lease; it lay buried in the secret files of wartime production ministries and Cabinet committees. As a consequence, the British people never had to face the reality about themselves and their future place in the world, let alone come to terms with it and adapt to it accordingly.
>
> It is therefore more than time for the audit of war on Britain to be rendered. But in rendering it this book explores much more than technological performance in the narrow sense. It ranges across the education and training of the nation; the human qualtiy of the workforce; the capability of management; the cultural values and attitudes of the governing class and the intelligentsia; even the influence of religion. For all these factors inter-reacted to determine the level of British operational efficiencey as an industrial society.