



Our Hidden Curriculum:

a comparison of two surveys in Technology and other subjects

Dr Stan Owers
Ultralab
Anglia Polytechnic University
2004

Our Hidden Curriculum:

a comparison of two surveys in Technology and other subjects



About the Author...

Stan Owers PhD has been pursuing the issues surrounding education and industry over two decades culminating in doctoral research at Ultralab, APU. Before this Stan was a professional engineer, and worked in manufacturing industry, mostly in the fields of engineering research and product development. Stan was Manager Commercial Testing at Ford's when the Transit van was launched first in 1965. Subsequently he worked on product development programmes for various passenger cars including Capri I, Capri II and Sierra.

Stan's thesis 'The place and perception of technology in the curriculum - Doctoral research amongst sixth form students in the UK', was based on the viewpoint that the UK has consistently failed to respond appropriately to 'Technology' (hence the UK's economic decline), and to test the hypothesis that this failure has contributed to the problems associated with the place and perception of 'technology' in the National Curriculum. The full text can be found at the following website: <http://www.ultralab.ac.uk/tools/>

The following screenshot is from the website.

The screenshot shows a website layout with the following sections:

- The Culture of Tools**: Includes a hand holding a tool and a quote from Dr Stan Owers: "My thesis offers an explanation for the inadequate response by our society to the subject of technology..."
- Evidence of a problem:**: Features a quote from Brian Robinson, Chairman, Haggerston Services Consortium, The Times, July 1996: "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."
- Further Research**: States that Stan has repeated part of his research to check for emerging trends, published as a report: "Our hidden curriculum: a comparison of two surveys in Technology and other subjects."
- Downloads**: Lists "The Thesis and its appendices published 2001" and "Further research published 2004".
- How does the Culture of Tools impact on our lives?**: Explains that education and industry are two parts of the same society, dependent on our tool culture.
- How have these issues been tackled before now?**: Notes that education policy is culturally driven and that there is a conflict between educational ideals and the low intellectual esteem of manual work.
- Why is the Culture of Tools an issue?**: States that tool-culture was never regarded as important in education, but modern technology has evolved from it.
- What can be done to improve the situation?**: Calls for teachers and policy-makers to think differently and recognize the skills and aptitudes used in 'wealth creation' activities.

At the bottom, it says "Dr Stan Owers February 2003, Ultralab, APU" and "ULTRALAB" logo.

The intellectual property used in this report is covered by the statement on the Ultralab web site:

<http://www.ultralab.ac.uk/tools/>

To find this statement, go to the second page on the web site and look in the bottom right hand corner. The copyright status is in pdf format, runs to some 23 pages and requires 2.5 MB of disc space.

*Our hidden curriculum:
a comparison of two surveys in
Technology
and other subjects*

Dr Stan Owers

ULTRALAB

learning technology research

Anglia Polytechnic University

2004

Contents

Contents		i
Acknowledgements		ii
Executive summary		iii
Chapter 1	Results summary, Discussion, Conclusions and Recommendations	1
Chapter 2	Rationale for research project	21
Appendix 1	Presentation of results from 6th Form surveys	43
Appendix 2	Comparison of 6th Form surveys: <u>D&T</u> in 1995-6 and 2001-2	47
Appendix 3	Comparison of 6th Form surveys: <u>English</u> in 1995-6 and 2001-2	67
Appendix 4	Comparison of 6th Form surveys: <u>Maths</u> in 1995-6 and 2001-2	87
Appendix 5	Comparison of 6th Form surveys: <u>Science</u> in 1995-6 and 2001-2	107
Appendix 6	Comparison of 6th Form surveys: <u>Art & Design</u> in 1995-6 and 2001-2	127
Appendix 7	Comparison of 6th Form surveys: <u>Geography, History and a 2nd Language</u> in 1995-6 and 2001-2	143
Appendix 8	Comparison of 6th Form surveys: <u>Cross-curricular themes</u> in 1995-6 and 2001-2	155
Appendix 9	Comparison of 6th Form surveys: dependency on <u>Commerce, Finance and Industry</u> in 1995-6 and 2001-2	169
Bibliography		175
Attachment 1	Questionnaire for the school year 1995-1996	178
Attachment 2	Questionnaire for the school year 2001-2002	181

Note: A statement covering the copyright material used in this report and in my thesis may be found on:

<http://www.ultralab.ac.uk/tools/>

Acknowledgements

The people who have come together to work in ULTRALAB bring experience from many different backgrounds and disciplines and form an eclectic group. These team attributes come to the fore in many projects, and this research project has also benefited.

Mark Constable made a significant contribution with (1) the design of the questionnaire, (2) all the enquiries and pilot trials in schools, (3) a leading role in the distribution of the finalised 3-page questionnaire to schools circulating more than 7000 original copies, (4) organising machine reading of the completed questionnaires, and (5) transfer of these data to the author. Mark's help and assistance was invaluable.

I would also like to pay tribute to Ian Puzey, a professional statistician, for his help and guidance. Richard Millwood gave of his time with useful contributions in the context of the presentation format.

Alice Mitchell and Carole Chapman both proof read and provided valuable comments as critical friends. Sandy Atkinson, a long standing friend in private life, provided valuable comment on specific editorial matters.

Many in ULTRALAB have shown interest in this research project. If I have failed to mention any person in particular who has rendered useful thoughts and ideas, the fault is entirely mine and I apologise unreservedly.

I would also like to pay tribute to Professor Stephen Heppell whose idea it was to repeat the first survey to find out whether trend movements had taken place between the school years 1995-6 and 2001-2. Stephen made many useful contributions throughout the progress of the project, and from the beginning he was keenly interested in the outcomes and the arguments.

Lastly, I would like pay tribute to my dear wife Mary.

Stan Owers—2004

Our hidden curriculum: a comparison of two surveys in Technology and other subjects

Executive summary

A project was started at ULTRALAB in 1995 to research *The place and perception of technology in the National Curriculum*; it was reported as a doctoral thesis in 2001. As part of the project, a survey of more than 3000 A-level students was conducted in the school year 1995-6. The primary purpose was to discover what students thought about Design and Technology (D&T) after introduction of the subject on a national basis as authorised by the Education Reform Act of 1988, but it was clearly important to incorporate other curriculum subjects in the survey.

The survey was repeated in the school year 2001-2 because it was hypothesised that there may since have been some movement in what students thought about D&T. As the data were being gathered, a Green Paper on Education was published as a consultation document (February 2002) asserting that the 'education system was too often a one-size-fits-all structure', and 'for too long, vocational studies and qualifications have been undervalued'.

These statements convey significant concerns with what is on offer through our educational system, concerns that are made worse because technical studies, too, are undervalued. As a curriculum subject, D&T is crucial for the economic well-being and functionality of our society, but it becomes evident that the nature of these vital relationships is insufficiently comprehended at the level of a critical mass in education or society to bring about change.

Since our educational system has for too long been a one-size-fits-all structure, it also raises questions about the ethos of education, the structure of the curriculum, and its suitability for sustaining ourselves as a society both economically and environmentally in the 21st Century.

This report draws a comparison between the original and latest surveys, and highlights the movement trends. The report also draws attention to an increasing awareness that all is not well with our education system, and uses this as the rationale to analyse the survey data according to the criteria associated with earning our way in the world as an industrial and trading society.

The report comprises two main chapters, nine appendices and two attachments. Chapter 1 contains the results summary, discussion, conclusions and recommendations. Chapter 2 provides the cultural and value judgment background to the research, discusses the hidden curriculum, considers the pivotal role of our tool- and technology-culture as our constant evolutionary companion, and shows how native societies have always used the available materials to support their living; in other words through their technology. Thus we need to value our own technology. The appendices provide the statistical analyses by curriculum subject.

Chapter 1

Results summary, Discussion, Conclusions and Recommendations

Foreword

This report raises extremely serious concerns which need to be understood before change can be effective. Recent governments have expressed concern about economic prosperity, and the present administration is no exception. This is necessary but not sufficient.

As adults we know the importance of an income to set up home, but that model has not been successfully transferred to the national situation. Education should be a key player in the transfer process, but essentially it does not know how to value aptitudes and skills beyond the text based curriculum. As a consequence, many leave education with low self esteem, disenfranchised from the learning process. Ultralab's notschool.net initiative is helping to repair the situation.

With government support, Ultralab has now launched the Ultraversity (degree@ultralab.net) project creating a new on-line degree for people who wish to study within their work situation, while remaining in full-time employment. So the core of the degree will be based on action research building on the expertise of the student. Currently, academia stores knowledge in ways that mean it is not readily accessible. The knowledge gained by the Ultraversity students will be much more accessible and pertinent to the work situation.

These initiatives help to show the way, and to demonstrate that there is no cause for a counsel of despair. What follows should not be a surprise to anyone because the pivotal place of our tool- and technology culture was never understood, a prerequisite for finding a new way.

01.01 - Introduction

In the context of 'values, aims and purposes', the current issue of the National Curriculum (March 2003) states: *Education influences and reflects the values of society, and the kind of society we want to be.*

As a society we live in the made world surrounded by the products of our tool- and technology-culture, and upon which we are totally dependent to function as individuals and as a society. However Design & Technology (D&T) was the last subject to be introduced on a national basis, authorised by the Education Reform Act of 1988. This late introduction is seen to be symptomatic of the inappropriate values of our society. In the context of sustaining itself economically, our society has long been disabled by its value judgments failing to understand the pivotal role of technology in the related wealth creation processes.

This report comments on the progress made after the introduction of D&T, reflecting on a comparison between two studies conducted in the school years 1995-6 and 2001-2. For the purpose of these studies, D&T and all the curriculum subjects were considered from a 'real world' cross-curricular perspective. But account is also taken of the Green Paper *14 - 19: Extending Opportunities, Raising Standards* published as a consultation document in February (2002:3) which states:

In the 21st century, to be prosperous, the economy will depend heavily on the creativity and skills of its people. In a knowledge economy it is vital that we tap the potential of every one of our citizens.

01.02 - Results summary

01.02.01 - The hidden curriculum— see Chapter 2

The hidden curriculum flourished among opinion leaders considered educated in decades past. Indeed, their administrative influence caused the appointment of a Select Committee in 1868 'to inquire into the provisions for giving instruction in theoretical and applied Science to the Industrial Classes', so providing statutory sanction for the disparagement of the tool and technological culture that underpins the way we live and function as a society. As an industrial and trading society, we have been adversely influenced by the prejudicial and short sighted value judgments of those times.

Thus in England the past is in the present with a well established durable hidden curriculum among a majority that refuses to attribute any intellectual activity to the hand-eye co-ordination skills, or the practices governing hand-eye co-ordination skills, even though without exception we are all tool and technology users. Furthermore, there is no link with the wealth creation activities upon which any modern society is dependent for the health of its socio-economic communities through the quality of its technological application and dedication. Nevertheless, we continue to expect and demand services from the state.

The following sections on curriculum subjects show some predictable results, but these were regarded as affirmation of methodology, and were useful as a monitor of trends between surveys. Overall the analysis generated many serious concerns as explained below.

01.02.02 - D&T in industry and education— see appendix 2

- The results in Appendix 2 disclose serious causes for concern both in the context of the pivotal role of the tool- and technology-culture upon which we are totally dependent, and in the context of the Green Paper published as a consultation document February (2002:3).
- As an advanced industrial society, the UK has become a high wage high salary economy, and is therefore at a disadvantage in manufacturing costs compared with developing industrial societies. Since we use technologies as extensions of ourselves in order to

enhance our productivity and capability, we need urgently to raise the profile of the importance and pivotal role of D&T within the subculture of education, including teacher training. These exceptionally serious issues require action on several fronts, and unless that happens as a co-ordinated programme, initiatives attempting to change the philosophical direction of education are hardly likely to succeed.

- As lower cost technological systems becomes available on a global scale, our high wage high salary economy comes under pressure causing transfer overseas not only of manufacturing, but service industry functions such as call centres. These events contribute to the deskilling of our society, and critically in areas that include high value-added.

In the current issue of the national curriculum (2003), the importance of D&T was described as follows:

Design and technology prepares pupils to participate in tomorrow's rapidly changing technologies. They learn to think and intervene creatively to improve quality of life. The subject calls for pupils to become autonomous and creative problem solvers, as individuals and members of a team. They must look for needs, wants and opportunities and respond to them by developing a range of ideas and making products and systems. They combine practical skills with an understanding of aesthetics, social and environmental issues, function and industrial practices. As they do so, they reflect on and evaluate present and past design and technology, its uses and effects. Through design and technology, all pupils can become discriminating and informed users of products, and become innovators.

However the Green Paper stated 'we do not think that design and technology should be required study for all pupils' over 14 years—(2002:26), and is in direct contrast to the expressed aim for a prosperous economy. The problem for education and our society is that there is as yet a failure of comprehension among the majority about the pivotal role of technology in the way we live, and this comparison of A-level students shows a deteriorating trend. The trends in all 7 parameters of analysis from 1995-6 to 2001-2 were wholly negative for those studying D&T—see Fig. AB15/1 in appendix 2.

01.02.03 - English in industry and education—see appendix 3

Whether studying English or not, all students nonetheless remain totally dependent on language to function as individuals within society; from their earliest days they have been socialised into developing language skills. The findings present serious causes for concern.

- The interest of pupils studying English was high at 77% and 71% respectively for the two surveys. This compares with less than 7% in both surveys for those not taking English, indicating little grasp of language dependency.
- The level of difficulty for those studying English was 32% and 26% respectively for the two surveys, and compares with 29% and 31% for those not studying the subject.

- When it came to getting a job English was more highly valued; for those studying the subject, the combined percentage totals for ratings 7, 8 and 9 were in excess of 84% for both surveys. This compares with 69% and 62% respectively for those not taking English. However, 'NINE out of ten graduates are turned down for a job because their CVs are full of errors of spelling and grammar, according to a study ...'—*The Times* March 18, 2003.
- In the context of Economic and Industrial Understanding (EIU) both surveys recorded less than 50% for students studying English. For students not taking the subject, the comparisons were less than 36%, so comprehension of how we earn our way in the world was unsatisfactory.
- As a modern society, our dependence on English was rated at 62% and 64% respectively by students studying the subject; the comparisons for students not taking the subject were 43% and 46%. These results show a serious failure to understand our functional dependence on the first language of our society.

In the current issue of the national curriculum (2003), the importance of English was described as follows:

English is a vital way of communicating in school, in public life and internationally. Literature in English is rich and influential, reflecting the experience of people from many countries and times. In studying English pupils develop skills in speaking, listening, reading and writing. It enables them to express themselves creatively and imaginatively and to communicate with others effectively. Pupils learn to become enthusiastic and critical readers of stories, poetry and drama as well as non-fiction and media texts. The study of English helps pupils understand how language works by looking at its patterns, structures and origins. Using this knowledge pupils can choose and adapt what they say and write in different situations.

The results of these surveys disclose the existence of very serious problems.

01.02.04 - Maths in industry and education—see appendix 4

- Interest in Maths by those taking the subject in the first survey came to more than 68% for ratings 7, 8 and 9, declining to 60% in the second survey. For those not taking Maths, the comparable totals were less than 6%.
- Those studying Maths regarded the level of difficulty at more than 59% in both surveys for ratings 7, 8 and 9, while those not taking Maths scored 66% and 60% respectively.
- When it came to getting a job the level of importance attributed to Maths was high at 84% and 81% respectively for ratings 7, 8 and 9. This compares with 76% and 68% for those not taking Maths.
- Maths was considered relatively important in the context of Economic and Industrial Understanding; those studying the subject had totals of 74% and 71% respectively for ratings 7, 8 and 9. This compares with 68% and 61% for those not taking Maths.
- In the context of the influence of Maths on the we live now, those studying the subject

had totals of 49% and 56% respectively for ratings 7, 8 and 9. This compares with 47% and 48% for those not taking Maths.

- The levels of creativity perceived as allowable in the curriculum were extremely low and a very serious cause for concern; for ratings 7, 8 and 9 the totals were less than 6% in both surveys whether students were taking Maths or not.
- As a modern society, our dependency on Maths was recorded respectively as 63% and 68% for ratings 7, 8 and 9 by those taking the subject; those not taking Maths recorded 58% in both surveys.

In the current issue of the national curriculum (2003), the importance of Mathematics was described as follows:

Mathematics equips pupils with a uniquely powerful set of tools to understand and change the world. These tools include logical reasoning, problem-solving skills, and the ability to think in abstract ways. Mathematics is important in everyday life, many forms of employment, science and technology, medicine, the economy, the environment and development, and in public decision-making. Different cultures have contributed to the development and application of mathematics. Today, the subject transcends cultural boundaries and its importance is universally recognised.

Mathematics is a creative discipline. It can stimulate moments of pleasure and wonder when a pupil solves a problem for the first time, discovers a more elegant solution to that problem, or suddenly sees hidden connections.

The results of these surveys disclose the existence of very serious problems.

01.02.05 - Science in industry and education—see appendix 5

- For those taking the subject, interest in Science was relatively high; the first survey gave 76% for the addition of ratings 7, 8 and 9, declining in the second survey to 71%. For those not taking Science, the comparable totals were less than 10%.
- The role of Science in the context of Economic and Industrial Understanding (EIU) was quite well understood in the first survey with a total of more than 71% for the addition of ratings 7, 8 and 9 by those studying the subject. The second survey gave 63%. The comparable results for those not taking Science were 58% and 49%.
- In the context of the way we live now, the role of Science was also quite well understood by those studying the subject; they returned 84% and 78% respectively. Those not taking Science returned 71% and 67%.
- For those taking the subject, the creativity allowed in the curriculum for Science was very low; less than 16% and less than 12% in the two surveys respectively. These compare with less than 12% and less than 9% for those not taking Science.
- As a modern society, our dependency on Science was also quite well understood; those studying the subject returned 84% for the addition of ratings 7, 8 and 9. Those students not taking Science returned 71% and 64%.

There are a number of aspects about these results that present causes for concern. They include a declining interest in Science against a reasonable appreciation of the importance of the subject in the context of: (1) EIU, (2) the way we live now, and (3) our dependency as a modern society. But against these levels of appreciation, the perceived level of creativity in the curriculum was extremely low, presenting a concern of the gravest magnitude. In the current issue of the national curriculum (2003), the importance of Science was described as follows:

Science stimulates and excites pupils' curiosity about phenomena and events in the world around them. It also satisfies this curiosity with knowledge. Because science links direct practical experience with ideas, it can engage learners at many levels. Scientific method is about developing and evaluating explanations through experimental evidence and modelling. This is a spur to critical and creative thought. Through science, pupils understand how major scientific ideas contribute to technological change – impacting on industry, business and medicine and improving quality of life. Pupils recognise the cultural significance of science and trace its worldwide development. They learn to question and discuss science-based issues that may affect their own lives, the direction of society and the future of the world.

The results of these surveys disclose the existence of very serious problems.

01.02.06 - Art & Design in industry and education—see appendix 6

- The importance of Art in the context of Economic and Industrial Understanding (EIU) was not understood; the total for rating scale 7, 8 and 9 in both surveys was less than 26% for students taking the subject. For students not taking Art the comparable totals were less than 8%.
- The influence of Art on the way we live now was better understood; the totals for rating scale 7, 8 and 9 in both surveys were within $\pm 1\%$ of 53% for students taking the subject. For students not taking Art the comparable totals were within $\pm 1\%$ of 28%.
- The creativity perceived permissible within the curriculum was high. In both surveys the total for rating scale 7, 8 and 9 were within $\pm 1\%$ of 84% for students taking the subject. These results compare with 76% and 71% respectively for students not taking Art.
- As a modern society our dependency on Art was not properly understood. The totals in the two surveys for rating scale 7, 8 and 9 were between 26% and 27% for students taking the subject. Totals for students not taking Art were within $\pm 1\%$ of 10.5%.

'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" for both home and export markets'—Owers (2001:170).

'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" (motor industry jargon for encouraging potential buyers into the showrooms), and young people show a great deal of interest in cars'—Owers (2001:170).

Finally, the current issue of the national curriculum (2003), 'the importance of art and design'* was described as follows:

Art and design stimulates creativity and imagination. It provides visual, tactile and sensory experiences and a unique way of understanding and responding to the world. Pupils use colour, form, texture, pattern and different materials and processes to communicate what they see, feel and think. Through art and design activities, they learn to make informed value judgements and aesthetic and practical decisions, becoming actively involved in shaping environments. They explore ideas and meanings in the work of artists, craftspeople and designers. They learn about the diverse roles and functions of art, craft and design in contemporary life, and in different times and cultures. Understanding, appreciation and enjoyment of the visual arts have the power to enrich our personal and public lives.

*Art and design includes craft.

Although the parameters of analysis were limited for the subject of Art, the results show that the importance, contribution and influence of the subject in the way we live was simply not comprehended.

01.02.07 - Further appendices

The remaining appendices include:

Appendix 7 - Geography, History and a 2nd Language,

Appendix 8 - Cross-curricular themes, and

Appendix 9 - dependency on Commerce, Finance and Industry, and all three present many causes for concern.

01.03 - Results - closing comment

In the appendices 2 to 7 the parameters of analysis were considered in four ways: (1) subject studied, (2) subject not studied, (3) girls, and lastly (4) boys. In appendices 8 and 9, analysis was by gender only. Hence between the two surveys, trend movement could be determined in a total of 146 comparisons for the whole study. For the purpose of this analysis, only movement in excess of $\pm 2\%$ was considered, presenting an overall picture as follows:

- a positive trend in 22 parameters of analysis, or 15%, and
- a negative trend in 85 parameters of analysis, or 58%.

The Green Paper published as a consultation document in February (2002:3) stated:

In the 21st century, to be prosperous, the economy will depend heavily on the creativity and skills of its people. In a knowledge economy it is vital that we tap the potential of every one of our citizens.

These results show the enormity of the problems we face as a society, including the subculture of education. There should be no surprise at these results since they represent an inevitable consequence of the long-standing inappropriate value judgments of our society—Owers¹ (2001), in particular *Chapter 7 - Technology in Education - statutory considerations*. The statements in the curriculum about the 'importance' of the subjects help to point the way forward, but they do not address the biggest obstacle, namely our culture. For the UK, the greatest hope for arresting our long industrial decline and appreciating the pivotal importance of D&T rests with education, but education has to shed its prejudicial shackles—the hidden curriculum.

Discussion

01.04 - The challenge for education - NACCCE report

The report² *All our futures: Creativity, Culture and Education* argued 'raising standards in literacy and numeracy ... will not be enough to meet the challenges that face education'—(1999:5). The report goes on: 'We need a broad, flexible and motivating education that recognises the different talents of all children and delivers excellence for everyone'—(*ibid*).

The NACCCE report asserted that 'a national strategy for creative and cultural education' was 'essential to that process. ... By creative education we mean forms of education that develop young people's capacities for original ideas and action: by cultural education we mean forms of education that enable them to engage positively with the growing complexity and diversity of social values and ways of life. We argue that there are important relationships between creative and cultural education, and significant implications for methods of teaching and assessment, the balance of the school curriculum and for partnerships between schools and the wider world'—(*ibid*).

'Education faces challenges that are without precedent. Meeting these challenges calls for new priorities in education, including a much stronger emphasis on creative and cultural education and a new balance in teaching and in the curriculum'—(*ibid*).

The NACCCE report represents a *tour de force* setting out the need for cultural and creative education, as well as identifying the challenge for education. But the subculture of education can only deliver cultural education if it comprehends the value judgments deeply embedded within its own psyche, and which have evolved as a powerful 'hidden curriculum' with

¹ *The place and perception of technology in the curriculum: historical developments up to 1997*; the thesis and appendices may be downloaded from: <http://www.ultralab.ac.uk/tools/>

² Published in 1999 by the National Advisory Committee on Creative and Cultural Education (NACCCE).

entirely inappropriate value judgments for an industrial and trading nation. With value judgments of the past dominating the present, we cannot expect to earn our way in the world.

However, subcultures have the greatest difficulty examining themselves. In some ways it is easier for an international corporation made up of a number of national companies since comparisons are feasible in many ways. Furthermore, competition provides an imperative for national companies to change in order to remain economically viable. Nevertheless, re-evaluation of accepted ways of operating still constitute cultural change and the difficulties associated with change; industry in the UK has been undergoing such change for more than 25 years. Until now, education has not been confronted with the economic imperative so ably put in the NACCCE report:

It is emphasised the urgent need to unlock the potential of every young person and argued that Britain's economic prosperity and social cohesion depend on this—(1999:5).

But the economic imperative is not one that the subculture of education can easily accept as shown by anecdotal and research evidence. The complexity of culture also needs to be comprehended before trying to engage in a state of helping children to learn about culture.

01.05 - Discussion - the REAL challenge for education

So the *real* challenge for the subculture of education includes comprehending the derivation of its own value judgments, and examples from the past serve to illustrate:

- The nine schools were seen as good examples 'to which most Englishmen of the higher class ... wish to send' their sons—Clarendon (1864:11). Since the earliest days in 'these schools', the curriculum 'remained substantially unaltered' and the 'classics' were seen to hold 'intrinsic excellence as an instrument of education'—Clarendon (1864:12). Education 'alters slowly', and remains in 'the same groove for a long time'—Clarendon (*ibid*). Teachers 'can only teach what' they have learned, and consequently they 'set the highest value on the studies' that have occupied their own lives—Clarendon (*ibid*).
- 'All civilisation' rises in 'human intercourse', so the 'study of human speech' was the 'most efficient instrument of education'—Taunton (1868:22). Nothing hindered 'true cultivation' so much, nor was 'so unreasonable as excessive narrowness of mind—Taunton (*ibid*). However, it was 'admitted' that 'cultivation' would occur by 'the ordinary intercourse of life', but if the 'material studies' were 'not regularly taught' they would probably 'never be learned—Taunton (1868:23). This argument must be given great 'weight' where the 'time assigned to education' was 'short'—Taunton (*ibid*).
- After the Great Exhibition in 1851, Paris staged the 'International Exhibition of 1867',

where Britain's fading industrial supremacy was 'alarmingly revealed'; 'Britain took only ten of ninety prizes'—Barnett (1986:99). This dire 'performance' created shock waves, and prompted 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 (*ibid*). In 1868, the Select Committee was appointed 'to inquire into the provisions for giving instruction in theoretical and applied Science to the Industrial Classes'—Parliamentary Papers 24th March 1868. Note the link between Science and the 'Industrial Classes'.

So the most highly valued form of education structured around the classics attracted a great deal of snobbery. In his report of 1868, Taunton emphasised the importance of speech and hence communication. But the development of knowledge for 'technological success' was left to the industrial classes for whom there was no intellectual challenge as demonstrated by anecdotal evidence. The above statements identify the educational philosophy among opinion leaders of the 1860s, and it is still with us today as shown by the anecdotes below.

01.05.01 - Anecdotal evidence

A total of some 65 anecdotes appear in Appendix 5—Owers (2001); they start on page 268 and come from across society. Examples here have been chosen from Appendix 5 to illustrate the low esteem associated with working with one's hands and technological studies in the subculture of education:

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 schoolchildren. 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 technological resources.
25. In April 1991, the head teacher 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 head teacher had a degree in Science.

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 head teacher to a parent when the son had failed his English O-level—September 1977.
31. 'We are not in the business of producing fodder for factories'—heard from primary and secondary school teachers.
32. 'One of my teachers told me I was too intelligent to become an engineer'—said by a former professional engineering colleague to Dr Stan Owers in 1992.
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 Head teacher 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.

Finally, to illustrate how these negative attitudes have dominated the thinking of our opinion leaders, an extract from a video film produced for Industry Year 1986 (see Appendix 4—Owers 2001), as narrated by Mr Brian Redhead (now deceased):

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?

But snobbery has been identified before:

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. The climate of thought of young research workers in Cambridge then was not to our credit. We prided ourselves that the science we were doing could not, in any conceivable circumstances, have any practical use. The more firmly one could make that claim, the more superior one felt—Snow (1965:32).

What an educational disaster!

01.05.02 - Research evidence

To help teachers with the requirement for economic and industrial understanding (EIU), the National Curriculum Council published a number of guidelines. One example was *Managing Economic and Industrial Understanding in Schools*, and an extract from the Foreword states:

EIU is an essential part of every pupil's curriculum. It helps them understand the world in which they live. It prepares them for life and work as producers, consumers and citizens in a democracy which is part of a complex and rapidly changing world. It is needed in all stages of their education—Graham (1991:1).

Teacher training was similarly influenced as demonstrated by DES Circulars 24/89 and 18/89. The Teacher Training College at Anglia Polytechnic University, revised their courses to include sessions on EIU. The purpose here is to provide further examples of the enormity of the cultural problems faced by teachers in their attempts to grapple with the bolt-on subject of EIU as part of their training—see Owers (2001:154).

Workshop exercises were used for the sessions on EIU with student teachers in training during 1994-96. The student teachers were either on a two-year Licensed Teacher Training programme, or a Four-year BEd degree course. During the workshop sessions, the student teachers were split into subgroups of four or five, and asked to reflect on their perceptions of industry, to reach consensus, and commit their 'collective view' to a flip-over chart. The exercise outcomes were reviewed in plenary session, and one example appears below in Fig. 01.01—see Owers (2001:158).

Further similar examples appear in Owers (2001:156), and so the initial reactions among student teachers were negative. Common to all their perceptions were the chimneys

discharging smoke, but with the decline of manufacturing industry, as well as technological changes, there are far fewer chimney stacks on any horizon in the UK.

When teachers and student teachers have had the opportunity to explore beyond their first negative reactions, the scenario changes. But the predominantly negative reactions are traditional, and part of the culture that has been handed down and absorbed by the critical mass in our society, and hence most difficult to change.

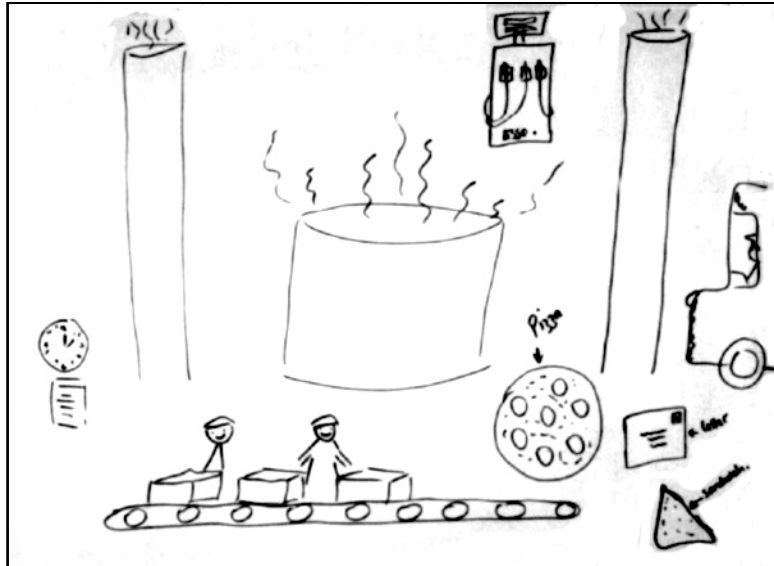


Fig. 01.01 - Collective view of industry by a student teacher subgroup

Traditional views such as those expressed in Fig. 01.01 may come as a surprise to the majority, but the positive benefits of industry have never been taught as part of the curriculum or teacher training. Indeed the disparagement of industry by statutory sanction has filled the void in the absence of positive instruction about the role of industry or technology in society, a role in which:

- The products and services of industry are the lifeblood of society.
- If at a stroke the benefits of technology could be removed, not only would this paper disappear, but we would be sitting without shelter, without heating, without either an organised system of food provision or medical care, unclothed on the mud, looking for cover to hide our embarrassment—Owers (1993b:7).
- Manufacturing industry is part of the economic activity that contributes to the Gross Domestic Product (GDP) from which all the services we expect and demand from the state are funded.
- Society demands consumer products of every kind from cars to computers, from cotton reels to clothes, from kitchen knives to refrigerators, to microwave ovens and washing machines. And when the price and/or quality is not right, imports flourish causing a loss of indigenous wealth creation, as well as the associated creative technological disciplines and skills.
- Society demands services such as water-on-tap, drainage and sewage disposal, energy

supplies such as gas, electricity, fuel oil, petrol, coal, transportation systems, and cheap communication systems—the list is endless.

The NACCCE report *All our futures: Creativity, Culture and Education* stated 'by cultural education we mean forms of education that enable them to engage positively with the growing complexity and diversity of social values and ways of life. We argue that there are important relationships between creative and cultural education, and significant implications for methods of teaching and assessment, the balance of the school curriculum and for partnerships between schools and the wider world'—(1999:5).

Value judgments are just a small part of culture, and inappropriate values may be found in all national or institutional organisations, but teachers in particular need to appreciate the complexity of culture if the above requirement of the NACCCE report is to be met.

01.05.03 - The complexity of culture

The structure of culture is complex, and is perceived to include 'certain kinds of knowledge, certain attitudes and values'—Lawton (1975:6). The word culture is used in a variety of ways, and conveys different things to different people. Anthropologists use the term when making reference to the particular ways of life of early indigenous peoples—Williams (1988:39). Social scientists use this word as a way of distinguishing or separating societies, and in this process they consider:

- the 'language',
- the ways of 'perceiving and thinking',
- 'non-verbal communication and social interaction',
- the 'rules and conventions' that govern reaction 'in different situations',
- the 'moral and other values', faiths and 'beliefs',
- the 'technology and material culture'—Argyle (1976:78).

The word is also used to lay claim to 'superior knowledge', or to distinguish between 'high' art (culture) and popular art and entertainment'—Williams (1988:92). So it becomes clear that the word 'culture' has a wide range of applications and meanings. The complexity of culture was also considered in *Chapter 6 - Technology and Culture*—Owers (2001:89-108), including the diagram below.

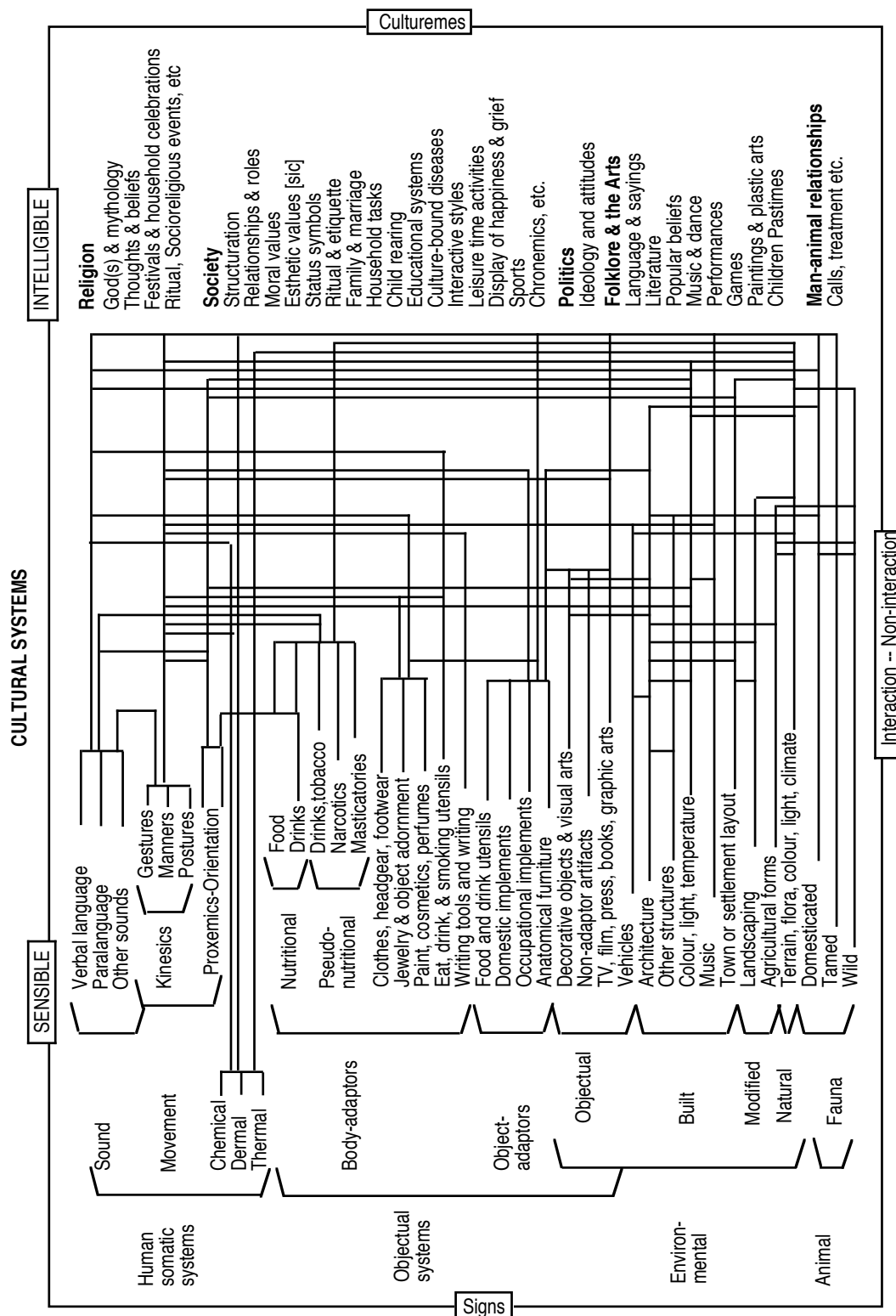


Fig. 01.02 - Sensible and Intelligible Systems in Culture - Poyatos (1983:29)

From Fig. 01.02 above, the composition of culture is 'multifaceted', and grouped into two system domains through which culture is experienced—Poyatos (1983:27). These system domains are defined as 'Sensible' and 'Intelligible', and describe experiences achieved respectively through the 'senses' and through the 'mind'—Poyatos (*ibid*). The imaginative and creative technological activity of humankind was also represented; examples include

vehicles, architecture, town and settlement layouts. These examples have followed the pattern of technology from the Stone Age to the Space Age—Owers (2001:105). The pattern whereby humankind has consistently applied inventive capability on the materials by which it was surrounded in order to remake its environment—Bronowski (1979:20).

However, in our society, learning about the pivotal importance of technology has never held sway over our cultural norms. A subset of norms influenced by snobbery, unable to attribute any worthwhile intellectual purpose in the study of subjects associated with technological application, yet key to the way we function as individuals, as a society, and which enable us to engage in the business of earning our way in the world.

01.05.04 - Intelligence

'In the 20th century the education system was too often a one-size-fits-all structure. It neither demanded nor provided excellent standards in education for everyone. Nor did the education system adequately target the needs of the individual pupil'—Green Paper (2002:3). '... For too long, vocational studies and qualifications have been undervalued. This must change – we must introduce qualifications and pathways that are of an excellent standard, that deserve and are accorded high status, that are not a sink option for failed students, but which can lead the bright and able through into higher education and beyond ...'—(*ibid*).

The one size fits all philosophy of education was structured around a dominant academic appreciation of intelligence, that can be 'positively disabling' in the world of work—Handy (1997:118). 'Everyone can be assumed to be intelligent, because intelligence comes in many forms'—Handy (1997:120). Handy (*ibid*) goes on to define the following intelligences:

- *Factual Intelligence* — the know-it-all facility possessed by Master Mind addicts,
- *Analytical Intelligence* — the ability to reason and to conceptualise,
- *Numerate Intelligence* — being at ease with numbers of all sorts.

These 'three intelligences will get you through most tests and examinations and entitle you to be called clever'—Handy (*ibid*). As early as 1983, Gardner³ argued along similar lines, asserting 'our schools and culture focus most of their attention on linguistic and logical-mathematical intelligence. We esteem the highly articulate or logical people of our culture.'

However, we need to value equally the intelligences of '... artists, architects, musicians, naturalists, designers, dancers, therapists, entrepreneurs, and others who enrich the world in which we live.' Indeed 'many children who have these gifts don't receive much reinforcement for them in school. Many ... end up... labelled "learning disabled" or simply underachievers, when their unique ways of thinking and learning aren't addressed by a heavily linguistic or logical-mathematical classroom'—Gardner (*ibid*).

Thus, not only do we have a one size fits all educational system, unable to appreciate other

³ Gardner Dr Howard, http://www.thomasarmstrong.com/multiple_intelligences.htm

forms of intelligence, but the established educational system disparages the intelligences associated directly with earning our way in the world—see the anecdotal evidence.

Unfortunately, the subculture of education has never received any instruction on the pivotal role of our tool and technology culture: (1) in the way we function as individuals, and as a society, and (2) our dependency on technology in the wealth creation processes necessary to earn our way in the world.

Survival depends on intelligence. Human ingenuity underpinned our ability to survive the early harsh world; tool-making abilities were at the core of the survival strategies for every society.

For education to value other forms of intelligence is culturally very difficult, but it becomes crucial to achieving the aims of the NACCCE report *All our futures: Creativity, Culture and Education*. Education has to understand that children want to learn in the way for which they have the greatest aptitude; their leading aptitude would be the easiest way to stimulate their enthusiasm for learning.

01.06 - Discussion - the challenge for education should not be underestimated

The NACCCE report (1999:13) states:

There is intense concern with raising standards in education, and schools and the education sector in general are already deluged with reports. How important is this one? For some people, the very theme of this report may seem a distraction from the main business of raising standards. We do not think so. Our concerns are the same as everyone else's. How can education enable our children to make the most of themselves and take the best advantage of the opportunities and uncertainties that they face in a fast changing world?

However, the challenge for education will require massive change within its own subculture. Although *Education influences and reflects the values of society, and the kind of society we want to be*—National Curriculum (2003), the value judgments of our society have roots going back to before the formative years of education—Owers (2001:142). Those value judgments pose a real economic threat for the well-being of our society, and although education currently regurgitates them as an incestuous cultural trait, education remains the greatest hope of real change for the prosperity of our society. This 'hope' however, can only be realised if the training for teachers and head teachers includes confronting not only the value judgments of education, but the pivotal role of technology in the well-being of our society; as individuals and as a society we are functionally totally dependent on our tool- and technology-culture—see page 1.

The NACCCE report (1999:185) concludes:

The new provisions in initial teacher training pose serious threats to the future

development of creative and cultural education in general, and of the arts and humanities in particular. Urgent action is needed to secure a continuing supply of trained teachers in these fields and to raise the standards of expertise among all teachers, both in initial and in service training. New strategies are also needed to draw on the experience and expertise of specialists other than teachers, both through initial training and through new programmes of continuing professional development.

Under no circumstances can we afford to neglect the pivotal importance of our tool- and technology dependency—it is an inherent part of our culture stretching back to before the Stone Age. If we neglect our technological dependency, our society faces a bleak economic future. Furthermore, if teachers do not receive instruction in the complexity of culture, they can not hope to deliver 'cultural education' as part of the national strategy required by the NACCCE report. Finally, understanding the tool- and technology culture of other ethnic/native societies helps us to understand our own tool-culture, since tools have always been used as extensions of ourselves to enhance capability and productivity for the purposes of survival—see Chapter 2.

01.07 - Conclusions

- In England, there is a well established durable hidden curriculum among a majority that refuses to attribute any intellectual activity to the hand-eye co-ordination skills, or the aptitudes and practices dictating the hand-eye co-ordination skills, although without exception we are all tool and technology users. Furthermore, there is no link with the wealth creation activities upon which any modern society is dependent for the health of its socio-economic communities through modern technological applications.
- There is a critical need to confront the hidden curriculum in education that functions as a debilitating force philosophically opposed to our tool- and technology-culture with serious economic and environmental implications, but which is now deeply embedded in the national psyche.
- As an advanced industrial society, the UK has become a high wage high salary economy, and is therefore at a huge disadvantage in manufacturing costs compared with developing industrial societies. Since we use technologies as extensions of ourselves in order to enhance our productivity and capability, so underpinning the standard of living for our society, we need urgently to raise the profile of the importance and pivotal role of D&T within the subculture of education, including teacher training.

The statements in the curriculum about the 'importance' of the subjects help to point the way forward, but they do not address the biggest obstacle, namely our culture. For the UK, the greatest hope for arresting our long industrial decline and appreciating the pivotal importance of D&T rests with education, but education has to shed its prejudicial shackles—the hidden curriculum. Indeed Dahrendorf⁴ (1976:460) argued '... an effective economic strategy for Britain will probably have to begin in the cultural sphere, in attitudes, habits, expectations'.

⁴ Dahrendorf, R, *Europe: some are more equal*, *The Listener*, 1976, Vol 96, pp 458-460, 14th October.

01.08 - Recommendations

This report highlights many extremely serious concerns for our society. The government shares these concerns as indicated by:

- the report *All our futures: Creativity, Culture and Education* published by the National Advisory Committee on Creative and Cultural Education (NACCCE) in 1999,
- the Green Paper *14–19: Extending opportunities, raising standards*, published by DfES February 2002,
- National Curriculum documents - statements defining the 'importance' of each of the subjects has been added.

However, these reports do not address the biggest obstacle to change, namely the well established value judgments endemic within the subculture of education. As a consequence, it becomes necessary for teachers to receive training in:

- the pivotal role of our tool- and technology-culture in the wealth creation processes by which we sustain ourselves as a trading economy and as a society,
- the complexity of culture as a prior requirement not only to understand culture, but for helping students learn about culture,
- the nature of the incestuous value judgments, and the damage they inflict on society.

These serious issues require action on several fronts; unless they happen as a co-ordinated programme, any initiatives will not succeed.

The hidden curriculum will be discussed in the next chapter.

Chapter 2

Rationale for the research project

02.01 - The issues and why they should concern us

The educational system of the past was inadequate—Green Paper⁵ (2002:3). For 'too long, vocational studies and qualifications have been undervalued'. But prosperity for our society in the 21st century 'will depend heavily on the creativity and skills of its people'—(*ibid*).

The National Curriculum⁶ states: 'Education influences and reflects the values of society, and the kind of society we want to be. It is important, therefore, to recognise a broad set of common values and purposes that underpin the school curriculum and the work of schools'.

Lawton (1975:6) argued that the school curriculum was influenced by society, including 'aspects of the way we live, the 'kinds of knowledge to be learned', with certain attitudes and values to be acquired. This selection from our culture was so important that its dissemination 'is entrusted to specially-trained professionals (teachers) in elaborate and expensive institutions (schools)'—Lawton (*ibid*).

However, the government's wishes for a 'prosperous economy' 'creativity' and a 'knowledge economy' are seriously at risk since teachers 'can only teach what' they have learned, and they 'set the highest value on the studies' that have occupied their own lives—Clarendon (1864:12). The problem for our society is that our wealth creation activities have been taken utterly for granted, and teachers have received little formal instruction about their importance, particularly the pivotal role of technology within the wealth creation processes. This is of extreme concern since our commercial survival as a society is seriously threatened. An explanation for the inadequate response by our society appears in Owers⁷ (2001).

What was learnt in the absence of positive instruction about the pivotal roles of technology, industry and business in our society, was almost entirely negative, pouring widespread scorn with statutory sanction on the intellectual and practical hand/eye co-ordination skills associated directly with enhancing our productivity and capability. Yet the collective standard of living and quality of life for society is influenced directly by its collective technological productivity and capability—Owers (2001:151), presenting us with a moral imperative.

⁵ Green Paper 14–19: *Extending opportunities, raising standards*, published by DfES February 2002.

⁶ National Curriculum (March 2003) on-line

⁷ *The place and perception of technology in the curriculum: historical developments up to 1997*; the thesis and appendices may be downloaded from: <http://www.ultralab.ac.uk/tools/>

02.02 -The initial investigation and findings

As part of the research into *The place and perception of technology in the curriculum*, a survey was completed among 6th form students in the school year 1995-6—Owers (*ibid*). The survey was based on a 3-page questionnaire, and kindly co-ordinated by the Heads of Technology in participating schools. This survey was conducted to gain some appreciation of the perception of Design and Technology as a curriculum subject after its introduction.

In order to obtain a balanced picture from this survey, the Heads of Technology were asked to find equal numbers of students taking Humanities subjects to complete the questionnaires. The questionnaires included most of the curriculum subjects not only out of research interest, but technological solutions typically require cross curricular awareness and application. The results were reported in a Doctoral thesis—Owers (2001), and provided yet further evidence of the seriousness of the problems that confront us here.

02.03 - The hypothesis

Since the first survey of 1995-6, it was hypothesised that there may have been some 'trend' movement, and so the survey was repeated in the school year 2001-2. The purpose here is to present a results comparison of the two surveys⁸, but the challenge lies in establishing what criteria should be used to evaluate these data when:

- technology is not culturally valued in our society,
- the pivotal role of technology in our lives is not comprehended, and
- the 'hidden curriculum' represents a powerful influence threatening our survival?

Against this background, it becomes necessary to discuss:

- national recognition of technology,
- the hidden curriculum,
- England's post-war legacy,
- England's 19th Century legacy,
- the pivotal role of our tool- and technology-culture,

so as to explain the rationale adopted for evaluating these data from the two surveys.

02.04 - National recognition of technology

For the informed witness, the evidence of our technological dependency can be seen all around us, but technology was only authorised as a curriculum subject on a national basis by the Education Reform Act of 1988. Subsequently, there were three sets of Standing Orders:

- June 1989, Design and Technology for ages 5 to 16,

⁸ Attachments 1 and 2 provide copies of the two questionnaires designed for completion by A-level students

- December 1992, Technology for ages 5 to 16 (1992), and
- January 1995, Design and Technology.

However, none of these Standing Orders defined technology, so how can it be taught?

02.05 - Today's technology - the latest manifestation of the culture of tools

The three sets of Standing Orders were indicative of the difficulties associated with the introduction of the subject to the curriculum, not the least of which was an appropriate name. For presentation of the results of this investigation, the term used will be 'Design and Technology' or D&T, but the point is made strongly that in reality *design is an implicit part of the creative and intellectual processes embedded within technological advance*.

Furthermore, the technology we know today is the latest manifestation of the culture of tools, and tool-culture has been humankind's constant evolutionary companion since before the Stone Age, playing a dominant role in the shaping of our civilisation.

Hence, with technology so manifestly important, it is vital not only to understand why it was authorised as a curriculum subject in 1988, but to evaluate the level of understanding and the progress made since then.

02.06 - The nub of the issue

As far as the late introduction of the subject to the curriculum is concerned, the issues are essentially culturally driven; they are about a conflict between education ideals, and the low intellectual esteem in which 'working with one's hands' is held. Not only is this perception having seriously negative consequences for our potential intellectual and industrial growth as a nation, importantly it neglects to acknowledge that when our Stone Age ancestors fashioned a cutting-edge on a piece of stone to use as a tool, it was a deliberate act of hand-eye co-ordination driven by the imagination, and so conceptually visualised.

Developments of the 'cutting-edge' in technology, and the products and services influenced by the 'cutting-edge', eg cars, electrical power, water supply systems to name but a very few examples, are more than an essential part of our lives today — they are all part of a massive artefact and product inventory, an inventory that has been growing since before the Stone Age, and which we take utterly for granted with almost no reflection on the conceptual origins within the tool- and technology-culture that underpins the way we now live, both as individuals and as a society. This is explained in part by a hidden curriculum.

02.07 - The hidden curriculum

02.07.01 - The past is in the present - flawed assumptions are still evident

In the context of education, part of our long-standing heritage is a flawed value judgment system. Until recently, and by default, the driving forces behind the design of our education

system were such that no recognition of technology, as a culturally valued subject, was possible. Furthermore, there was no perception that tool use was inherent in every human society, and therefore an intrinsic part of every culture, including our own. Yet for a sophisticated industrialised society, tool design, tool manufacture and tool use, were always at the core of the technologies that have underpinned our standard of living, including the funding of education—see Owers (2001:225).

Thus it may be argued that our educational system was founded on a number of flawed assumptions including:

1. 'As all civilisation really takes its rise in human intercourse, so the most efficient instrument of education appears to be the study which most bears on that intercourse, the study of human speech'—Taunton Report on secondary education (1868:22),
2. there was no intellectual content in the design of processes to apply practical skills, and
3. there was no imaginative or intellectual content in the application of practical skills—see Owers (2001:225).

02.07.02 - Total dependence of humankind on tool- and technology making skills

'While Taunton's intentions were straightforward and symptomatic of the period, they were a grossly inadequate appreciation. Humankind separated from all other animal species because of communication skills, but more particularly because humankind excelled as a toolmaker and tool-user; these skills were probably among the earliest imaginative influences in the evolution of humankind'—Owers (2001:225). Evolution of these skills laid the foundation of the technologies upon which we are now utterly dependent, both as individuals and as a society. But in education, those skills came up against a powerful cultural force as a hidden curriculum that could attribute little esteem to the vital intellectual iterative creative processes, and almost certainly because they were not comprehended.

02.07.03 - The nature of the hidden curriculum

As stated earlier, the school curriculum is influenced by society—Lawton (1975:6). The influences extend to particular aspects of the way we live, particular kinds of knowledge to be learned, together with certain attitudes and values to be acquired. Collectively, this selection from our culture is deemed so important that its dissemination 'to the next generation is not left to chance in our society but is entrusted to specially-trained professionals (teachers) in elaborate and expensive institutions (schools)'—Lawton (*ibid*), hence the national curriculum. But in addition to the national curriculum there is a powerful 'hidden curriculum'—Owers (2001:189).

Barnes (1982:169) described the hidden curriculum as 'what children would learn over and above the official curriculum', arguing that the 'list of possible learning is a long one'. Barnes (*ibid*:171) asserted there had been 'little explicit research on the hidden curriculum', and we 'do not know ... what values schools tend to inculcate'.

Discussing the hidden curriculum, Pinder (1987:143) argued 'The curriculum is the total experience of the school for the child. Thus the kind of learning that takes place, the kind of teaching, the discipline and ethos of the school, all these are part of the school curriculum'.

In developing this concept, Pinder refers to the importance of communication and the conflicts children witness between what teachers say and their body language. Such conflicts send out important messages, and Pinder (*ibid*:146) goes on to discuss 'What we teach without meaning to'. Describing her experience as an infant school teacher, Pinder (*ibid*:146) refers to the shock she received to hear the retort of a 6 year-old-girl 'in a voice dripping with sarcasm', and immediately recognised herself.

Boronski (1988:47) regards the hidden curriculum as: '... those things which a pupil learns along with official classroom subjects. He or she must acquire appropriate attitudes and behave in a particular way in order to gain the approval of teachers. It can be seen to operate in the way that school is organized (*sic*) — that is, in terms of its hierarchical nature, and also within the classroom. ... The hidden curriculum transmits important messages with regard to the appropriate attitudes, such as the importance of obedience to superiors, co-operation and the virtues of hard work.'

And Margolis *et al* (2001:6) write:

... the foundations for the general definition of the hidden curriculum as the elements of socialization (*sic*) that take place in school, but are not part of the formal curricular content. These include the norms, values, and belief systems embedded in the curriculum, the school, and classroom life, imparted to students through daily routines, curricular content, and social relationships.

Most teachers are probably familiar with the concept of the 'hidden curriculum'. But in all probability, few ever have the opportunity to observe and understand the impact of the 'hidden curriculum' on what the child learns, and this can be disastrous. In the worst case scenario, a person can go from school, to college, to teacher training college, and back to school as a teacher. Although education regularly makes the headlines, too many teachers live in a world of sheltered experience relative to the country's wealth creation activities.

'Too many people experience school as a failure experience, leaving with their self-esteem in tatters, believing they are stupid, inadequate and incapable. This is the worst possible starting point from which to start looking for work, particularly when so much of that work will, in future, have to be created by ourselves. ... We can no longer rely on our work institutions to fill our empty minds with their skills'—Handy (1997:119).

'In the history of education, the most striking phenomenon is that schools of learning, which at one epoch are alive with a ferment of genius, in a succeeding generation exhibit merely pedantry and routine. The reason is that they are overladen with inert ideas. Education with

inert ideas is not only useless: it is, above all things, harmful Except at rare intervals of intellectual ferment, education in the past has been radically infected with inert ideas'— Whitehead (1966:2).

'From the very beginning of his education, the child should experience the joy of discovery. The discovery which he has to make, is that general ideas give an understanding of that stream of events which pours through his life. ... Pedants sneer at an education which is useful. But if education is not useful, what is it?'— Whitehead (1966:3).

02.07.04 - Summarising the hidden curriculum

The hidden curriculum is a sub-set of learning experiences over and above the statutory curriculum requirements to which every child is exposed. This sub-set is not only influenced by society, but society has given much of the responsibility for delivery to schools. As a hidden curriculum however, we do not fully comprehend what has happened. The list of possible learning outside the curriculum is a long one; it includes our value judgment and belief systems. A by-product of the hidden curriculum is that not only do many leave school with low self esteem, we do not value the tool- and technology culture upon which we are totally dependent to function as individuals and as a society. Thus our standard of living is threatened. The problem is that the past resides in the present, and this will be explained.

02.08 - England's post-war legacy - official concerns emerging

Official recognition that there may be some quite legitimate concerns with our educational system is becoming apparent. In the Green Paper published February 2002, the then Secretary of State for Education and Skills, Estelle Morris (2002:3) wrote:

In the 20th century the education system was too often a one-size-fits-all structure. It neither demanded nor provided excellent standards in education for everyone. Nor did the education system adequately target the needs of the individual pupil.

In the 21st century, to be prosperous, the economy will depend heavily on the creativity and skills of its people. In a knowledge economy it is vital that we tap the potential of every one of our citizens.

... For too long, vocational studies and qualifications have been undervalued. This must change – we must introduce qualifications and pathways that are of an excellent standard, that deserve and are accorded high status, that are not a sink option for failed students, but which can lead the bright and able through into higher education and beyond. ...

Chapter 1 of the Green Paper (2002:7) continues :

Half a century ago, at the time of the 1944 Education Act, it was clear that the nation

needed to develop better vocational and technical education to meet the needs of a rapidly changing post-war society. It did not happen. During the last sixty years, the pace of social and economic change has increased dramatically and successive attempts have been made to improve vocational education and raise its standing in society. In practice most of these changes were piecemeal and enjoyed limited or no more than short-term success, while a long tradition of apprenticeship training was allowed to go into decline. There is no economic basis for undervaluing vocational education and qualifications. Yet this is precisely England's post-war legacy. We need now to rectify the traditional neglect of vocational education as a route to success and encourage far more young people to stay on in learning after age 16.

These statements in the Green Paper represent a courageous attempt to confront our culture, while at the same time providing a real rationale for desperately needed change. And the need for change has been identified before, for example:

There is only one way out of all this: it is, of course, by rethinking our education. In this country, for the two reasons I have given [the two cultures: Literary intellectuals at one pole—at the other scientists], that is more difficult than in any other—Rede Lecture by Snow, 1959 (1965:18).

Further evidence:

I believe ... they were able to convince themselves and their fellow countrymen that what was wrong with the education system that had served the Empire was its social injustice, characterised by them as "elitism". By concentrating on this aspect of the education system, they were able to ignore the *real* anachronism which was the bias in the curriculum, indeed in the whole school ethos, against what might be useful to the trading and industrial society and towards what was unworldly, theoretical, and academically pure—Rae⁹ (writing about *Our Obsolete Attitudes* (1977:15).

From what Estelle Morris writes, it may be thought that our problems go back to the time of the 1944 Education Act. However, the real problems with our educational system and its philosophical direction go back much farther.

02.09 - England's 19th Century legacy - serious problems evident

In 1861 Herbert Spencer observed:

That which our school-courses leave almost entirely out, we thus find to be that which most nearly concerns the business of life. Our industries would cease, were it not for the information which men begin to acquire, as best they may, after their education is said to be finished—Spencer (1861:25), see also Barnett¹⁰.

⁹ Rae, J, Headmaster of Westminster School in London, and former headmaster of Harrow public school.

¹⁰ Barnett, C, *The Audit of War: The Illusion & Reality of Britain as Great Nation*, Papermac, 1990, London.

One of the earliest indicators that there were serious problems with our educational philosophy occurred in 1867. After the Great Exhibition in 1851, Paris staged the 'International Exhibition of 1867', where Britain's fading industrial supremacy was 'alarmingly revealed'; 'Britain took only ten of ninety prizes'—Barnett (*ibid*:99). This dire 'performance' created shock waves, and prompted 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 (*ibid*), see also Owers (2001:120).

Hence in 1868, the Select Committee was appointed 'to inquire into the provisions for giving instruction in theoretical and applied Science to the Industrial Classes'—Parliamentary Papers 24th March 1868. And here the link between Science and the 'Industrial Classes' provided statutory sanction—Owers (2001:141) for devaluing both technical and vocational education, and was just one of numerous examples.

Although the current government seeks to promote technical and vocational education, earlier administrations did not know how to attribute any intellectual esteem to these subjects, and almost certainly because the majority did not understand them or their pivotal role in the well-being of our society. This philosophical failure was shared by education, and it remains a key problem. Indeed the language of Estelle Morris was not encouraging - '... sink option for failed students ...' - when the real problem is the education system, its values and what it has failed to offer students in the interests of the students and the interests of our society. Education should be the last bastion of prejudice—Owers (2001:236).

As a consequence there are a number of serious attitudinal obstacles to be overcome:

- Those who have succeeded in the educational system usually have no wish to change it.
- In the context of economic survival, the application of knowledge is more important than the acquisition of knowledge for its own sake.
- 'Cultures "see" [only] what they are predisposed to see and ignore the rest'—Hampden Turner, and Trompenhaars (1994:60).

In addition to these attitudinal problems, there are three significant curriculum issues that warrant serious consideration:

- The curriculum needs to underpin the pivotal role of the tool- and technology-culture in our lives as individuals and as a society, and upon which we are utterly dependent. In this context, a prescriptive curriculum would be counterproductive.
- The hidden curriculum and its value judgments are a real incestuous cultural force within education.
- There is a critical need to confront the hidden curriculum in education that functions as a debilitating force opposed to our tool- and technology-culture with serious economic and environmental implications, but which is now deeply embedded in the national psyche.

By now, it should be evident that these attitudinal and curriculum concerns present a serious challenge. In our society, the challenge is made greater because there is no social esteem attached to working in industry, even though the products and services of industry are the life blood of society, and competitive industry seeks the forefront of technological innovation. Without exception we are all users and consumers of technology, and furthermore we are totally dependent on technology. Since our society is 'technically illiterate'—Sharon (1989:55), our dependency on technology and industry is just not understood. However, it is significant that little social stigma attaches to being 'technologically illiterate', and therefore 'only partially educated'—Penfold (1988:21)—see also Owers (2001:141).

Merrill (1965:585) argues:

... evidence suggests that technological traditions are far more complex than usually realised and that they contain numerous features of the greatest significance for understanding the possibilities and processes of technological change. Even 'accident', that unpredictable source of change, is well known to depend on a prepared mind ...

Our tool- and technology-culture prospered above all among a minority who developed prepared minds, and as a consequence they played a dominant role in the shaping of our civilisation as knowledge built on knowledge, and was handed down the generations. So the influences of our tool-culture are everywhere to be seen, but only by informed witnesses. Usually, uninformed witnesses take the benefits of our tool- and technology-culture entirely for granted. They have little comprehension of the processes or products that have enhanced their own productivity and capability in every field of human experience, and upon which they are utterly dependent.

Handy (1997:125) writes:

There has always been a lot of learning going on in society, but most of it has been happening outside schools.

And it was the learning that was going on outside schools which started and sustained the Industrial Revolution. However, the evidence shows that the dominant majority in the educational establishment, were never able to accept technology with any parity of esteem—Owers (2001:109). In this context, Brian Redhead (1986) narrating for the RSA¹¹ stated:

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. ... We even devised an education system which chose not only to ignore industry but to steer its ablest pupils well away from it. This cultural disparagement of industry, this snobbery, is the root cause of Britain's industrial decline. It is a failure to take industry seriously. ...

¹¹ See Video Film "Thanks to Industry", produced for the Royal Society for the encouragement of Arts, Manufactures and Commerce (RSA), as a resource during Industry Year 1986.

02.10 - Our proud technological heritage goes back to the Stone Age

The body of our technological knowledge was derived from conceptual activity that goes back to before the Stone Age, and which was subsequently proven by demonstration. As the body of theory and conceptual knowledge expanded, the separate areas of knowledge became distinct disciplines that now underpin the functionality of our society. These distinct disciplines include all the engineering disciplines such as mechanical, civil, electrical, aeronautical etc, but also all the health, dental and nutritional technologies. The knowledge base continues to expand in each of these disciplines, and it can only continue to do so with the committed interest, comprehension and help of education.

The earliest bodies of knowledge were also derived around basic tool concepts that made use of the 'cutting edge', and the driving rationale was survival. Such concepts could be realised only by selection of appropriate materials that were then subjected to hand/eye co-ordinated skills driven by the imagination. The purpose in the next section is to show how a Stone Age concept eventually enabled us to achieve electrical power generation and supply systems.

02.11 - The pivotal role of our tool- and technology-culture

The evidence of our tool-culture is everywhere around us, and so the subject matter fills many, many libraries. Here, the intention is to discuss briefly a number of key concepts that have made a fundamental contribution to the way we live as well as our standard of living, and about which there is very little comprehension. But even to discuss briefly the impact of this subject on our lives still takes some 11 pages since it also covers other tool-cultures!

The tool-culture that has been humankind's constant evolutionary companion has been driven by the application of imaginative intellectual and practical knowledge together, providing the foundations for what we know as Technology today. But in our society 'working with one's hands' is held in low esteem, as demonstrated by a head of D&T describing a personal experience in July 2002:

Teachers with a non-technological background in my school refer to pupils taking practical/technological subjects as 'thickies', and they find it amusing.

This experience of one teacher as head of technology is not unusual. Appendix 5 Owers (2001:268) provides many other examples. The various ways in which the anti-technological and anti-industry cultures have become established testify to the enormity of the problems for our society, and education in particular—see Owers (*ibid*). A further indication of the huge cultural problems we face may be gauged by the introduction of the subject of D&T on a national basis with the Education Reform Act of 1988, rather than in 1868 or earlier.

As already discussed, after the introduction of the subject on a national basis, there were 3 sets of Standing Orders for D&T. However, none of them offered a definition for technology. 'If you can't define something you have no formal rational way of knowing that

it exists. Neither can you really tell anyone else what it is'—Pirsig (1991:206). Thus the absence of a definition for technology in the Standing Orders for D&T was critical, and added considerably to the difficulties faced by teachers. How could the central and pivotal role of the subject in our lives as individuals and as a society ever be comprehended? The enormity of the problems we face may be gauged by reference to the following extract:

From an historical and cultural perspective, this research suggests that our tool-culture has been at the core of the evolution of humankind through knowledge building on knowledge as social cumulation. Hence the place of technology in our lives may be helpfully and briefly summarised as follows:

- 1 Technology is the generic creative system of humankind that has brought us from the Stone Age to the way we live now.
- 2 Humankind has progressed from the Stone Age because of its tool-culture.
- 3 The sophisticated technologies we use today as tools, are the outcomes of knowledge-building-on-knowledge ever since the Stone Age.
- 4 Knowledge builds on knowledge as social cumulation. In reality the 'hero inventor' has the role of witness to a new convergent synthesis, which is the outcome of his/her new knowledge and ideas building on existing knowledge.
- 5 As knowledge builds on knowledge, technology becomes multilayered, and is implicit in the law of prior dependency.
- 6 Without exception we are all tool-users.
- 7 Although we are all tool-users, relatively few of us are tool- or technology-makers.
- 8 We use tools, and technologies as tools, as extensions of ourselves in order to enhance our productivity and/or capability.
- 9 As a society, our collective productivity and capability underpins our standard of living relative to other countries.
- 10 In order to function as individuals and as a society, we are dependent on tools and technology.
- 11 The evidence of our dependency stares us in the face every day; we have not been educated or trained to see this dependency, but ever since the Stone Age humankind has been socialised into using tools—Owers (2001:232).

02.12 - Our constant evolutionary companion

The tool-culture that has been humankind's constant evolutionary companion has been driven by the application of imaginative intellectual and practical knowledge together, providing the foundations for what we know as Technology today. But as stated earlier, in our society 'working with one's hands' is held in low esteem, and so vocational education has been consistently damned. Indeed there is a cultural obsession with the practical aspects of technology, and a complete failure to see the intrinsic intellectual content as a necessary precursor of the practical content, as typified by the following:

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.

Baker's assessment epitomises the dominant culture in our society unable to see that technology at the leading edge enhances our productivity and capability, as well as our living standards. Such statements reinforce the prevailing 'statutory sanction'—Owers (2001:141) ensuring continuity of disparagement of the subject and of our critically important tool- and technology-culture, upon which we are totally dependent.

Since knowledge builds on knowledge, there has been an endless stream of inventions in our tool-culture, and they go back to before the Stone Age. Two of the most important tool concepts that now underpin our standard of living were the 'cutting-edge' and the 'lathe'.

02.13 - The cutting-edge and the lathe

The historical evidence of our tool-culture demonstrates how the toolmakers of humankind have constantly applied thought in the development of their tools using available materials. For example, a wooden spear made from a Yew tree found at Clacton-on-Sea was of 'special interest', and was 'estimated to be three hundred thousand years old'—Shick & Toth (1995:271). As knowledge built on knowledge among our ancestral forebears, their tools, now crude by our standards, gradually became more sophisticated. However, the technology we know and have today could not have been attained without the evolutionary processes of our tool-culture as started by our forebears. And as stated earlier, the Stone Age concept of the 'cutting-edge' was significant, indeed it was a giant intellectual leap.

The importance of the cutting-edge, and its significance in our lives is such that without it we would have made far less technological progress. In fact it is hard to imagine much in the way of evolutionary progress without the cutting-edge. As knowledge built on knowledge, humankind was able to cut and work increasingly harder materials, making possible the construction of tools with progressively greater levels of sophistication. However technology never stands still, driven on constantly by the imagination of humankind through new convergent syntheses, but this process can take generations. In the continuity of our tool- and technology-culture, another important development was the lathe.

The earliest machine tool which applied the 'cutting-edge' appears to have been the lathe, a most important development for humankind. Turned artefacts date from as early as 700 BC—Woodbury (1972d:20/21). By the 18th Century, the skills and techniques of precision had evolved with the instrument makers; they had a profound effect on the course of technological history—Rolt (1965:38). Their knowledge and skills provided scientists with instruments capable of accurate measurements to an extent previously unknown—Rolt (*ibid*). Scientists were able to 'formulate theories' that engineers could use in place of empirical methods, with significant results 'towards the end of the 18th Century'—Rolt (*ibid*), thus

expanding the frontiers and capability of our tool-culture—see also Owers (2001:3).

In western industrial societies, every product bears witness of technological achievement. Products such as cars, trains, ships and aircraft are obvious examples, as well as all the equipment used in the home. However, none of these or any other modern products would be feasible without machine tools. Pioneers such as James Watt (steam engine), George Stephenson (locomotive), Gottlieb Daimler (car), Rudolph Diesel (compression ignition engine), and the Wright Brothers (aeroplane) became household names because of their achievements—Rolt (1965:11). But none of the achievements of these famous pioneers would have been possible without machine tools—Rolt (*ibid*)—see also Owers (2001:40).

Machine tools have a special place in the evolution of technology—Rolt (*ibid*). Although historians and sociologists acknowledge the 'powerful influence of technology', they have not considered the role of machine tools—Woodbury (1972a:Preface)—see also Owers (2001:40). As a machine tool, the evolution of the lathe illustrates remarkably well the inventive processes of humankind, and how this tool also became progressively more sophisticated. The iterative creative process is there for all to see—Owers (2001:143/144).

Lathes are used to make things. As tools, they extend the productivity and capability of humankind. The lathe allows a workpiece to be rotated about a fixed axis for the removal of unwanted material in order to create a smooth circular finish. This technique is still known as 'turning'. Typically, a tool is held against the revolving workpiece to remove excess material. The remains of turned wooden bowls or vessels were discovered in Italy dating from c.700 BC, in Asia Minor from the 7th Century BC, and in Upper Bavaria from the 6th Century BC—Woodbury (1972d:20/21)—see also Owers (2001:41).

Although the remains of turned artefacts have been found from such early times, there are no surviving examples of lathes from these times—Woodbury (1972d:30). However, there are illustrations of lathes for reference; one of the earliest appeared in an Egyptian grave of the 3rd Century BC—Woodbury (1972d:32)—see also Owers (2001:41). By comparison with this illustration, the German pole lathe of 1395 represented a significant advance—see Owers (2001:41), and this level of low cost technology is still in use today. Fig. 1 below shows a pole lathe being used to turn a chair leg from local ash at the Hatfield Forest Wood Fair on 5th September 1998; note the operator was controlling the cutting-edge to determine the dimensions and shape of the chair leg, and also providing the rotary motion.

The never-ceasing progression of human creative imagination and capability in the fertile fields of our tool-culture, found many important further improvements in lathe technology, including the use of iron and the development of the first precision flat surfaces. These also were crucially important developments in what was then a new convergent synthesis.



*Fig. 1 - Pole lathe in use at Hatfield Forest Wood Fair
- 5th September 1998*

02.14 - Flat surfaces and precision technology

Precision flat surfaces were another important breakthrough in our technological evolution, but how were the first truly flat surfaces obtained at a time when none existed? For true flat surfaces in machine tool design—Woodbury (1972d:101), states:

The usual method of checking then and now was by use of a standard plane surface, or surface plate. A small amount of red lead or other material is smeared lightly over the surface to be tested. It is then rubbed lightly with the surface plate, and any high points will be clearly indicated by the removal of the red lead.

This same method was also used by Maudslay [1771-1831] to construct original surface plates. In order to be sure that the surface plate is neither concave, nor convex, nor twisted, three plates are made at a time and checked against each other. This technique was not original with Maudslay; what was new was his method of producing these surfaces by patient scraping, rather than grinding or filing off the high points until a perfect plane was achieved. ...

Master surface plates must be neither convex nor concave in any direction—Rolt (1965:88). The original standard plane surfaces were achieved as a source of reference by a similar method; in this case however, '... three, or possibly four ...' plates were worked together—Rolt (1965:87). After filing to obtain a flat surface, Maudslay introduced 'scraping' with a hand-tool as a further refinement, and for easier control of the finishing process to achieve

precision—Rolt (*ibid*).

Maudslay established exacting requirements, ensuring his workmen had standard flat surfaces besides their places of work that were used regularly—Woodbury (1972d:101). Maudslay's method of hand finishing was still in use for precision surfaces, '... despite the advent of precision grinding machines—Rolt (1965:87)—see also Owers (2001:48).

Hundreds of engineers contributed to the history of machine-tool development—Rolt (1965:90). Among these, Clement, Fox, Nasmyth, Roberts, and Whitworth were '... the most celebrated ... great engineers and toolmakers ...'—Rolt (*ibid*). They achieved national or international recognition in their own right through innovative machine tool design—Rolt (1965:90–121). Among his contemporaries, Maudslay stood 'supreme'—Rolt (*ibid*). His introduction of precision methods in the workshop, transformed the techniques of mechanical engineering in the space of one life-time—Rolt (*ibid*).

These methodological changes created the platform for the development of steam power '... and the complete transformation of many industries by the substitution of ingenious machines for hand methods'—Rolt (1965:91). At the time, these were sensational developments that came about because of the "'behind-the-scenes revolution" ... wrought by Henry Maudslay and his school'—Rolt (*ibid*)—see also Owers (2001:49).

Addressing the British Association at Manchester in 1861, the President William Fairbairn summarised the machine-tool revolution that he had witnessed as follows:

When I first entered this city the whole of the machinery was executed by hand. There were neither planing, slotting nor shaping machines; and, with the exception of very imperfect lathes and a few drills, the preparatory operations of [engineering] construction were effected entirely by the hands of workmen. Now everything is done by machine tools with a degree of accuracy which the unaided hand could never accomplish. ...—Rolt (1965:91).

These capabilities were achieved by sophisticated development of hand-eye co-ordinated skills, driven by the imagination in an iterative process, progressing the frontiers of precision technology to machine tools, and hence increasingly widespread application. Without these steps, we would never have achieved electrical generation and supply systems. Furthermore, the cutting edge eventually enabled humankind to progress to the technologies of precision as the key to replaceable parts and mass production. The way we now live is totally dependent on the technologies of precision—see Owers (2001:29).

02.15 - Electricity generation and supply systems

Machine tools made many highly significant technological impacts leading to improvements in the quality of life for UK citizens, and not least in electrical supply systems. In 1821, Michael Faraday (1791-1867) showed that 'a wire connected to a battery would rotate around

a fixed magnet'—Byers (1988:10). By 1831, Faraday had 'established ... the relationship between electrical and magnetic effects'—Bowers (1990:4). Other inventors worked on the dynamo so that by 1870, the basic 'winding' variations were defined—Usher (1954:400). By 1880, the actions necessary to achieve 'lighting, power production, and traction' were feasible—Usher (1954:401)—see also Owers (2001:70).

However, the growth of the electricity supply industry was a tortuous one spanning more than five decades—Poulter (1986:178). Many of the difficulties would have been associated with discovering new methods in the engineering workshops to produce parts with precision that would reliably support the new electricity generating and supply technologies.

But there were also difficulties with electricity system supply standards. In 1928, 'there were thirty-three different AC [alternating current] systems, and twenty-four different DC [direct current] systems—Poulter (*ibid*). One of the earliest installations was in the small market town of Godalming in Surrey; the lights were switched on in September 1881—Byers (1988:6). By 1931, fewer than half the homes in Britain were connected to an electricity supply—Bowers (1990:1)—see also Owers (2001:70).

Electricity generation and supply now underpins a whole range of new industries and technologies that we take utterly for granted such as TVs, computers, mobile phones, and a multiplicity of electronic accessories and options for the home and cars. This list of technological products is but a tiny fraction, nevertheless they are all tools that enhance our productivity and/or capability. And the application of precision technology was paramount in their design and manufacture, whether in this country or some other industrialised society that exports manufactured goods to the UK.

02.16 - Technology in industry

For the lay person, what happens in industry is one of the hardest activities to place in a societal perspective. Perhaps the role of technology in industry or society is even more difficult to grasp. And yet both are vital in the culture of a western industrialised society.

The nature of the vital relationship between industry and society was shown by the government's Central Statistical Office (CSO). In April 1994, the CSO celebrated '... 80 years of official price watching.' The change in prices for certain goods and services over this period of time were published. The changes were measured by an index known in 1914 as 'the Cost of Living Index'. By 1994, it was known as 'the Retail Prices Index.' The RPI tracks inflation as a proportion of the family budget, and should be of interest to everyone because '... it is used in wage negotiations and to increase state benefits'—CSO (94) 84. Some of the changes are reproduced in Fig. 2 below, and supported by further extracts from Owers (2001:57).

	THEN - 1914	NOW - 1994
Population	43.0 million (GB & NI)	58.0 million (UK)
Life expectancy - Males	51.5 years	73.2 years
- Females	55.4 years	78.7 years
Food as a proportion of 'Index'	60%	15%
Motor vehicles licensed	300,000	24,851,000
Price of a car	£730 (20HP 4cyl.)	£6,995 (1.4L)

Fig. 2 - A few statistics from the period 1914-1994, Published by CSO 26.04.1994

From these data, it may be calculated that life expectancy for both sexes improved by 42% between 1914 and 1994. An obvious factor in such an improvement would be the quality of education and training of medical staff, including knowledge that has built on knowledge, on an increasingly scientific basis. But less obvious would be the contribution made by the products and services of industry through new and improving technology—a general problem for our society. In this context the CSO (94) 84 states:

As people become generally more prosperous and sophisticated, their needs change and so do their spending habits. In 1914 very few homes had electricity or gas, so candles were widely used for lighting and therefore featured in the cost of living index. Candles finally went out in 1956. ...

Changes in the products shown on the index list, reflected the growing affluence of society. In 1914, food as a proportion of the index represented 60%; by 1994 it was only 15%. Such changes were only possible because of technology, including increased mechanisation in agriculture, and a wider choice of affordable products. The CSO goes on to state:

The RPI is also a measure of purchasing power. For instance, since 1914 the pound has shrunk in value ... to purchase what a pound could buy in 1914, you would now need to spend around £50.

So at the same level of technology, a car that cost £730 in 1914 would have cost £36,500 in 1994. How many could afford such prices today? With improvements in product development technology, in manufacturing technology and in materials technology, there was a car in 1994 available for £6995. The modern car had superior performance and economy, superior ride and handling, much lower cost of ownership, and was safer.

These CSO data should similarly be a cause for celebration of the achievements of industry and technology, but there were no such references. Clearly, the functions of industry and technology are not comprehended in our society, and this represents a very serious problem since the products and services of industry are the lifeblood of society. As we are utterly

dependent on our tool- and technology-culture, other societies have become established around their own distinctive tool-cultures.

02.17 - Other tool-cultures

Total and distinctive ways of life are represented by many different societies, but the one feature they all have in common is how they apply their imagination to use available materials in their technologies in the quest for survival. Societies interact with their surroundings, and the location influences the evolution of their techniques and technologies. Knowledge is learned, passed down the generations as social cumulation, and becomes the culture which enables humankind to 'adapt' to 'different environments'—Cotterell and Kamminga (1990:1). In this process, mechanical knowledge was identified and applied throughout most of the life-span of humankind, with little 'theoretical' grasp—Cotterell and Kamminga (1990:11)—see also Owers (2001:94).

Total and distinctive ways of life are not immune to technology transfer; it takes place between nations through interaction which includes trade. For example, when a few 'white' people began to push into the North American 'arctic' regions, they had to 'learn' from the local people about 'shelter, clothing, hunting and travel'—Pacey (1996:142). Here were the technologies of survival for a severely cold climate—see also Owers (2001:94).

Through trade, a 'two-way exchange' of technological information took place between the white and local cultures first with the 'Dene' Indians, and subsequently with the Eskimos—Pacey (1996:144). The processes of technology transfer with the local people started in the 19th Century, and continued into the 20th Century—Pacey (*ibid*). People native to the region often found innovative ways to adapt the technologies of the west to their 'life-styles'—Pacey (*ibid*). Modification of the 'service and maintenance procedures' of the snow-mobile to cope with the arctic conditions was one example—Pacey (*ibid*). The word 'Anorak', now subsumed into the English language, evinces better protective clothing—Pacey (*ibid*), as well as technology transfer—see also Owers (2001:94).

The Lapp peoples live in the 'extreme north of Scandinavia' and had a way of life that was entirely dependent on material from the reindeer—Bronowski (1979:48). They ate the meat, drank the milk, used the sinews, furs, bones, and antlers, and they made shelters from the hides—Bronowski (*ibid*). The Lapps have since become dependent on the snow-mobile in order to herd their reindeer—Pacey (1996:2), a further example of western technology transfer—see also Owers (2001:94).

By about AD 1500, the South American Inca peoples had evolved their own distinctive way of life—Bronowski (1979:96). They developed masonry skills at a significant level, and the quality of their masonry has withstood the test of time—Bronowski (*ibid*)—see Fig. 3.

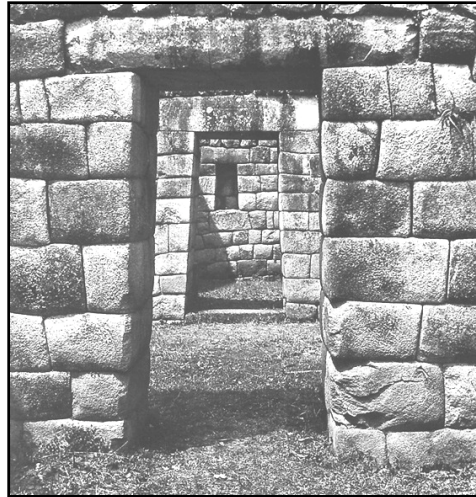


Fig. 3 - The masonry skills of the South American Inca—Bronowski (1979:97)

Stone was an ideal material for building walls, but considerable skill in hand/eye co-ordination had to be learned. The Inca masons applied their skills and imagination to make houses. With the addition of further new ideas as knowledge built on knowledge, they extended their skills to plan and make streets which became towns or cities such as Machu Picchu—Bronowski (1979:96)—see Fig. 4 below—see also Owers (2001:95).



Fig. 4 - The City of Machu Picchu - see Bronowski (1979; 98-99)

Machu Picchu is over 2400 metres (8000 feet) in the high Andes mountain range—Bronowski (1979:96). It maybe seen that the ground was steeply sloping. So the Inca peoples developed agriculture on terraced hillsides to grow their crops such as the potato and maize; control of irrigation was a primary necessity for the terrace technique—Bronowski (1979:100). With their stone structures and towns, their hillside terraced agriculture, the Inca people exhibited community organisations with divisions of labour in the learned form of behaviour characteristic of their culture—Bronowski (1979:96); in other words their response to the problems of survival as a society, and based on their unique tool-culture.

In the period between 1438 and 1532, the Inca culture established an empire bounded by three thousand miles of Pacific coastline and the Andes—Bronowski (1979:100). As in any empire, the authority of the ruling classes was sustained by three key [technological] inventions—'the roads, the bridges and the messages'—Bronowski (*ibid*). The Incas took great care of their inventions, but they did not use the wheel on their roads, nor the arch under their bridges, and their messages were not written, but comprised 'numerical data' as knots on pieces of string known as *quipus*—Bronowski (*ibid*)—see also Owers (2001:96).

The Spanish conquered the Incas in 1532, using the 'terrible horse' to plunder the cities—Bronowski (1979:102). Cities are sophisticated places devised by humankind to live on a larger agricultural base than can be sustained by a village—Bronowski (*ibid*). As such, a city not only provides an administrative centre, but can afford every kind of craft skill as a life-time specialist occupation with opportunities for goldsmiths, coppersmiths, weavers and potters—Bronowski (*ibid*). As a conquered people, the work of these specialists was plundered; with new masters invention ceased, leading to the demise of the Inca empire—Bronowski (1979:103).

The technology of Spain enabled the Spaniards to navigate their way to South America, and to conquer the Inca peoples, but what was the foundation of Spanish technology? The Greek and Roman civilisations were two of the most interesting in 'ancient Europe'—Landels (1997:7), and both provide further examples of distinctive ways of life. Their contributions in the field of social cumulation, or knowledge building on knowledge, were significant in Europe and beyond—see also Owers (2001:96).

The peoples of the polynesian islands had their own tool-culture, and this discovery was one of many outcomes of Captain James Cook's voyage in the *Endeavour* starting in 1768. Smiles (1863) commented as follows:

When Captain Cook [1728-1779] first sailed into the South Seas, they were surprised by the native demand 'for iron'. Indeed, 'iron was their beloved article'. 'A nail' could be exchanged for 'a good-sized pig', or 'four hundred pounds of fish' for 'improvised knives'—Smiles (1863:1).

'The principal tools of the Otaheitan' natives were of 'wood, stone and flint'; Cook thought them clumsy. The 'adzes and axes' were made of 'stone'. The 'bone of the human forearm' was commonly used as a 'gouge'. For a knife they used a 'shell, or a bit of flint or a jasper'. 'A shark's tooth, fixed to a piece of wood, served for an auger; a piece of coral for a file; and the skin of a sting-ray for a polisher. Their saw was made of jagged fishes' teeth fixed on the convex edge of a piece of hard wood' —Smiles (1863:2).

The native stone tools were made 'by rubbing one stone on another' to achieve the 'required shape'; they were 'inefficient', 'soon became blunted and useless', and the 'laborious process of making new tools had to be begun all over again'. 'The delight of

the islanders at being put in possession of a material which was capable of taking a comparatively sharp edge and keeping it, may therefore readily be imagined'. Iron was identified by the natives with 'power, efficiency, and wealth; and they were ready almost to fall down and worship their new tools, esteeming the axe as a deity, offering sacrifices to the saw, and holding the knife in special veneration'—Smiles (1863:3).

What was crucially significant about these observations was the recognition of tool concepts from a distant and entirely different culture that had much in common with our own tool concepts. The Otaheitan people had gone through the same intellectually driven iterative and creative imaginative processes to arrive at their tools; they could see that the tools used by Captain Cook's crew were superior since they were made from iron. The use of iron represented a new convergent synthesis.

Because the UK had iron and many other materials, plus a whole range of new imaginatively conceived concepts involving a growing scientific and mathematical understanding, we were able to develop electricity generation and supply systems with all the attendant benefits. As a new technological capability, electricity generation and supply systems provided the impetus for many new technological industries and products.

However, to remain competitive, industry has to be driven by people with a range of personal qualities including scholarly achievement and knowledge that supports the skills pyramid appropriate to their industry, but which is led by technological visionaries. This is crucial for every socio-economic community, but in our society hand skills driven by the imagination, upon which all industries still depend, are disparaged. The nature of this disparagement is so widespread within the culture of our educational system that it represents a 'hidden curriculum' that threatens our economic survival.

02.18 - Evaluating the data from the surveys

Revisions to the national curriculum were announced in September 1999; they became effective August 2001 and August 2002. Some may argue that the basis for evaluating the outcomes of the two surveys should be that required by the statutes. However, official insight into the enormity of our problems is beginning to emerge, and should be encouraged. Hence, this evaluation will reflect on the definition of technology as shown earlier, and the needs of our wealth creating activities as a society, particularly given the emphasis by the Secretary of State for Education for a 'prosperous economy', 'creativity', and a 'knowledge economy'.

If sustaining ourselves as a society is going to be taken seriously, then the application of knowledge becomes paramount, and not knowledge for its own sake. In particular, we have to comprehend the pivotal role of our tool- and technology-culture, since we cannot function as individuals or as a society without them.

Furthermore, if the application of knowledge to sustain ourselves both economically and

environmentally is of paramount importance, that surely changes the content and structure of the curriculum, and confronts the dominant influence of the hidden curriculum. The latest national curriculum includes a statement of the importance of the subject within each of the subject specific standing orders. These are reproduced in each appendix as appropriate.

After summarising this chapter, the presentation of these data from the surveys will be considered in the following appendices, including a comparison of the raw data.

02.19 - In summary

This report presents the outcome of two surveys in Technology and other subjects against the background of a hidden curriculum. The hidden curriculum flourished among opinion leaders considered educated in decades past. Indeed, their administrative influence caused the appointment of a Select Committee in 1868 'to inquire into the provisions for giving instruction in theoretical and applied Science to the Industrial Classes', so providing statutory sanction for the disparagement of the tool and technological culture that underpins the way we live and function as a society. As an industrial and trading society, we have been strongly influenced by the prejudicial and short sighted value judgments of those times.

Thus in England, there is a well established durable hidden curriculum among a majority that refuses to attribute any intellectual activity to the hand-eye co-ordinated skills, or the practices dictating the hand-eye co-ordinated skills, although without exception we are all tool and technology users. Furthermore, there is no link with the wealth creation activities upon which any modern society is dependent for the health of its socio-economic communities through technology. But we continue to expect and demand services from the state.

The pivotal role of our tool-culture was briefly discussed, drawing in particular on key concepts that underpin the way we live now. The aim was to counter the technological illiteracy deeply embedded in our psyche that attaches no intelligent activity to the application of hand-eye co-ordinated skills driven by the imagination. Yet it was expressly imaginative, intelligent activity also driving hand-eye co-ordinated skills that brought us to the way we live now.

Similar practices underpin how many different ethnic societies sought to live, embracing intelligently derived imaginative concepts achieved through hand eye co-ordination. The one significant variable between them were the types of materials available in their chosen habitat. Comprehending how different societies live and survive in other parts of the world, fosters understanding of the foundation principles of our own tool- and technology-culture.

In an endeavour to rectify the effects of the cultural problems peculiar to England, our history up to the present day discloses a past littered with agreements followed by action, achieving nothing more than a miserable cycle of failure—see in particular *Chapter 7 Technology in Education - statutory considerations*—Owers (2001).

Appendix 1

Presentation of results from 6th Form surveys

A1.01 - Introduction

The first three questions on these data gathering instruments enable definition and comparison as follows:

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

<u>Survey</u>	<u>1995-6</u>	<u>2001-2</u>	<u>Change %</u>
Female	1150	1199	+4.3
Male	1861	1707	-8.3
Missing entries	94	160	+70.2
Total number of cases	3105	3066	-1.3

Some of the missing entries relate to the question in which the A-level students were required to indicate their gender. Other missing entries occurred where faint marks were made on the questionnaire which could not be machine-read.

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

<u>Survey</u>	<u>1995-6</u>	<u>2001-2</u>	<u>Change %</u>
First year	2083	1721	-17.4
Second year	830	1127	+35.8
Missing entries	192	218	+13.5
Total no. cases	3105	3066	-1.3

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

<u>Survey</u>	<u>1995-6</u>	<u>2001-2</u>	<u>Change %</u>
Art	566	660	+16.6
Design & Technology	1470	1625	+10.5
English	773	779	+0.8
Geography	650	577	-11.2
History	394	370	-6.1
Maths	1051	812	-22.7
Modern Foreign Language(s)	340	245	-27.9
Science	1156	1107	-4.2
Other subjects - please define	1661	1624	

In both surveys, the scanned 3-page questionnaires produced more than 70 variables, with many analytical possibilities. The aim here is not only to discover whether movement has taken place, but also to illustrate 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—Owers (2001:189), hence the hidden curriculum.

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 RSA¹² 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* (EIU) 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.

In the pilot testing of the questionnaire among schools for the 2001-2 survey, it became evident that the cross-curricular themes were regarded as no longer compulsory. Certainly the recognition of earlier times no longer had the same emphasis. But during the pilot appraisals, some interest was expressed to retain parts 'G' and 'H' of the questionnaire to test for current awareness, as well as change in awareness.

So this survey comparison provides an opportunity to reflect on the perceived role in our lives of various curriculum subjects among A-level students, and at two points namely 7 and 12 years after the introduction of technology on a national basis, as authorised by the 1988 Education Reform Act.

¹² Royal Society for the encouragement of Arts, Manufactures and Commerce

Initially, the analysis will concentrate on Design and Technology abbreviated D&T in the results, and the core subjects of Mathematics, English and Science. Each subject will be considered in as many dimensions as the original questionnaires will allow, but the overriding focus will be: (1) the pivotal place of technology in our lives, and (2) the link between education and our economic and industrial activity.

Ideally, the data-gathering instrument should have used the same subset of curriculum subjects for each question. However, this would have required a 4 page questionnaire, and was perceived as a potential further source of resistance for exceptionally busy teachers contemplating participation in this research.

We at ULTRALAB are indebted to all the teachers who have given of their time to participate and help in this research; many have probably chosen to participate out of an instinctive appreciation of the gravity of the issues. Our heartfelt thanks go out to all, and we hope fervently that this research will help to lift the esteem in which D&T is held, a vital starting point in the school.

A1.02 - The comparison of statistical results

Statistical data are concerned usually with 'the measure of central tendency among a batch of values'—Velleman (1992:7/1), and applies also 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 these data collected.

The statistical analysis produced some 80 graphs in both surveys. The median values are shown, and the graph frames include sample sizes. The alpha/numeric reference in the top left hand corner of each graph frame refer to the questions on the data-gathering instrument. The year of the study appears bottom right hand corner. In addition, the graph figures for the first survey are referenced 'A', and for the second survey 'B'. In some cases, further charts have been produced to aid presentation of analysis; where a direct comparison has been made between the two surveys, the reference 'AB' has been used.

Many of the graphs exhibit a peak around the midpoint 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.

As may be expected, there were changes between the two surveys and these included two identifiable categories: (1) a small change in the shape of many curves, and (2) changes in

some 29 of the median values as plotted in the graphs.

The changes in the shape of the curves are dealt with by comparing the sum total percentages of the rating scale values 7, 8 and 9 for all forms of analysis. The rationale for picking these scale values was that they should indicate the greatest level of student comprehension about the value of the subject.

Data Desk (and Excel) calculate medians rounded to the nearest whole number, and these appear in the graphs. But for a comparative study it was necessary to know the real measure of change, and this was determined by calculating the 'unrounded median'. Calculation to two places of decimals became necessary because some movements were so small.

The sum total percentages of the rating scale values 7, 8 and 9 were also calculated to two decimal places because of small movement in some cases. These data were used in the summaries at the end of each appendix.

A1.03 - In summary

- There were 3105 cases and 3066 cases respectively in the surveys of 1995-1996 and 2001-2002, a reduction of 1.3% in case numbers; some 200+ questionnaires were received too late to be included in this analysis.
- Using the first survey as the base line, these A-level samples compare as follows:
 - * 4.3% more girls, but 8.3% fewer boys— see the first page of this appendix,
 - * 17.4% fewer 1st year students, and 35.8% more 2nd year A-level students,
 - * 16.6% more students taking Art,
 - * 10.5% more students taking Design and Technology,
 - * a negligible change in the number of students taking English,
 - * 11.2% fewer students taking Geography,
 - * 6.1% fewer students taking History,
 - * 22.7% fewer students taking Maths,
 - * 27.9% fewer students taking a modern foreign language, and
 - * 4.2% fewer students taking Science.

There was a remarkable degree of 'likeness' between the graphs measuring the comparable criteria in the two surveys, suggesting the data was reliable. In spite of this 'likeness' however, there were two clearly identifiable forms of change between the two surveys: (1) a small change in the shape of many curves, and (2) changes in median values. Analysis of these changes shows a worsening picture in many cases presenting causes for serious concern. These results are discussed in detail in the following appendices.

Appendix 2

Comparison of 6th Form surveys: Design & Technology in 1995-6 and 2001-2

A2.01 Introduction

D&T in education and industry

In this comparison of surveys, 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?

*Note: Economic and Industrial Understanding.

These questions provide the parameters of analysis and the results are presented according to this schedule, starting on the next page. The results are shown as graphs and presented two-to-a-page to enable direct comparison between the surveys.

All the graphs are annotated with the questionnaire references in the top left corner, and the school year of the survey in the bottom right corner.

First sight inferences appear with each pair of graphs, and an overall summary for D&T appears at the end of the appendix.

The appendix concludes with a detailed analytical summary of the graphs, and a 'Closing statement for D&T'.

Question 'D' : How much interest do you have in D&T?

Figures A01 and B01 below present the interest shown in D&T by both female and male A-level students as recorded in the surveys of 1995-6 and 2001-2 respectively.

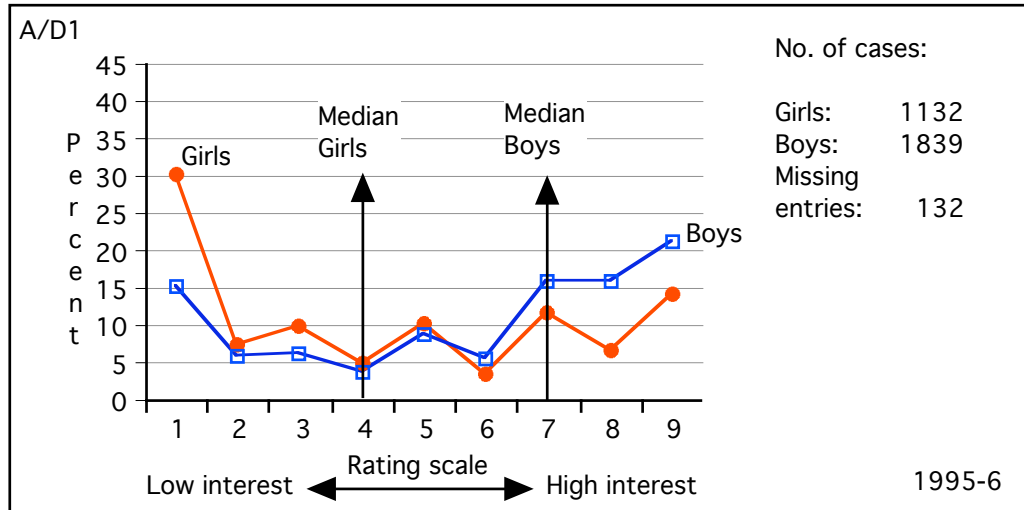


Fig. A01 - Interest in D&T - Analysis by gender

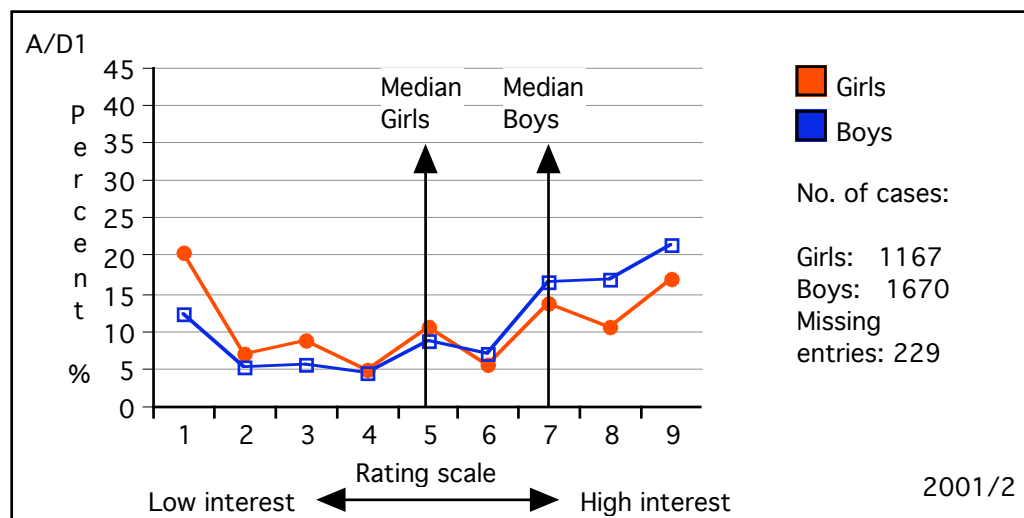


Fig. B01 - Interest in D&T - Analysis by gender

For both surveys, and by inspection, it may be seen that girls were less interested in D&T than boys. However, while there was no movement for the boys, the median of 4 for girls in 1995-6 became a median of 5 in the 2001-2 survey. In this case, the unrounded medians of 3.88 and 5.28 showed a greater degree of change.

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 similar improved picture emerged— see Figures A02 and B02 below.

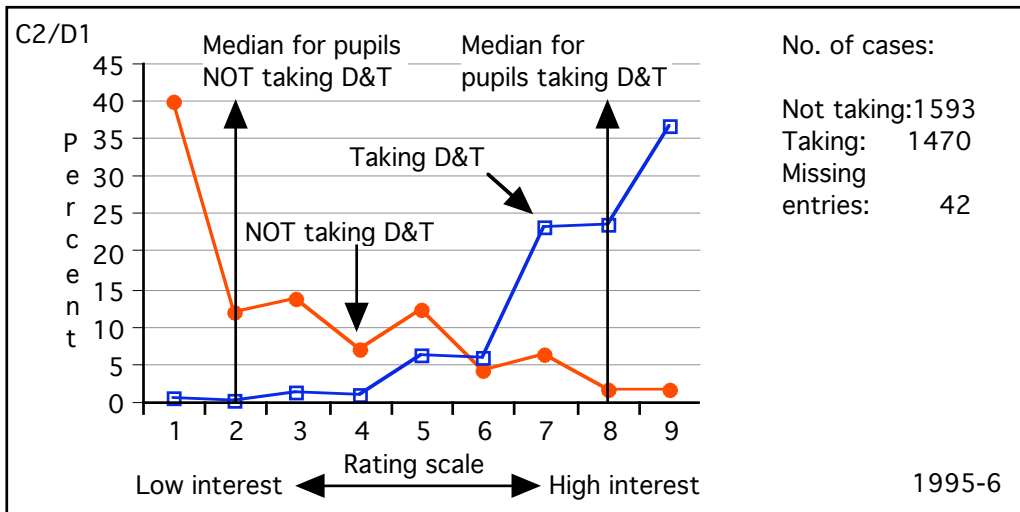


Fig. A02 - Interest in D&T - Analysis by subject studied
Comparison between pupils taking D&T and pupils not taking D&T

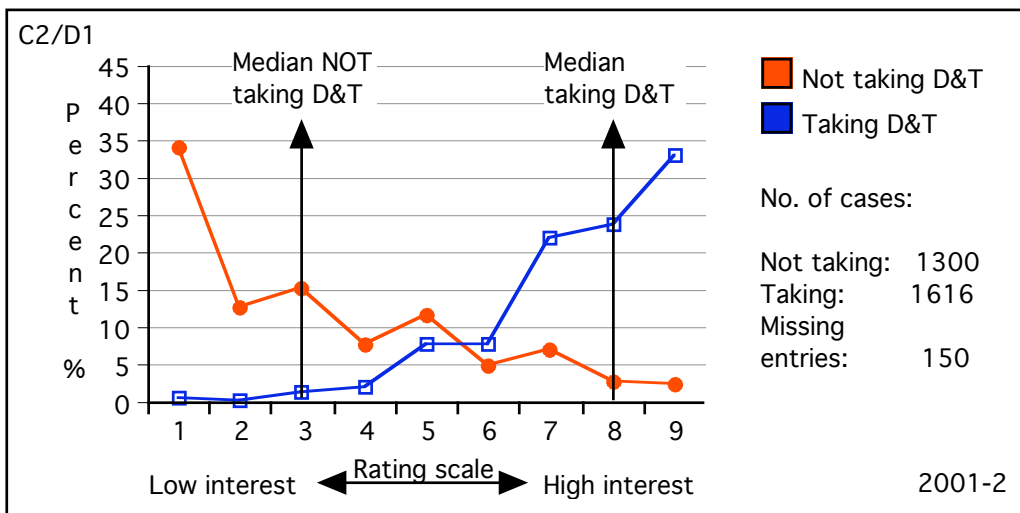


Fig. B02 - Interest in D&T - Analysis by subject studied
Comparison between pupils taking D&T and pupils not taking D&T

For the 1995-6 survey, Fig. A02 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. However, for those not taking D&T, comparisons between Fig. A02 and Fig. B02 discloses a change from a median of 2 to 3 on the rating scale for the 2001-2 study. The unrounded median showed the real change was from 2.30 to 2.67.

Since we all use tools and technologies as tools as extensions of ourselves in order to enhance our productivity and capability, this result remains a cause for concern.

Question 'E' : In your opinion, how difficult is D&T?

Figures A03 and B03 shows the difficulty with Design & Technology as perceived by the genders in the 1995-6 and 2001-2 surveys.

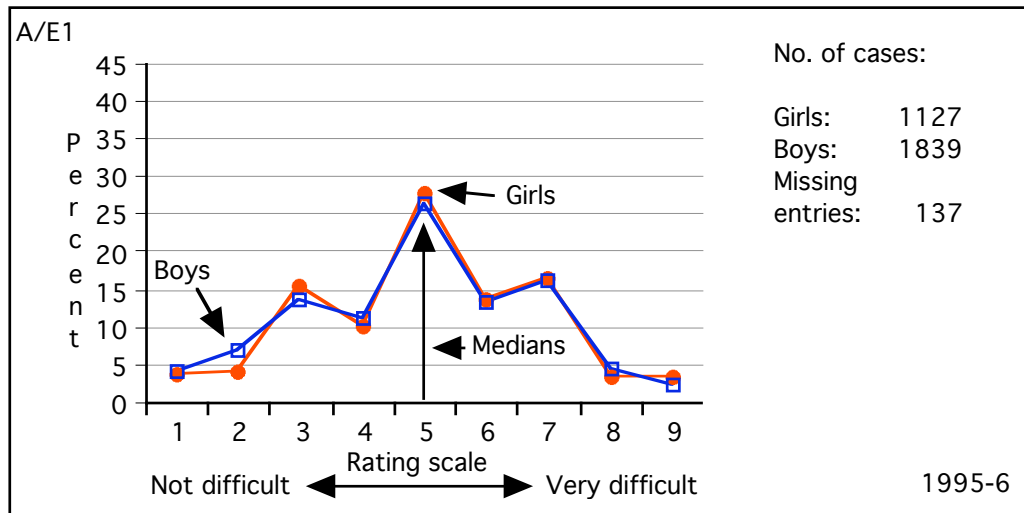


Fig. A03 - Difficulty with D&T - Analysis by gender

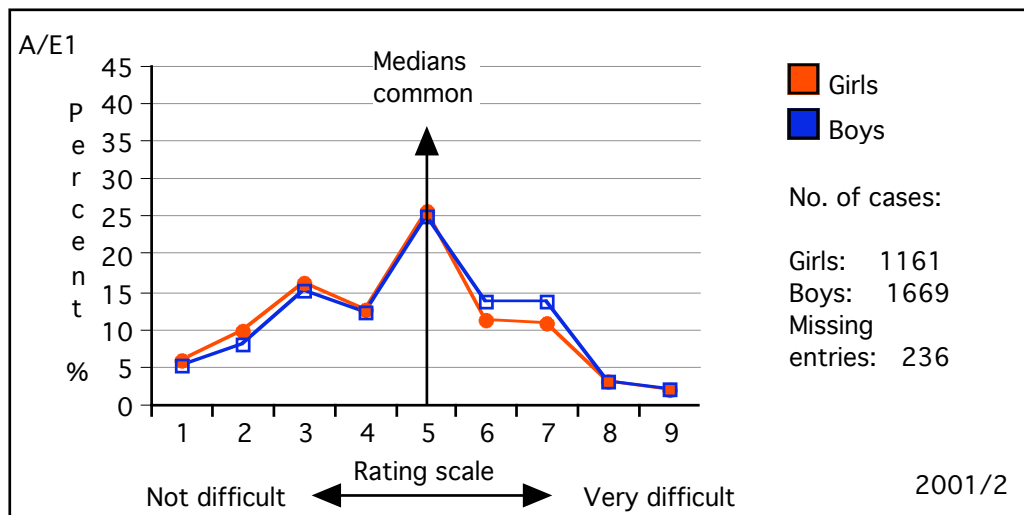


Fig. B03 - Difficulty with D&T - Analysis by gender

Figures A03 and B03 reveals no difference of opinion between the genders for these two surveys—they shared common median values of 5. So there was no change in trend between the two studies.

Figures A04 and B04 below illustrates the perceived difficulty with D&T by subject studied.

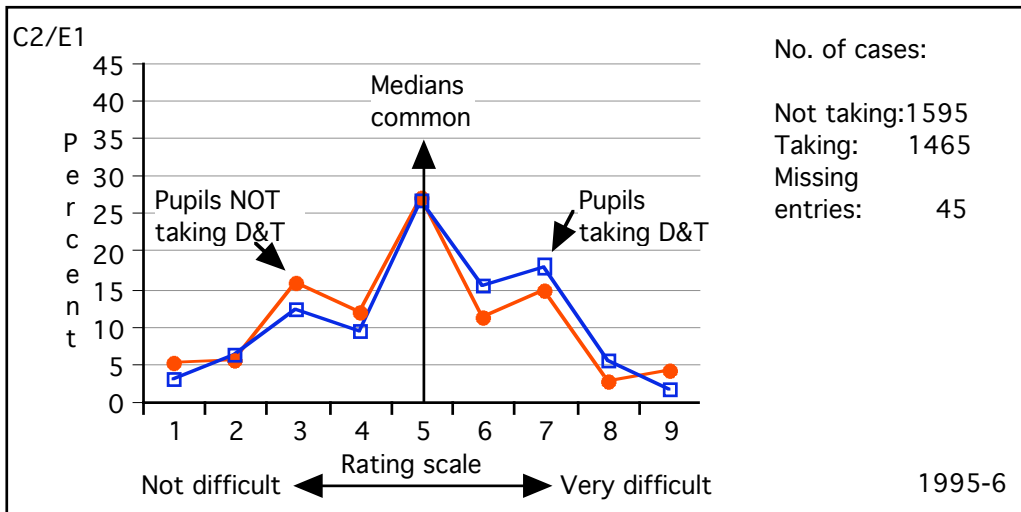


Fig. A04 - Difficulty with D&T - Analysis by subject studied
Comparison between pupils taking D&T and pupils not taking D&T

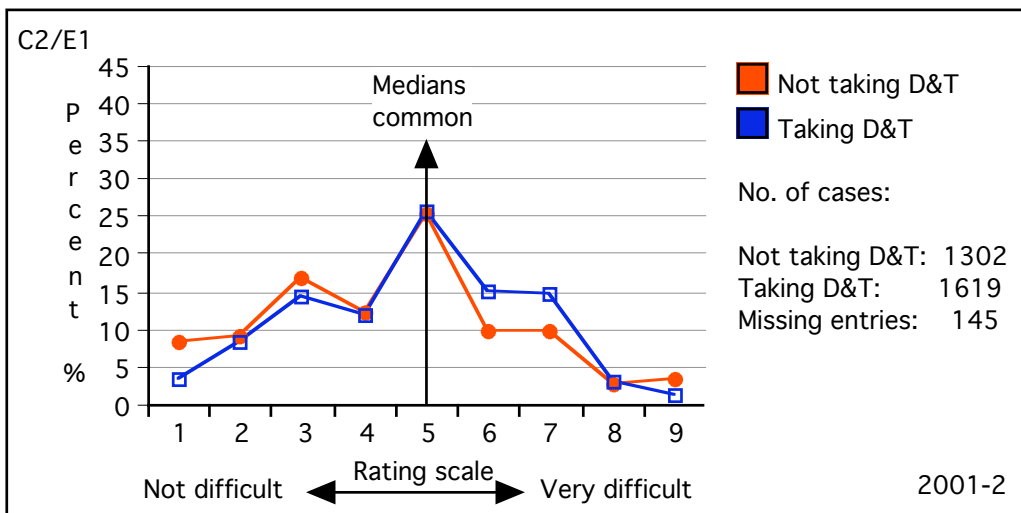


Fig. B04 - Difficulty with D&T - Analysis by subject studied
Comparison between pupils taking D&T and pupils not taking D&T

Fig. A04 shows 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 of 5 in the survey of 1995-6. And Fig. B04 showed no change in this perception. 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 knowledge components of D&T. This result is a serious cause for concern.

Question 'F' : 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. A05, and represent the findings of the 1995-6 survey.

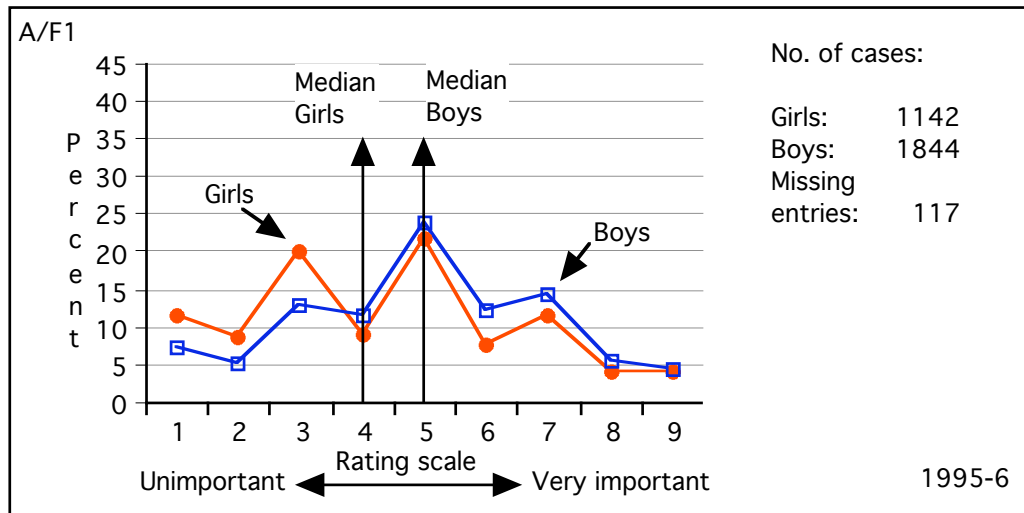


Fig. A05 - Importance of D&T when seeking a job - Analysis by gender

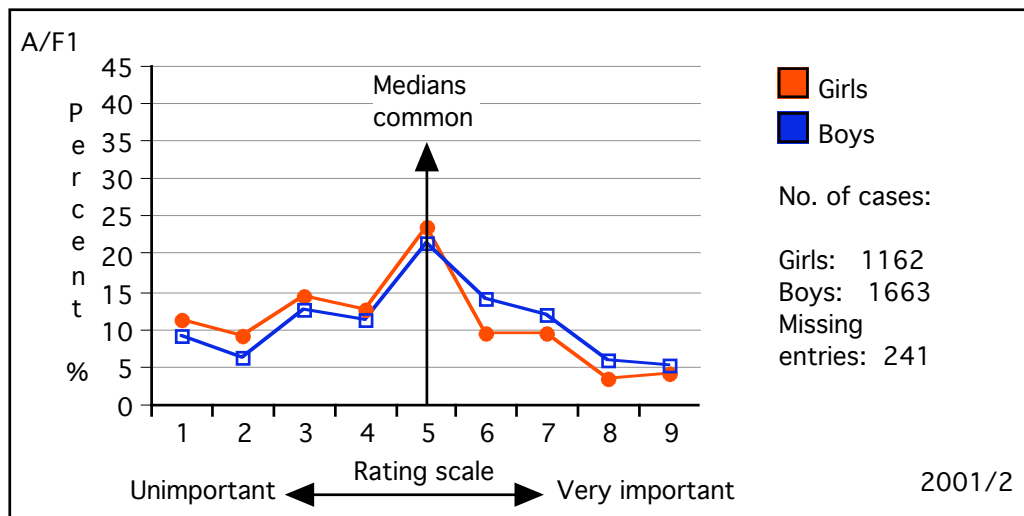


Fig. B05 - Importance of D&T when seeking a job - Analysis by gender

For the 1995-6 study, Fig. A05 indicated that boys attached marginally greater importance than girls to D&T when seeking a job. However, for the 2001-2 study, it may be seen that the genders shared a common median at 5—see Fig. B05, indicating a small improvement. However, when the unrounded medians were calculated for girls the comparisons were 4.48 rounded down to 4 for the 1995-6 survey, and 4.55 rounded up to 5 for the 2001-2 survey. Thus no importance can be attached to this change.

Figures A06 and B06 overleaf show the perceived importance of D&T when seeking a job analysed by subject studied; that is for those who took D&T and those who did not take D&T.

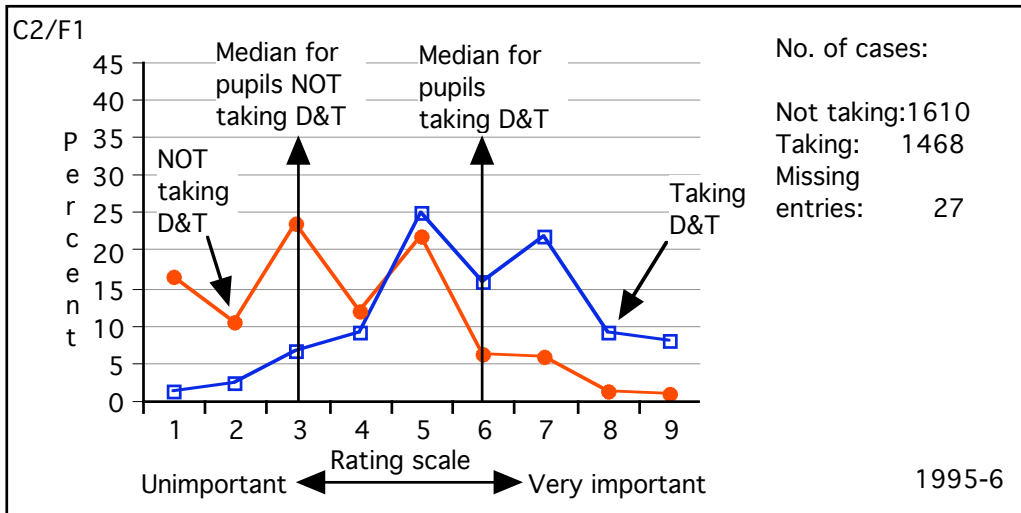


Fig. A06 - Importance of D&T when seeking a job - Analysis by subject studied
 Comparison between pupils taking D&T and pupils not taking D&T

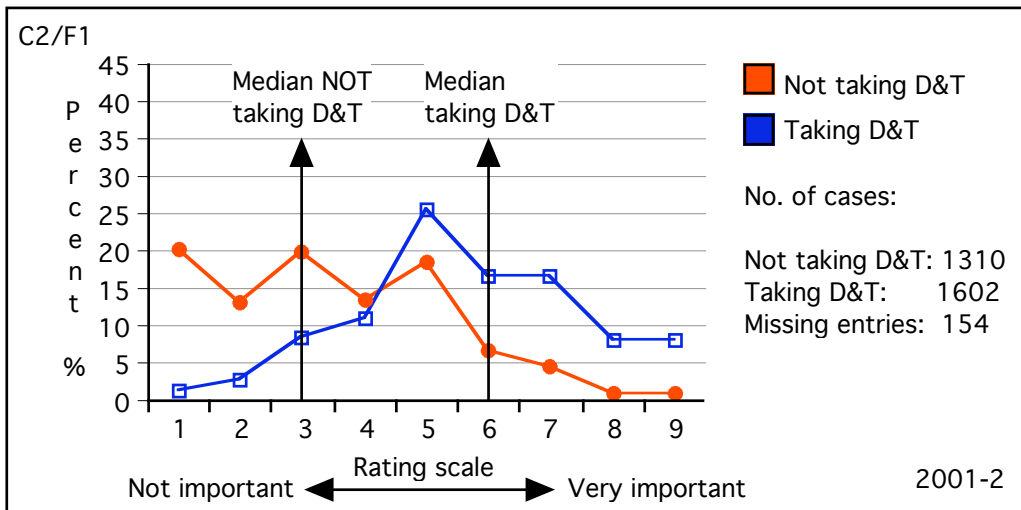


Fig. B06 - Importance of D&T when seeking a job - Analysis by subject studied
 Comparison between pupils taking D&T and pupils not taking D&T

In the context of the importance of technology when seeking a job, both studies showed that pupils who were taking D&T valued the subject more highly than pupils who were not taking D&T—compare Fig. A06 with Fig. B06. Note there was also no change between these two surveys. Since we use tools and technologies as tools in order to enhance our productivity and capability as individuals, and our collective productivity and capability as a society, these results are a real cause for concern.

Question 'J' : In the context of EIU, how important do you consider D&T?

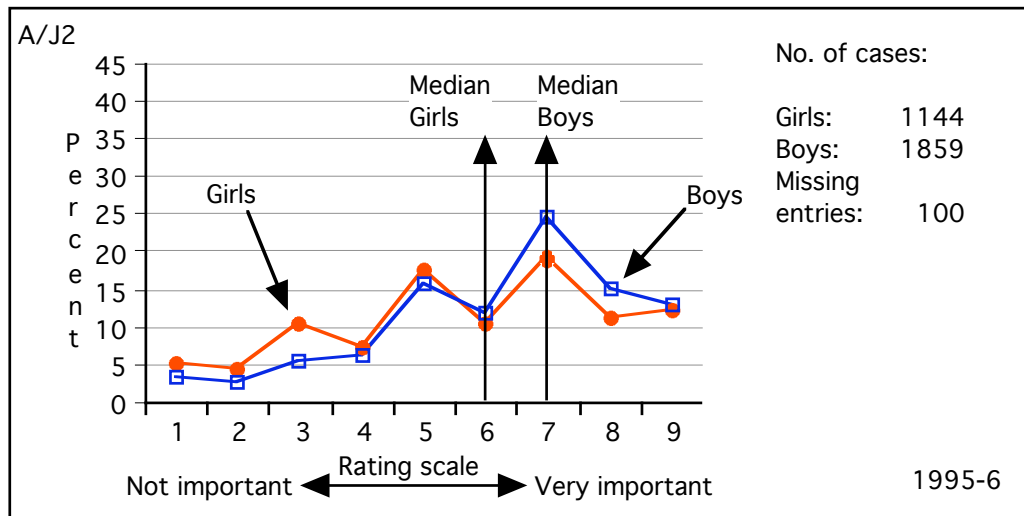


Fig. A07 - Importance of D&T in the context of EIU - Analysis by gender

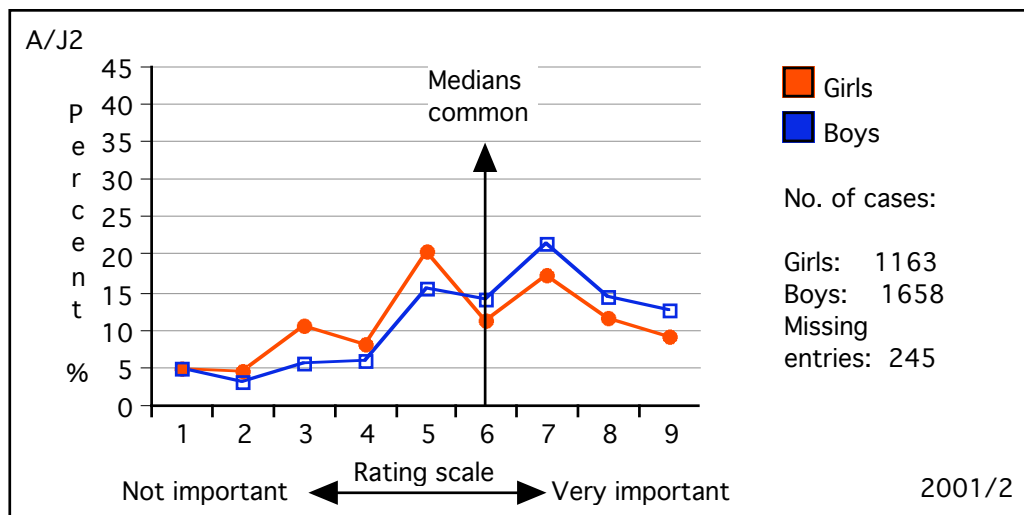


Fig. B07 - Importance of D&T in the context of EIU - Analysis by gender

The importance of D&T in the context of Economic and Industrial Understanding (EIU) by gender for the 1995-6 study appears in Fig. A07 above, recording a rounded median of 6 for girls and 7 for boys. For the 2001-2 study, Fig. B07 discloses that the rounded medians were common at 6, and hence the median for boys had fallen from 7 to 6. However, the unrounded medians for the first survey were 5.86 rounded up to 6, and 6.62 rounded up to 7. For the second survey the unrounded medians were 5.53 rounded up to 6, and 6.46 rounded down to 6. So the real change was unimportant.

However, there is a cause for concern given the emphasis for Education on a 'prosperous economy', 'creativity', and a 'knowledge economy', because D&T has a dominant role in such activities.

The importance of D&T in the context of EIU is shown also in Figures A08 and B08 below,

but illustrate comparisons between those who did take D&T, with those who did not take the subject in the two surveys respectively.

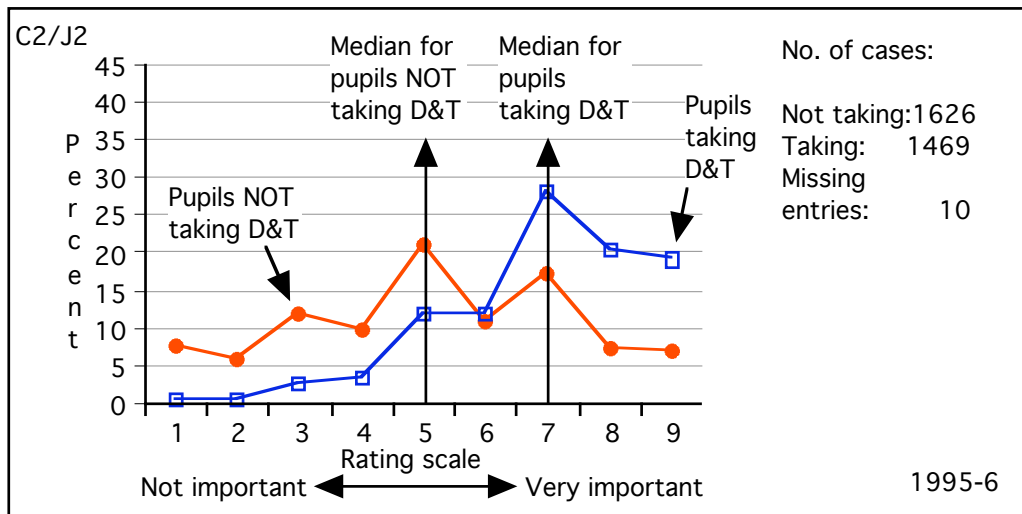


Fig. A08 - Importance of D&T in the context of EIU - Analysis by subject studied Comparison between pupils taking D&T and pupils not taking D&T

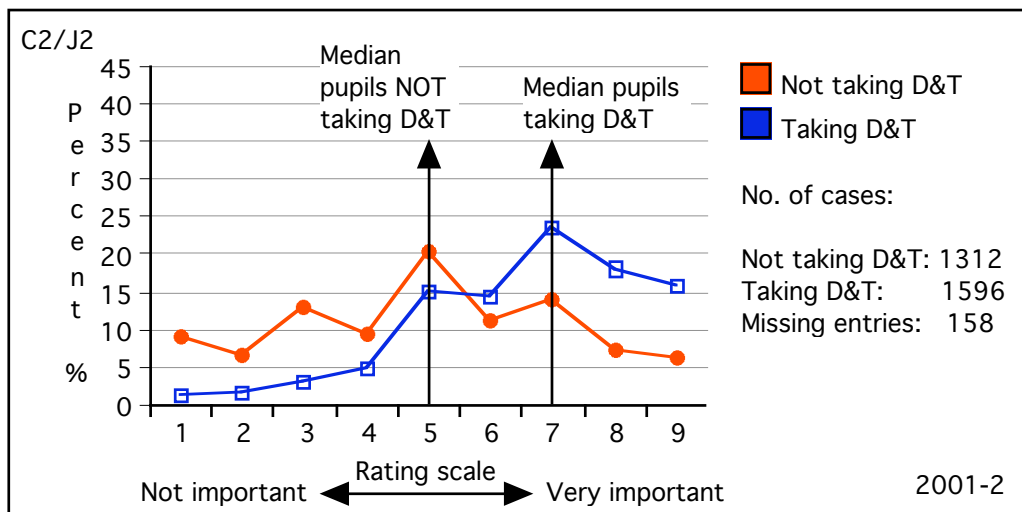


Fig. B08 - Importance of D&T in the context of EIU - Analysis by subject studied Comparison between pupils taking D&T and pupils not taking D&T

For both studies, students who were taking D&T attributed more importance to D&T in the context of Economic and Industrial Understanding (EIU) than students who were not taking the subject, and by two ratings in the rounded medians of 7 and 5—see Figures A08 and B08 above. Thus this latest survey showed no change over the first study.

Question 'K' : 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 below in Figures A09 and B09 for the two surveys respectively.

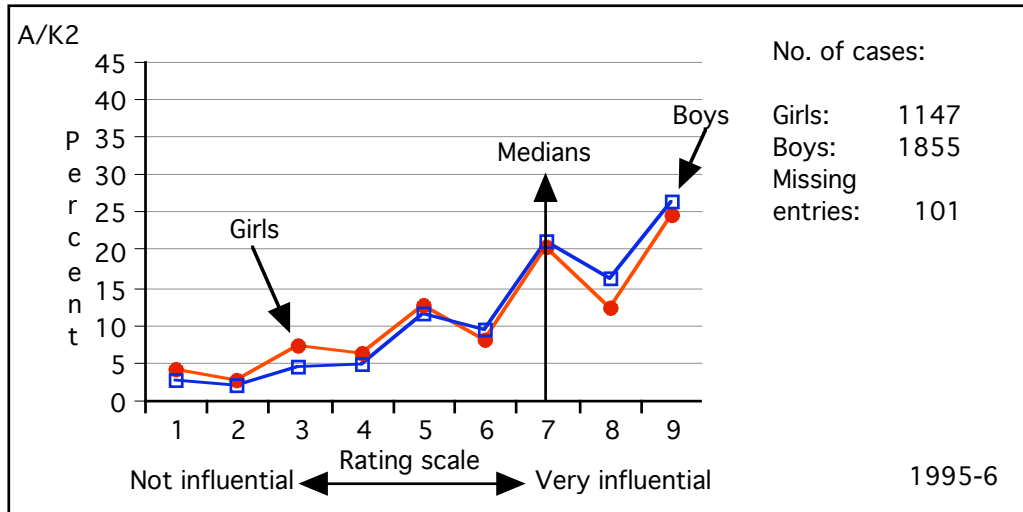


Fig. A09 - The influence of D&T on the way we live now - Analysis by gender

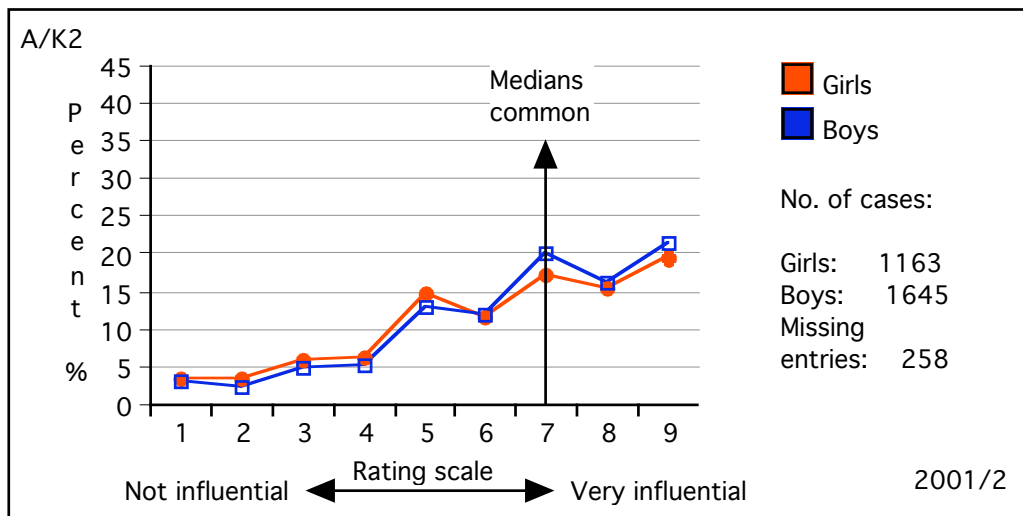


Fig. B09 - The influence of D&T on the way we live now - Analysis by gender

By inspection, it may be seen that there was little difference in perception between girls and boys in either survey, and furthermore that the medians were fairly high at 7. However, in the first survey some 24.6% of girls and 26.3% of boys rated the 'influence' of D&T at 9, whereas in the second survey only 19.8% of girls and 21.6% of boys gave a 9 rating. This trend continued when pupils who were taking D&T were compared with pupils who did not take the subject, as shown by Figures A10 and B10 overleaf. A more detailed analysis of these trends appears at the end of the appendix.

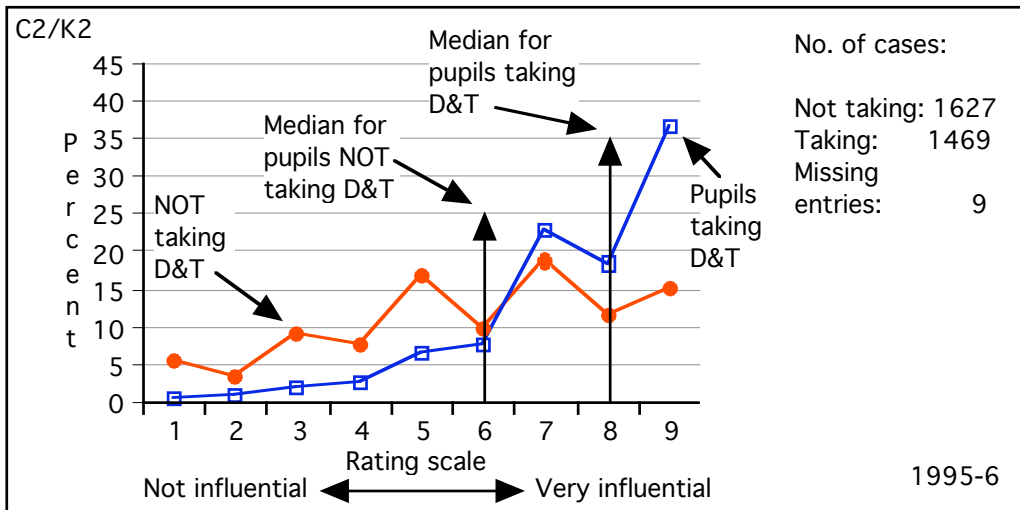


Fig. A10 - The influence of D&T on the way we live now - Analysis by subject studied
 Comparison between pupils taking D&T and pupils not taking D&T

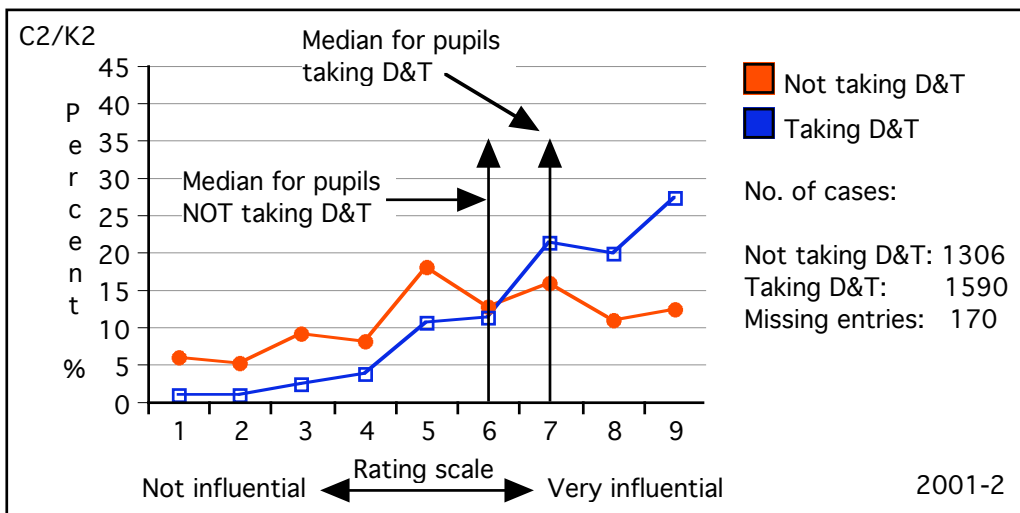


Fig. B10 - The influence of D&T on the way we live now - Analysis by subject studied
 Comparison between pupils taking D&T and pupils not taking D&T

From Fig. A10, it may be seen that pupils studying D&T attributed a significant level of influence 'on the way we live now' with a median of 8. The second survey, shown in Fig. B10, reveals that not only had this fallen to 7, but whereas 36.8% gave a 9 rating in the first survey, only 27.5% gave a 9 rating in the second survey. These are worrying trends because the role of the tool- and technology-culture upon which we are utterly dependent was simply not understood. Every ethnic group has evolved with a tool-culture as its constant evolutionary companion, and the progress made has always been dependent on the materials available in combination with the quality of the leading imaginative activity.

Pupils not studying D&T rated the influence at a median of 6 in both surveys, this too is a cause for concern since without exception they all use tools and technologies as tools as extensions of themselves to enhance their productivity and capability.

Question 'L' : How creative does the curriculum allow you to be in D&T?

The perceived level of creativity possible with D&T in the curriculum is shown in Figures A11 and B11 below.

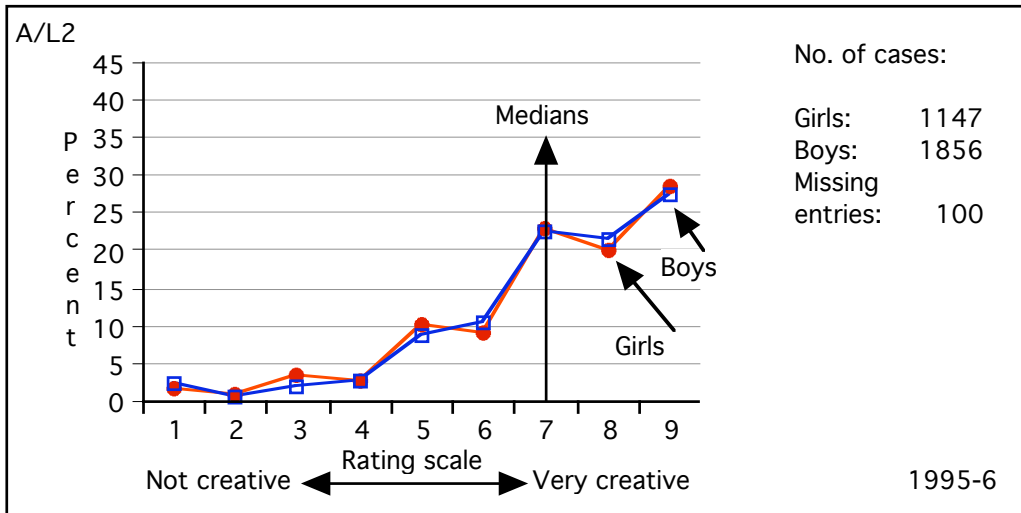


Fig. A11 - Creativity possible with D&T in the curriculum - Analysis by gender

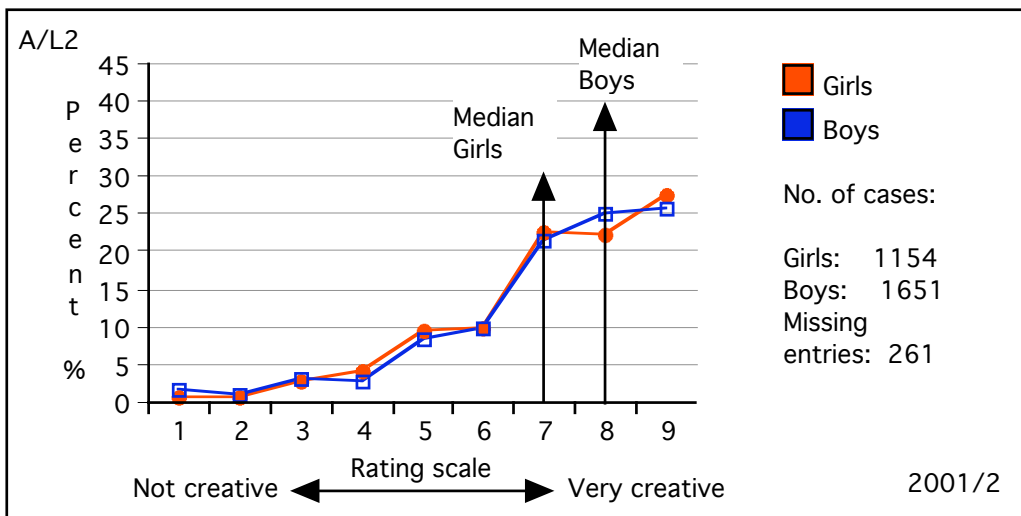


Fig. B11 - Creativity possible with D&T in the curriculum - Analysis by gender

For D&T in the curriculum, Figures A11 and B11 above show that the creativity perceived possible by the genders was rated fairly high with common median values of 7 in 1995-6, and medians of 7 and 8 in 2001-2. By inspection, it may be seen that the individual curve shapes obtained in the second survey were very close to those in the first survey. The unrounded median for the first survey was 7.45 and for the second survey 7.53, and so not significant.

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 continued to show a favourable response—see Figures A12 and B12 below.

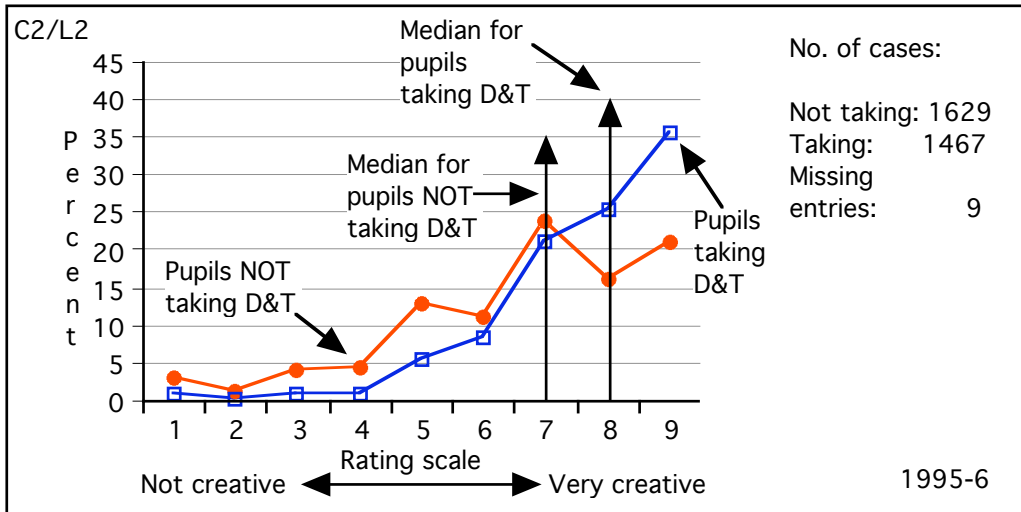


Fig. A12 - Creativity possible with D&T in the curriculum - Analysis by subject studied Comparison between pupils taking D&T and pupils not taking D&T

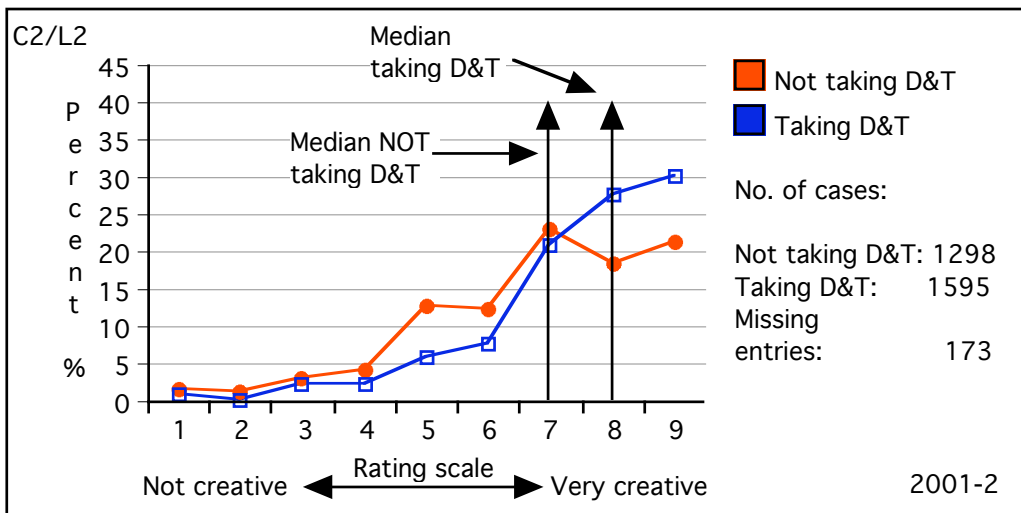


Fig. B12 - Creativity possible with D&T in the curriculum - Analysis by subject studied Comparison between pupils taking D&T and pupils not taking D&T

For the 1995-6 survey, Fig. A12 shows that 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. This trend was maintained in the 2001-2 survey as shown by Fig. B12.

Question 'M' : As a modern society, how dependent do you think we are on D&T?

Figures A13 and B13 below, capture the extent to which our society is dependent on D&T as perceived by two A-level population samples in 1995-6 and 2001-2, and shows the analysis by gender.

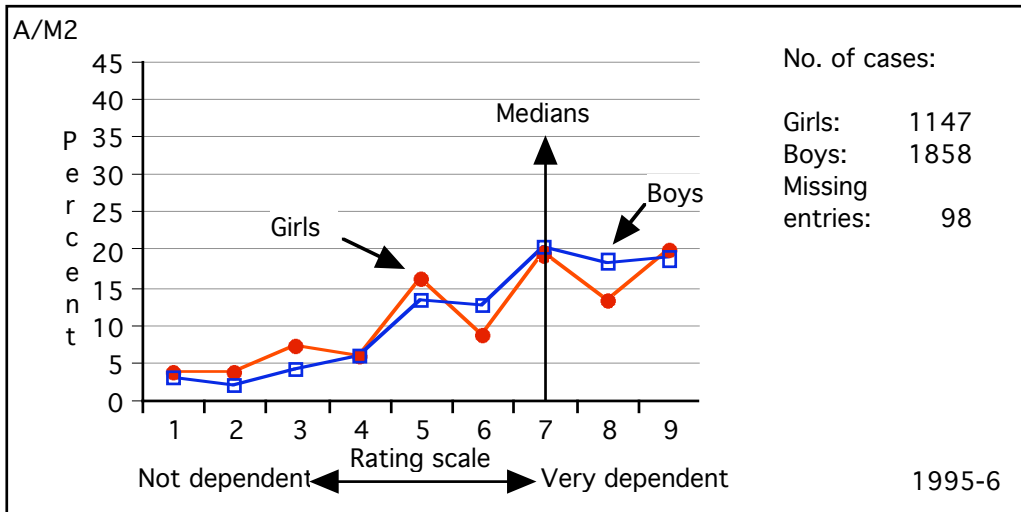


Fig. A13 - How dependent is our society on D&T? - Analysis by gender

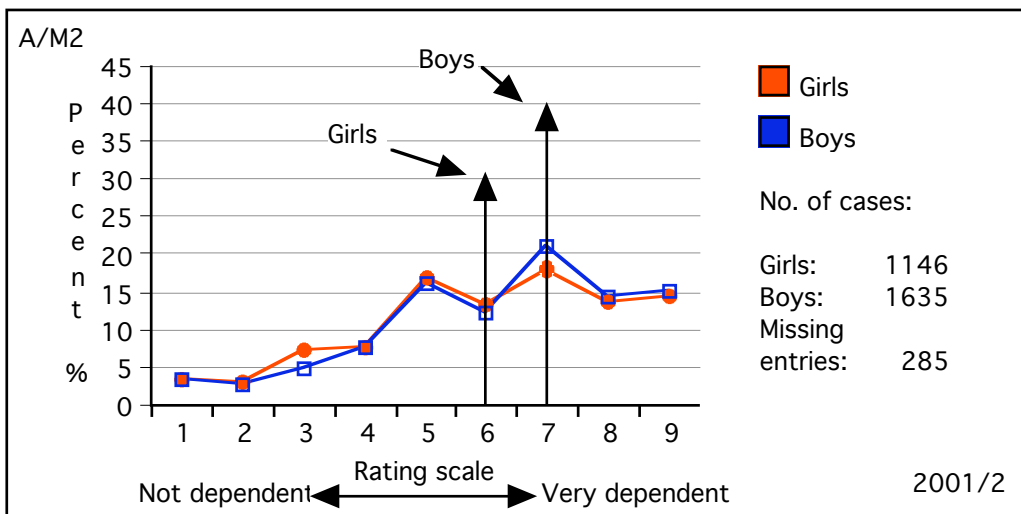


Fig. B13 - How dependent is our society on D&T? - Analysis by gender

With median values of 7, Fig. A13 shows that in 1995-6 both girls and boys considered that our society was relatively dependent on D&T. In the 2001-2 survey, Fig. B13 discloses that for girls the perception of our dependency fell by one rating from 7 to 6. Had the issues been properly understood, the median values would be 9 because the D&T we know today is the latest manifestation of a tool-culture that goes back to before our Stone Age ancestors, and we are utterly dependent on our tool- and technology-culture.

Figures A14 and B14 below reflect the dependency of our society on D&T as perceived in these two surveys, but by subject studied analysis.

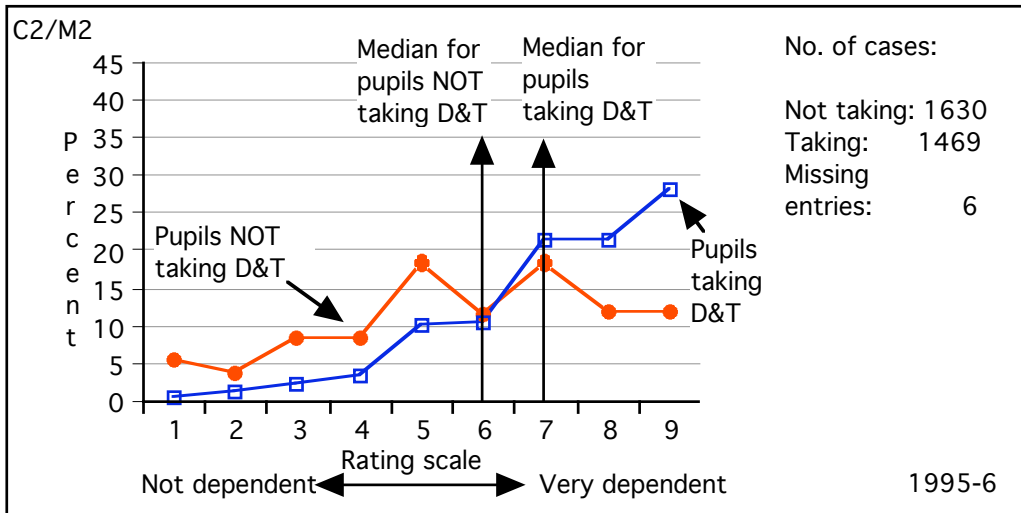


Fig. A14 - How dependent is our society on D&T? - Analysis by subject studied
Comparison between pupils taking D&T with pupils not taking D&T

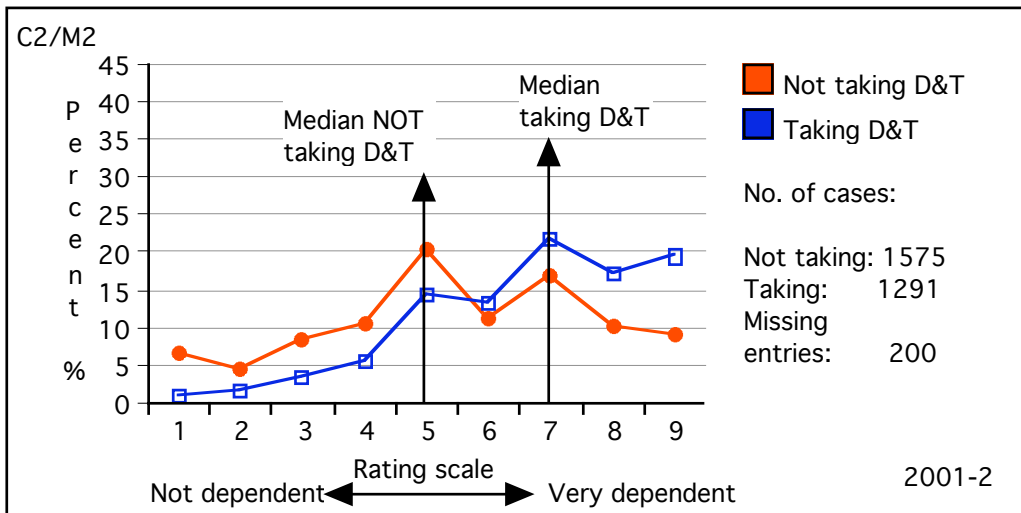


Fig. B14 - How dependent is our society on D&T? - Analysis by subject studied
Comparison between pupils taking D&T with pupils not taking D&T

For the 1995-6 survey, Fig. A14 portrays our society's dependence on D&T as perceived by a sample of A-level pupils studying the subject, and compared with a sample not studying the subject; the medians were 7 and 6 respectively. For the 2001-2 study, Fig. B14 shows a deterioration with medians of 7 and 5. These results are discussed further in the summary at the end of the appendix.

A2.02 - Summary of findings for D&T

As a comparative study, and because of our functional dependency on D&T as individuals and as a society, a closer scrutiny is provided by the following detailed analysis. Using the 1995-6 survey as the basis for comparison, Fig. AB15/1 shows a summary of key changes in the parameters of analysis for those A-level students studying D&T.

Parameters of analysis -see below	Comparison of unrounded medians for A-level sample taking D&T		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level sample taking D&T - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
1.	7.94	7.80	83.80%	79.20%	-4.60%
2.	5.17	4.93	25.67%	19.64%	-6.03%
3.	5.81	5.50	39.07%	32.99%	-6.08%
4.	7.14	6.85	68.00%	57.90%	-10.10%
5.	7.79	7.39	78.40%	69.00%	-9.40%
6.	7.93	7.80	82.20%	78.90%	-3.30%
7.	7.47	6.92	71.00%	58.90%	-12.10%

Parameters of analysis :
 1. How much interest do you have in D&T? - (C2/D1)
 2. In your opinion, how difficult is the subject of D&T? - (C2/E1)
 3. When it comes to getting a job, how important do you consider D&T? - (C2/F1)
 4. In the context of EIU*, how important do you consider D&T? - (C2/J2)
 5. How much do you think the way we live now has been influenced by D&T? - (C2/K2)
 6. How creative does the curriculum allow you to be in D&T? - (C2/L2)
 7. As a modern society, how dependent do you think we are on D&T? - (C2/M2)
 * Economic and Industrial Understanding

Fig. AB15/1 - Summary of changes between surveys for the parameters of analysis by students taking D&T

For students taking D&T, Fig. AB15/1 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9. The greatest degree of comprehension about the importance of the subject should be expected among students studying D&T. As a summary, Fig. AB15/1 presents a worrying picture:

- The trends in all parameters of analysis from 1995-6 to 2001-2 were wholly negative, both in the unrounded medians and the combined percentage totals for ratings 7, 8 and 9.
- Given that Maths and Science are components of D&T, the results for parameter 2 were too low in both surveys.
- Since we use tools and technologies as tools as extensions of ourselves to enhance our productivity and capability, the results for parameter 3 were too low in both surveys.

Fig. AB15/2 below provides a summary of changes in the parameters of analysis for those A-level students NOT studying Design and Technology.

Parameters of analysis -see below	Comparison of unrounded medians for A-level sample NOT taking D&T		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level sample NOT taking D&T - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
1.	2.30	2.67	10.23%	12.40%	2.17%
2.	4.89	4.58	21.92%	16.36%	-5.56%
3.	3.46	3.30	8.88%	6.95%	-1.93%
4.	5.18	5.01	32.03%	28.25%	-3.78%
5.	6.13	5.71	46.20%	39.50%	-6.70%
6.	6.99	7.08	62.80%	63.30%	1.50%
7.	5.86	5.44	42.60%	37.07%	-5.53%

Parameters of analysis :
 1. How much interest do you have in D&T? - (C2/D1)
 2. In your opinion, how difficult is the subject of D&T? - (C2/E1)
 3. When it comes to getting a job, how important do you consider D&T? - (C2/F1)
 4. In the context of EIU*, how important do you consider D&T? - (C2/J2)
 5. How much do you think the way we live now has been influenced by D&T? - (C2/K2)
 6. How creative does the curriculum allow you to be in D&T? - (C2/L2)
 7. As a modern society, how dependent do you think we are on D&T? - (C2/M2)
 * Economic and Industrial Understanding

Fig. AB15/2 - Summary of changes between surveys for the parameters of analysis by students NOT taking D&T

Students not studying D&T are nonetheless totally tool- and technology-culture dependent; from their earliest days they have all been socialised into using tools. Furthermore, the word technology appears frequently in the language of every day activity. The main points from Fig. AB15/2 include:

- The interest in D&T was low at less than 13% for ratings 7, 8 and 9 in both surveys indicating little grasp of their tool- and technology-culture dependency.
- Given that we use tools and technologies as tools as extensions of ourselves to enhance our capability and productivity, the results for parameter 3 at less than 9% in both surveys presents a cause for serious concern.
- The highest score was for creativity—see parameter 6 above.
- The second survey produced a negative trend in 5 of the parameters both in the unrounded medians and the combined percentage totals for ratings 7, 8 and 9.

Fig. AB15/3 below provides a summary of changes in the parameters of analysis for girls including those A-level students not studying and studying Design and Technology.

Parameters of analysis -see below	Comparison of unrounded medians for A-level Girls whether taking D&T or not		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for Girls whether taking D&T or not - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
1.	3.88	5.28	33.00%	41.70%	8.70%
2.	5.06	4.65	24.05%	16.41%	-7.64%
3.	4.48	4.55	20.04%	17.64%	-2.40%
4.	5.86	5.53	43.20%	38.39%	-4.81%
5.	6.86	6.67	57.60%	52.90%	-4.70%
6.	7.43	7.48	71.50%	72.00%	0.50%
7.	6.66	6.26	53.10%	46.50%	-6.60%

Parameters of analysis :
 1. How much interest do you have in D&T? - (A/D1)
 2. In your opinion, how difficult is the subject of D&T? - (A/E1)
 3. When it comes to getting a job, how important do you consider D&T? - (A/F1)
 4. In the context of EIU*, how important do you consider D&T? - (A/J2)
 5. How much do you think the way we live now has been influenced by D&T? - (A/K2)
 6. How creative does the curriculum allow you to be in D&T? - (A/L2)
 7. As a modern society, how dependent do you think we are on D&T? - (A/M2)
 * Economic and Industrial Understanding

Fig. AB15/3 - Summary of changes between surveys for the parameters of analysis by GIRLS taking and not taking D&T

All girls whether they are studying D&T or not are nonetheless totally tool- and technology-culture dependent; from their earliest days they have all been socialised into using tools. The word technology appears frequently in the language of every day activity. The main points from Fig. AB15/3 include:

- Once again, the highest score was for creativity—see parameter 6 above.
- The second survey produced a negative trend in 5 of the parameters both in the unrounded medians and the combined percentage totals for ratings 7, 8 and 9.
- These results can be described as neither encouraging in the context of the pivotal role of our tool- and technology-culture, nor for a 'prosperous', and a 'knowledge economy' sought by the government.

Fig. AB15/4 below provides a summary of changes in the parameters of analysis for boys including those A-level students not studying and studying Design and Technology.

Parameters of analysis -see below	Comparison of unrounded medians for A-level Boys whether taking D&T or not		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for Boys whether taking D&T or not - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
1.	6.71	6.83	53.40%	55.40%	2.00%
2.	5.00	4.84	23.37%	19.40%	-3.97%
3.	5.00	4.96	25.27%	23.96%	-1.31%
4.	6.62	6.46	53.00%	49.10%	-3.90%
5.	7.17	6.92	64.10%	58.20%	-5.90%
6.	7.45	7.53	71.50%	72.20%	0.70%
7.	6.88	6.56	57.80%	51.10%	-6.70%

Parameters of analysis :
 1. How much interest do you have in D&T? - (A/D1)
 2. In your opinion, how difficult is the subject of D&T? - (A/E1)
 3. When it comes to getting a job, how important do you consider D&T? - (A/F1)
 4. In the context of EIU*, how important do you consider D&T? - (A/J2)
 5. How much do you think the way we live now has been influenced by D&T? - (A/K2)
 6. How creative does the curriculum allow you to be in D&T? - (A/L2)
 7. As a modern society, how dependent do you think we are on D&T? - (A/M2)
 * Economic and Industrial Understanding

Fig. AB15/4 - Summary of changes between surveys for the parameters of analysis by BOYS taking and not taking D&T

All boys whether studying D&T or not are nonetheless totally tool- and technology-culture dependent; from their earliest days they have all been socialised into using tools. The word technology appears frequently in the language of every day activity. The main points from Fig. AB15/4 include:

- The trends for 5 of the parameters of analysis from 1995-6 to 2001-2 were negative, both in the unrounded medians and the combined percentage totals for ratings 7, 8 and 9. Comparison of the totals for rating scale 7, 8 and 9 showed negative trends exceeding 2% in 4 of the parameters.
- Since we use tools and technologies as tools as extensions of ourselves to enhance our productivity and capability, the results for parameter 3 were too low in both surveys.

A2.03 - Concluding statement for D&T

- Examination by gender and by subject studied considered 7 parameters of analysis in each of the two surveys. Thus there were 28 trends to monitor; 22 of these were negative in direction showing a worsening situation (20 by more than 2%), and 6 were positive in direction defining an improving situation.
- These results can be described as neither encouraging in the context of the pivotal role of the tool- and technology-culture upon which we are totally dependent, nor in the context of the Green Paper published February (2002:3) which states:
 - * In the 21st century, to be prosperous, the economy will depend heavily on the creativity and skills of its people. In a knowledge economy it is vital that we tap the potential of every one of our citizens.
- As an advanced industrial society, the UK has become a high wage high salary economy, and is therefore at a disadvantage in manufacturing costs compared with developing industrial societies. Since we use technologies as extensions of ourselves in order to enhance our productivity and capability, we need urgently to raise the profile of the importance and pivotal role of D&T within the subculture of education, including teacher training. These serious issues require action on several fronts; unless they happen as a co-ordinated programme, any initiatives will not succeed.

In the current issue of the national curriculum, 'the importance of design and technology' was described as follows:

Design and technology prepares pupils to participate in tomorrow's rapidly changing technologies. They learn to think and intervene creatively to improve quality of life. The subject calls for pupils to become autonomous and creative problem solvers, as individuals and members of a team. They must look for needs, wants and opportunities and respond to them by developing a range of ideas and making products and systems. They combine practical skills with an understanding of aesthetics, social and environmental issues, function and industrial practices. As they do so, they reflect on and evaluate present and past design and technology, its uses and effects. Through design and technology, all pupils can become discriminating and informed users of products, and become innovators.

Hence a new philosophical direction for education has been declared. These results show that it is long overdue. Education now has a significant challenge, not only to overcome long standing prejudice, but to provide courses that will lift the subject to a level of esteem commensurate with the tool- and technology-culture upon which we are totally dependent as individuals and as a society. Without exception we are all tool and technology users and we use tools and technologies as tools to enhance our productivity and capability.

Furthermore, education urgently needs to reflect on the aspirations of the government for a 'prosperous economy', 'creativity', and a 'knowledge economy', and to consider the role of D&T in that context. How we earn our living in the world needs to be understood and this means dropping the shackles of prejudice endorsed by the hidden curriculum.

Appendix 3

Comparison of 6th Form surveys: English in 1995-6 and 2001-2

A3.01 Introduction

For this appendix, the following questions were asked with respect to English in education and industry so providing the parameters of analysis. The results are given according to this schedule, starting on the next page; they are presented as graphs two-to-a-page enabling direct comparison between the surveys. The questions were:

- 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?

*Note: Economic and Industrial Understanding.

The graphs are annotated with the questionnaire references in the top left corner, and the school year of the survey in the bottom right corner.

First sight inferences appear with each pair of graphs, and an overall summary for English appears at the end of the appendix.

How much interest do you have in English?

Fig. A16 below 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.

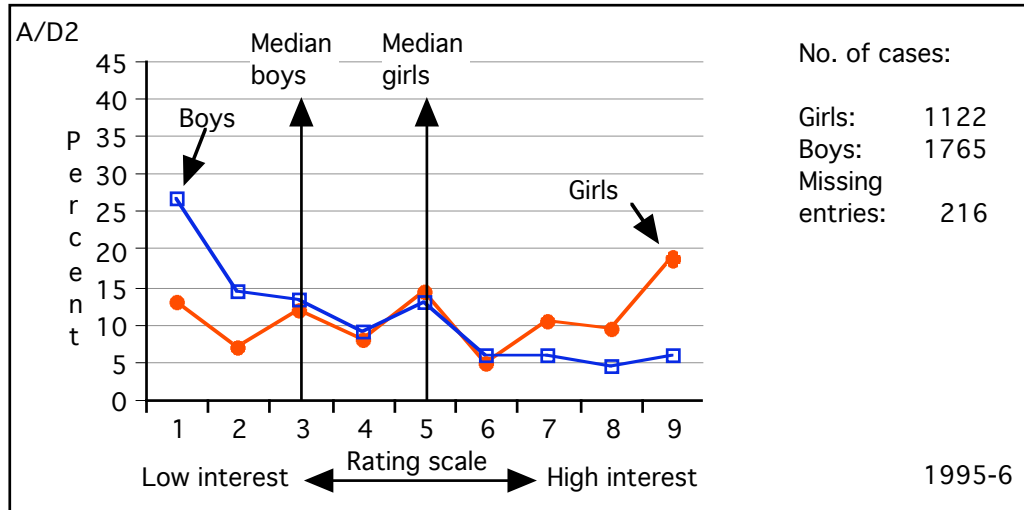


Fig. A16 - Interest in English - Analysis by gender

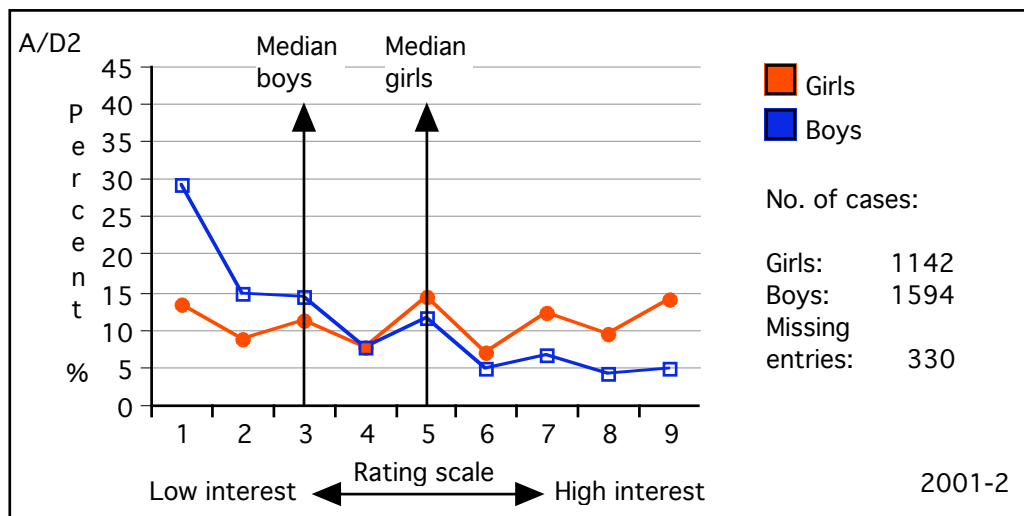


Fig. B16 - Interest in English - Analysis by gender

For the 2001-2 survey, Fig. B16 above 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. In other words, there were no differences between the findings of the two surveys.

Analysis of interest on the basis of students who did not take English, by comparison with students who did take English appears in Figures A17 and B17 below.

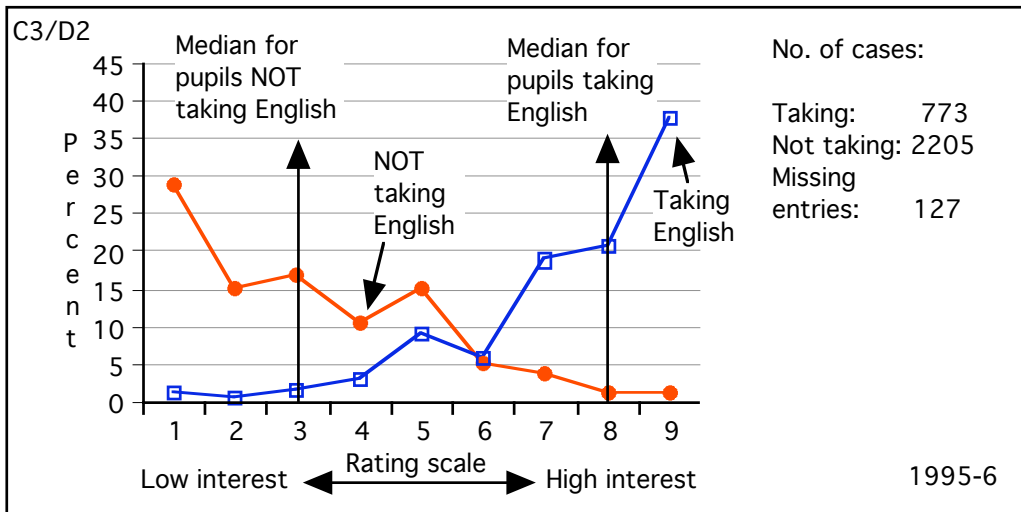


Fig. A17 - Interest in English - Analysis by subject studied
 Comparison between pupils taking English and pupils not taking English

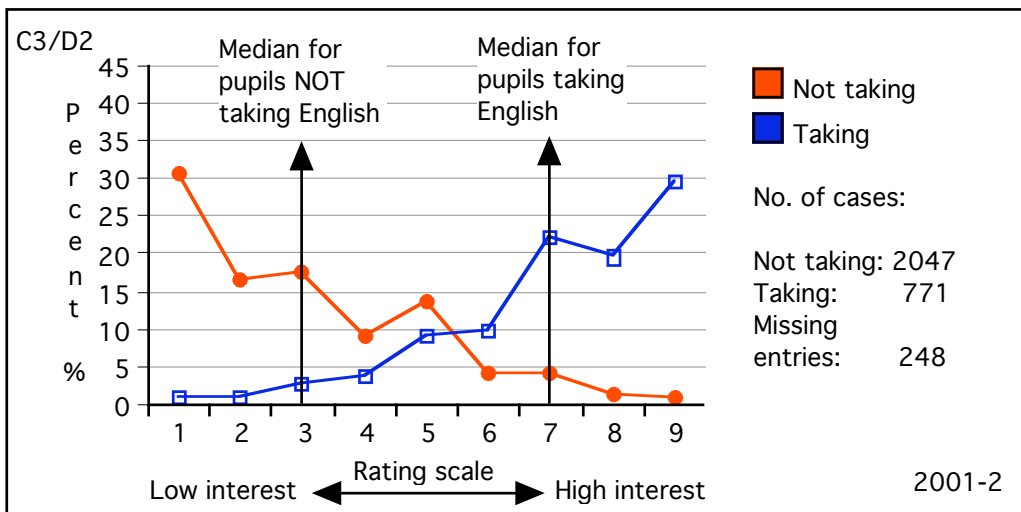


Fig. B17 - Interest in English - Analysis by subject studied
 Comparison between pupils taking English and pupils not taking English

By comparison with the previous Figures A16 and B16, Fig. A17 above shows two very different curves with much greater separation between the median values of 3 for pupils not taking English, and 8 for pupils taking English.

However the 2001-2 survey produced a change as reference to Fig. B17 above demonstrates; for pupils not taking English the median remained at 3, but the median value of 7 for pupils taking English was less by one rating.

In your opinion, how difficult is English?

With common medians of 5, Fig. A18 below shows that girls and boys found a similar level of difficulty with English in the 1995-6 survey.

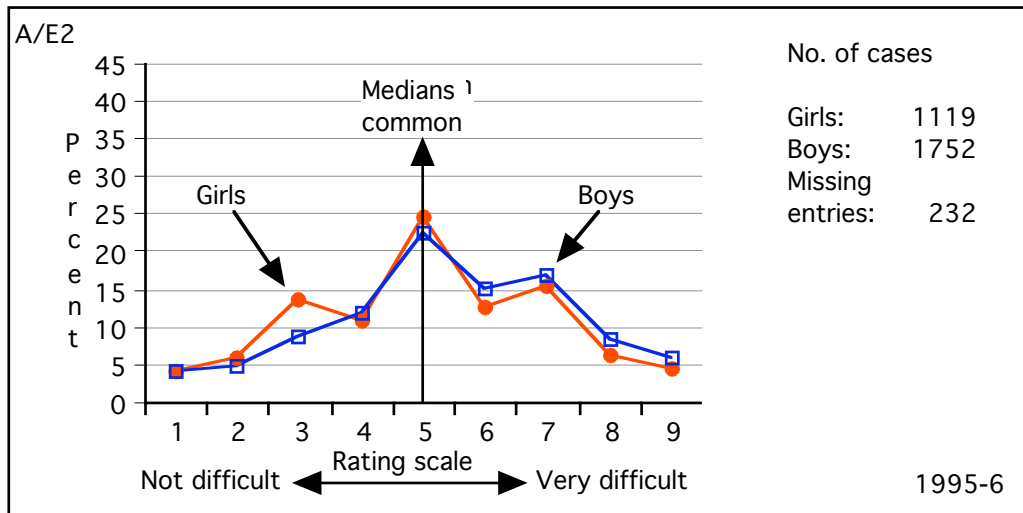


Fig. A18 - Difficulty with English - Analysis by gender

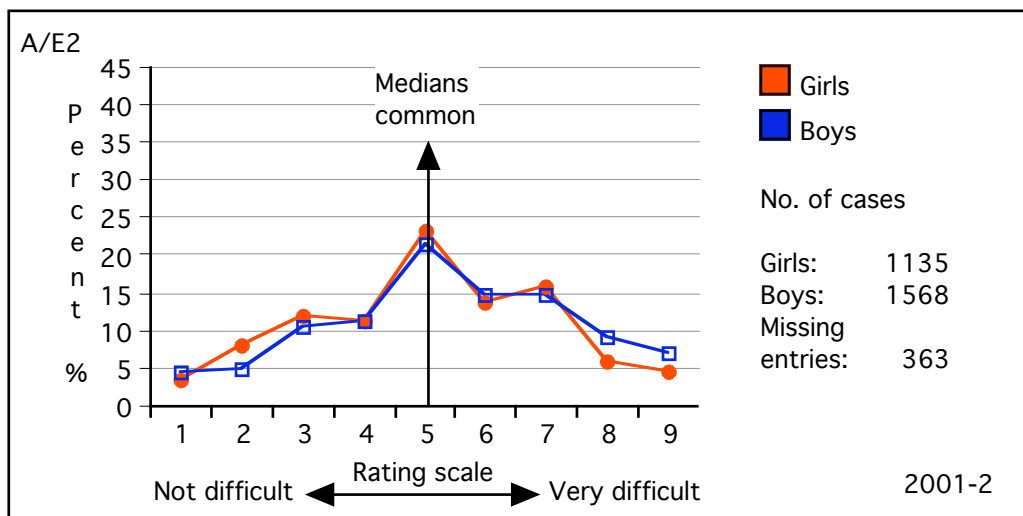


Fig. B18 - Difficulty with English - Analysis by gender

Fig. B18 above shows that the second survey produced no change; girls and boys continued to find a similar level of difficulty with English.

For the 1995-6 survey, a similar picture emerged when comparisons were made between pupils not taking English, and pupils taking English as may be seen from Fig. A19 below.

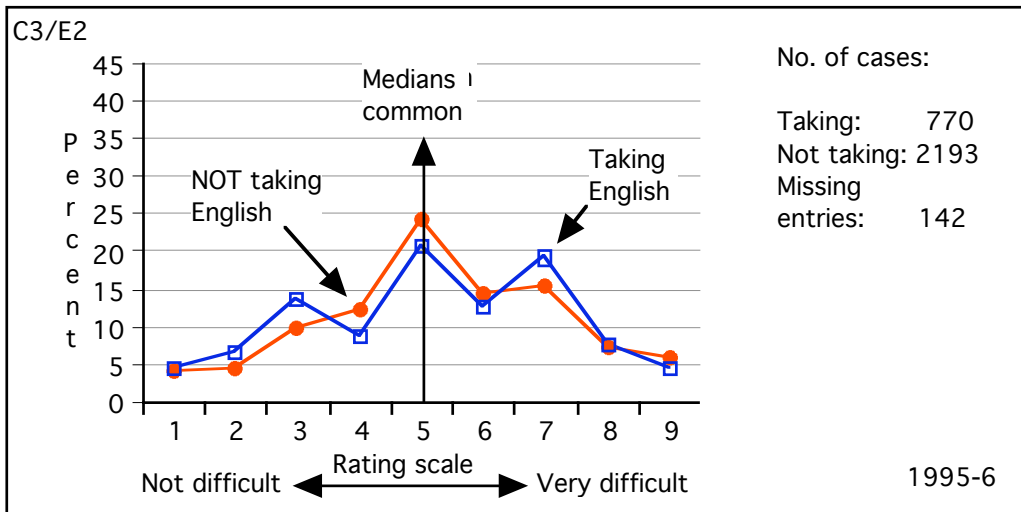


Fig. A19 - Difficulty with English - Analysis by subject studied
Comparison between pupils taking English and pupils not taking English

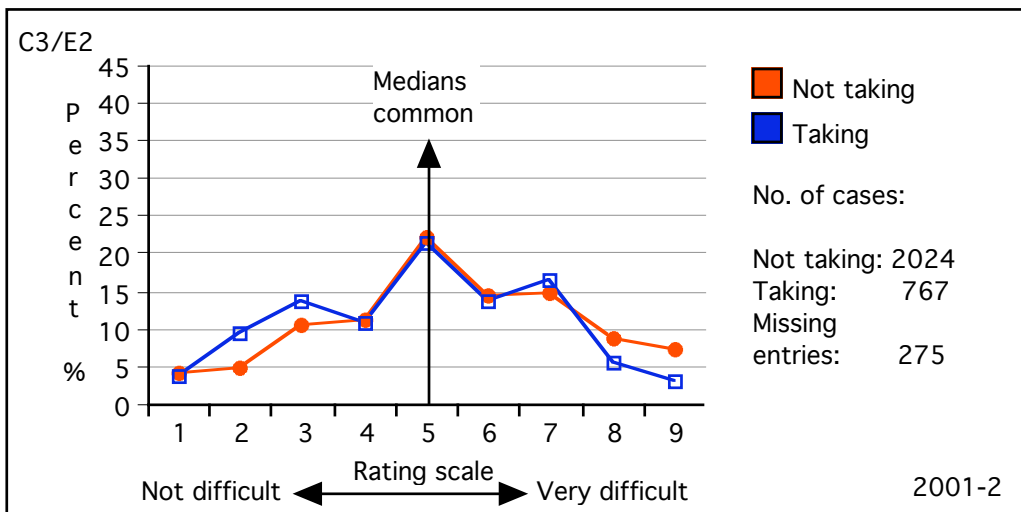


Fig. B19 - Difficulty with English - Analysis by subject studied
Comparison between pupils taking English and pupils not taking English

Reference to Fig. B19 above shows that the 2001-2 survey produced no change over the earlier survey; so those not taking English continued to find the same level of difficulty with the subject as those who were studying the subject.

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

With regard to the survey for 1995-6, Fig. A20 below 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.

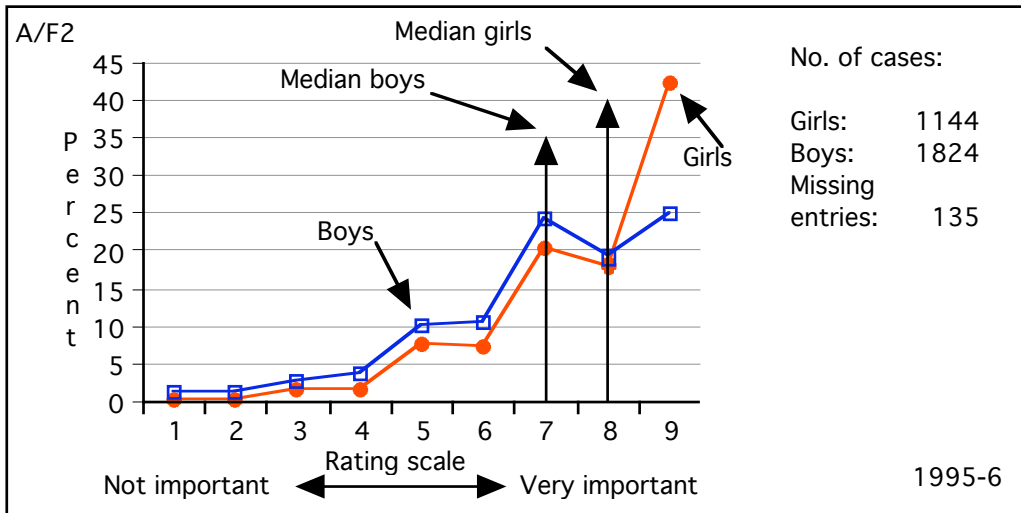


Fig. A20 - Importance of English when seeking a job - Analysis by gender

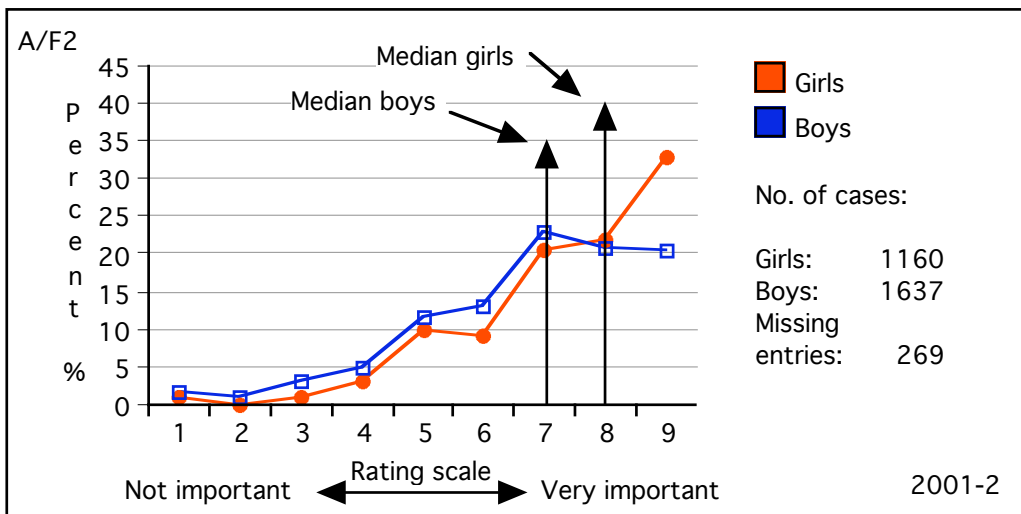


Fig. B20 - Importance of English when seeking a job - Analysis by gender

The survey of 2001-2 produced no change over the earlier survey for the importance of English when seeking a job; compare Fig. A20 with Fig. B20. Girls continued to rate the importance of English when seeking a job more highly than boys.

Fig. A21 below shows the importance of English when seeking a job as perceived by pupils not taking the subject, in comparison with pupils who were taking the subject.

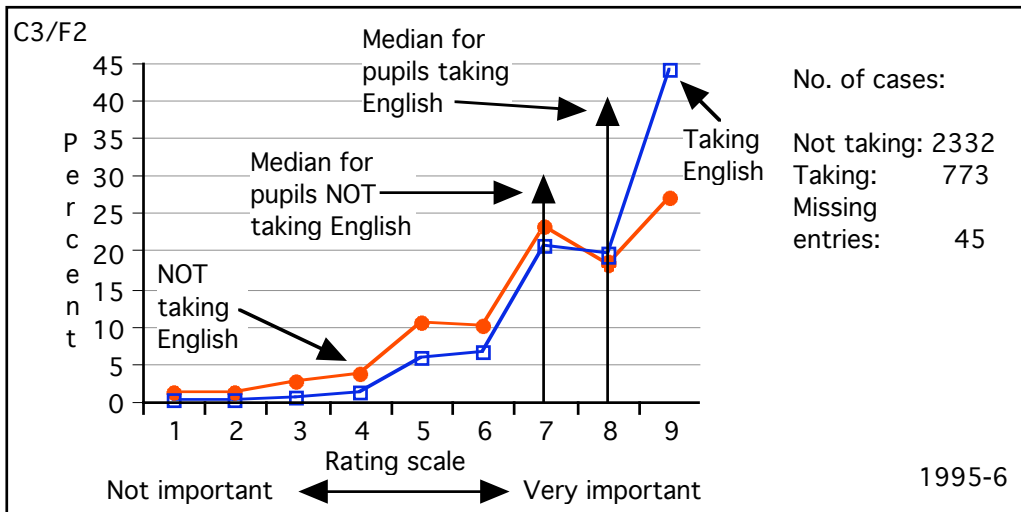


Fig. A21 - Importance of English when seeking a job - Analysis by subject studied Comparison between pupils taking English and pupils not taking English

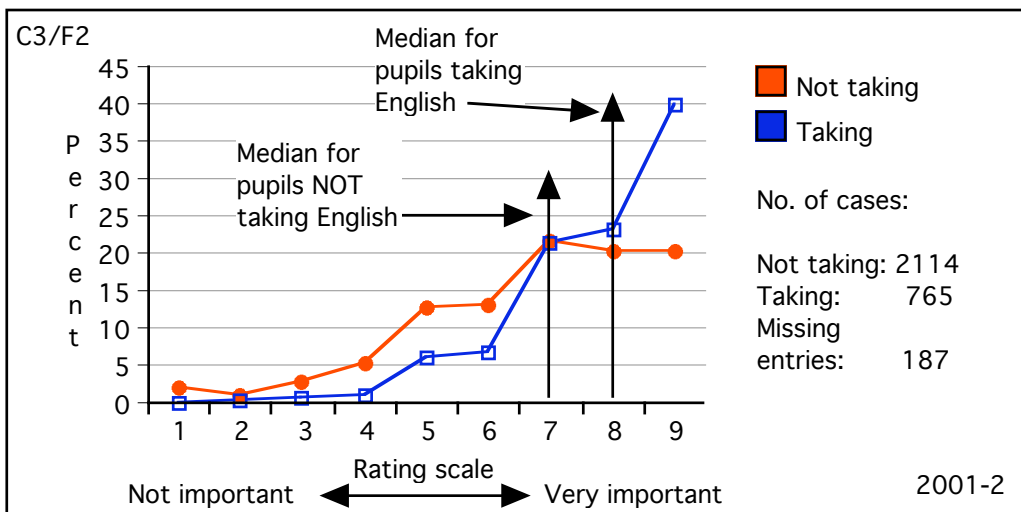


Fig. B21 - Importance of English when seeking a job - Analysis by subject studied Comparison between pupils taking English and pupils not taking English

For the 1995-6 survey, Fig. A21 shows that the median values were high for pupils who were not taking English, and for pupils who did take the subject; this was a good result.

Fig. B21 shows that for the 2001-2 survey, the median values remained high for pupils who did not taking English, and for pupils taking the subject; the medians were once again 7 and 8 respectively. So in the case of English, pupils clearly demonstrated their understanding of the application of knowledge, its importance and relevance.

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

Fig. A22 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 a disappointing result in the 1995-6 survey.

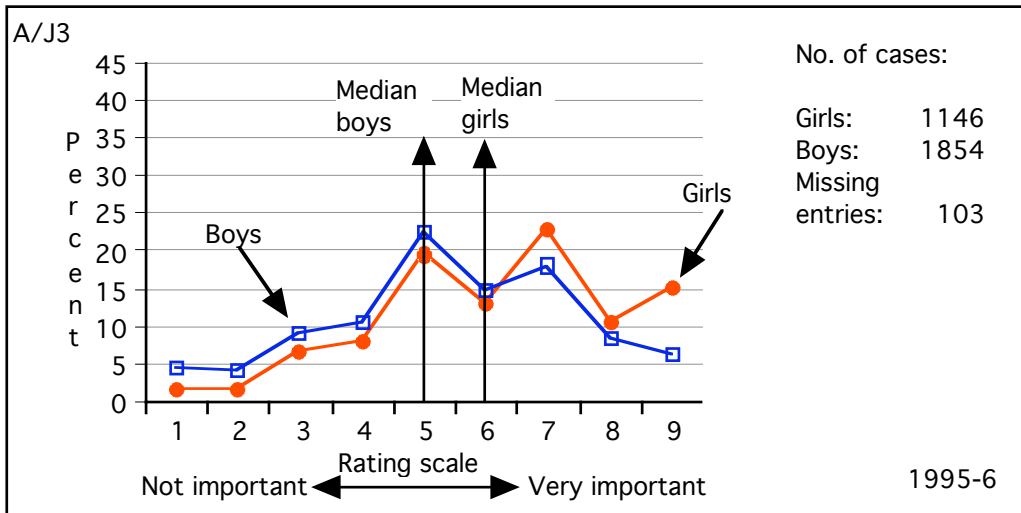


Fig. A22 - Importance of English in the context of EIU - Analysis by gender

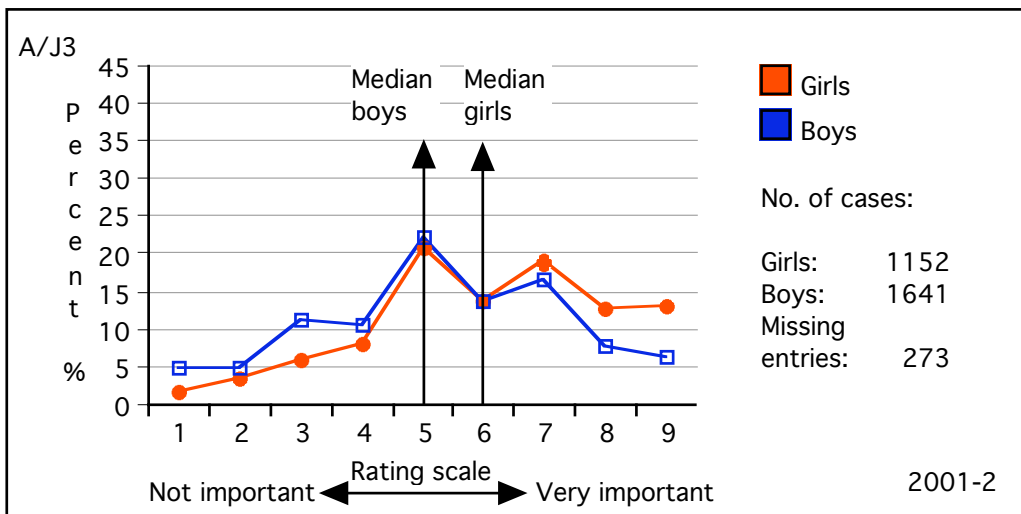


Fig. B22 - Importance of English in the context of EIU - Analysis by gender

Fig. B22 shows that there was no change in the median values for the survey of 2001-2; girls continued to rate the importance of English in the context of EIU more highly than boys.

A different picture emerged for the importance of English in the context of EIU when comparisons were made between pupils not studying and studying the subject, as may be seen from Fig. A23 below.

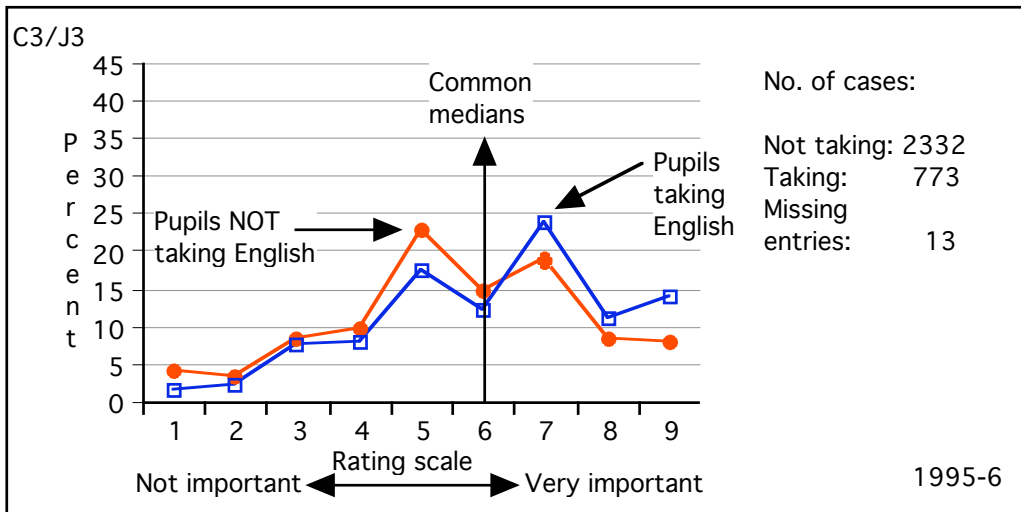


Fig. A23 - Importance of English in the context of EIU - Analysis by subject studied Comparison between pupils taking English and pupils not taking English

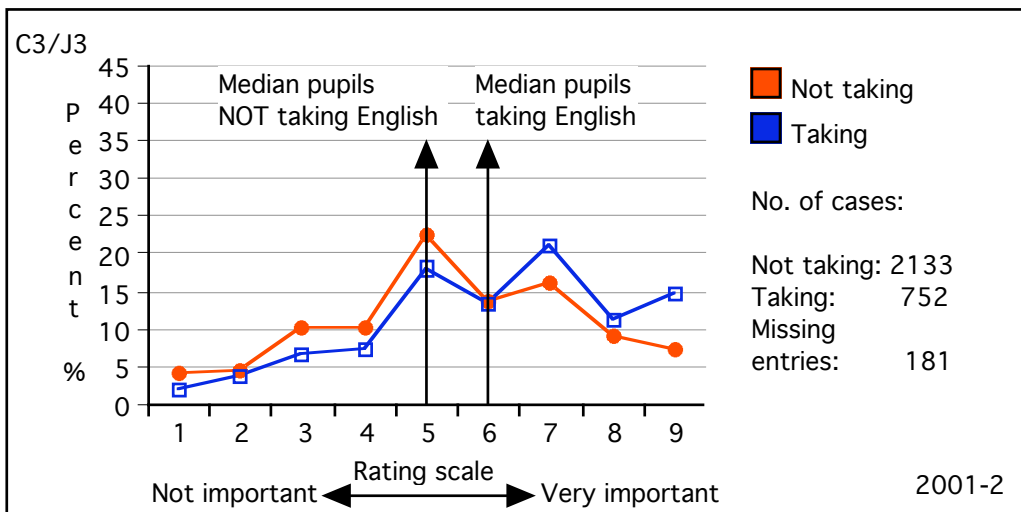


Fig. B23 - Importance of English in the context of EIU - Analysis by subject studied Comparison between pupils taking English and pupils not taking English

In the 1995-6 survey, Fig. A23 shows that there were common median values at 6 for pupils not taking English, and for pupils taking English.

The second survey in 2001-2 revealed a change; Fig. B23 shows that the median for pupils not taking English had fallen to 5, a loss of one rating, but the median for those taking English remained the same at 6.

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

Fig. A24 shows that in the survey of 1995-6, girls rated the influence of English on the way we live now in our society more highly than boys; the medians were 7 and 6 respectively.

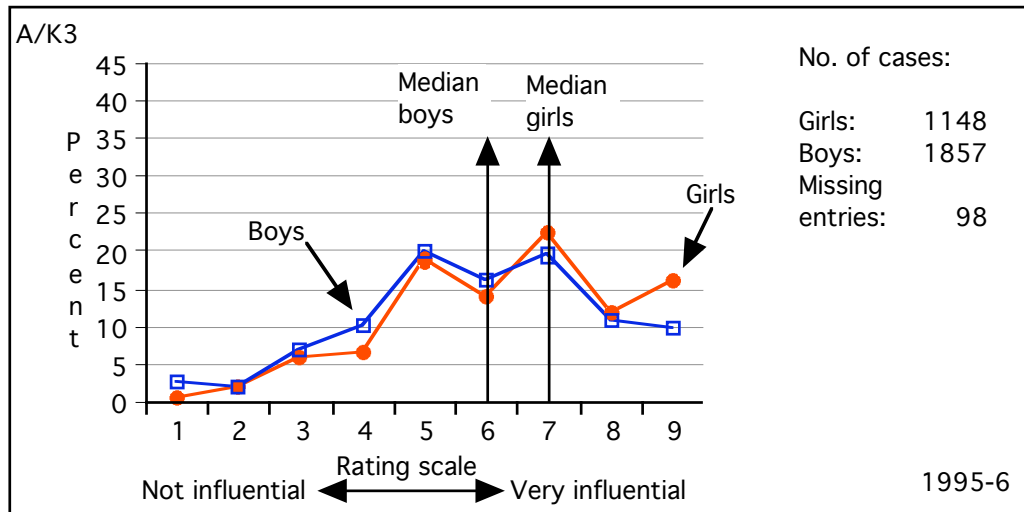


Fig. A24 - Influence of English on the way we live now - Analysis by gender

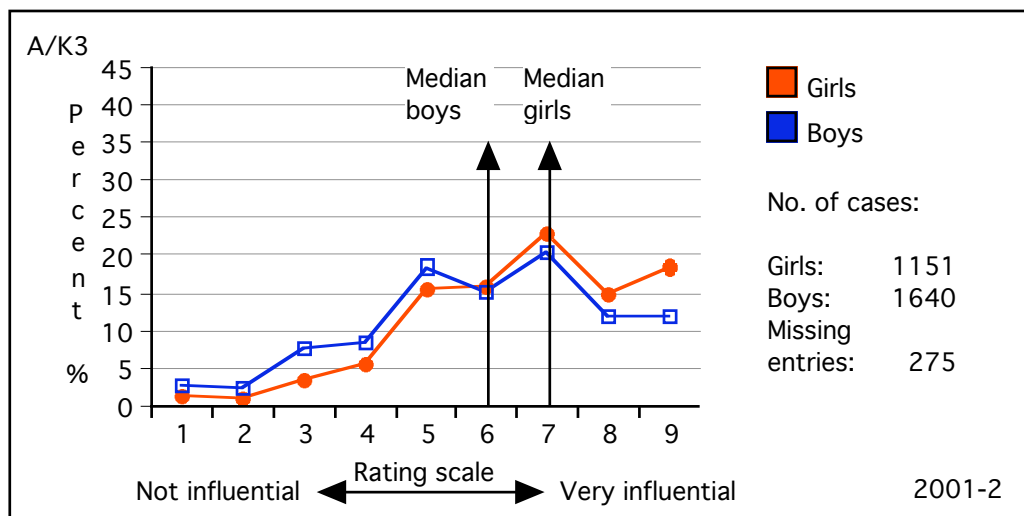


Fig. B24 - Influence of English on the way we live now - Analysis by gender

For the 2001-2 survey, Fig. B24 shows that girls continued to rate the influence of English on the way we live now in our society more highly than boys; the medians remained at 7 and 6 respectively.

The alternative analysis shown in Fig. A25 below, compares pupils who were not studying English with those who did study the subject.

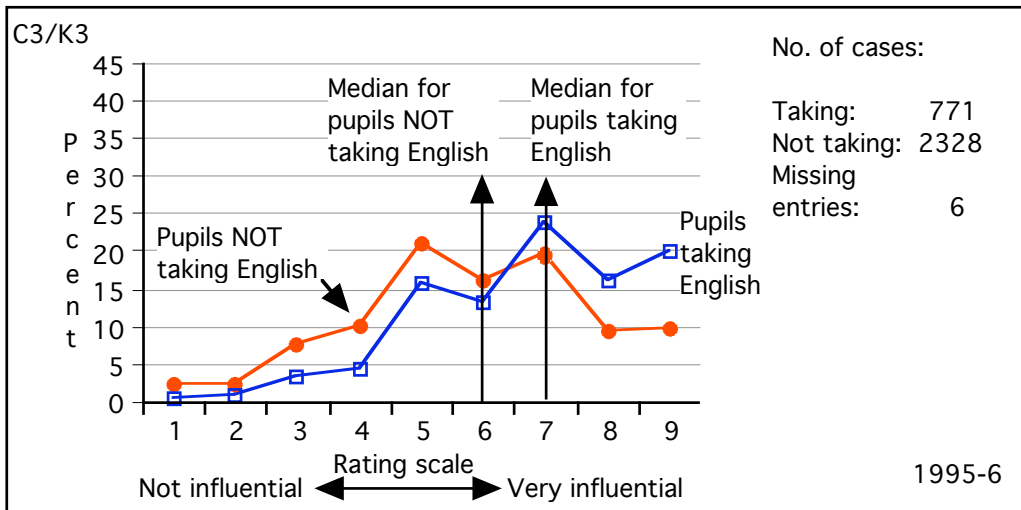


Fig. A25 - Influence of English on the way we live now - Analysis by subject studied Comparison between pupils taking English and pupils not taking English

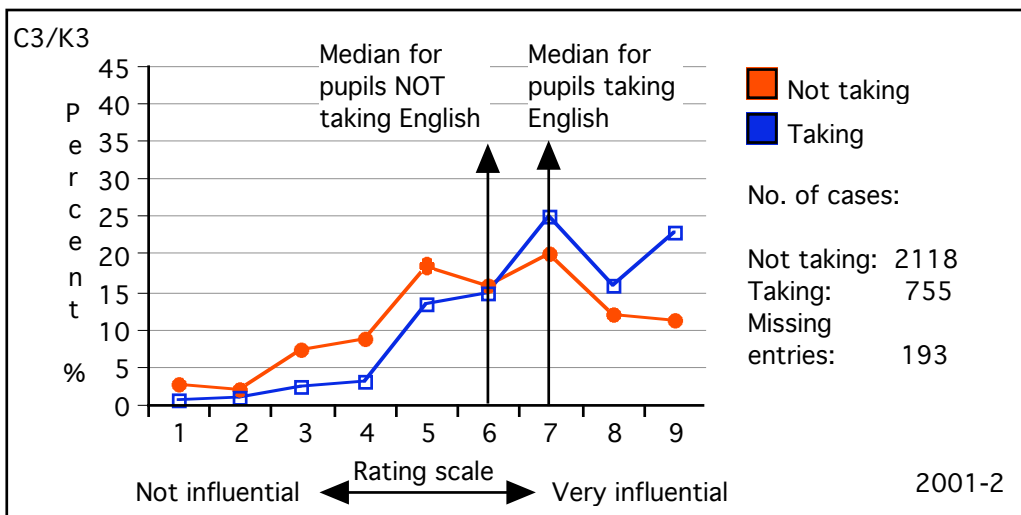


Fig. B25 - Influence of English on the way we live now - Analysis by subject studied Comparison between pupils taking English and pupils not taking English

In the survey of 1995-6, Fig. A25 shows that pupils who did not take English thought it was less influential on the way we live now in our society than pupils who did study the subject; the medians were 6 and 7 respectively.

There was no change in the second survey; once again Fig. B25 shows that pupils who did not take English thought it was less influential on the way we live now in our society than pupils who did study the subject; the medians remained at 6 and 7 respectively.

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

Referring to Fig. A26, girls rated the creative possibilities with English in the curriculum more highly than boys in the 1995-6 survey; the medians were 7 and 6 respectively.

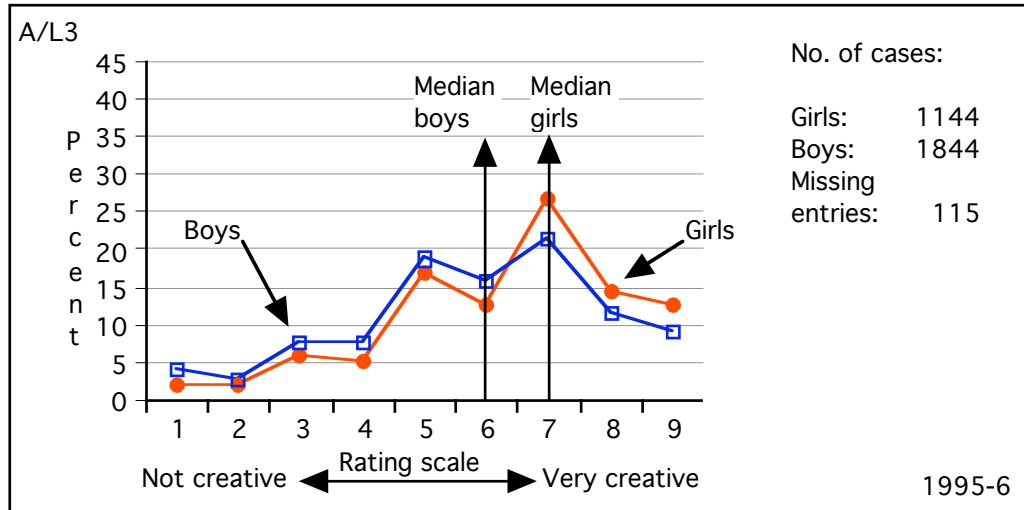


Fig. A26 - Creativity possible with English in the curriculum - Analysis by gender

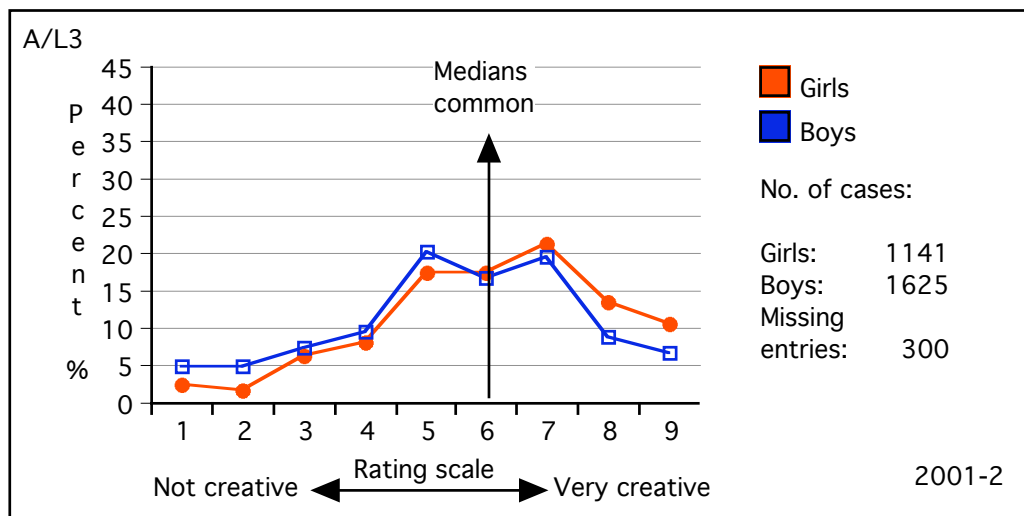


Fig. B26 - Creativity possible with English in the curriculum - Analysis by gender

However it may be seen that the survey of 2001-2 produced a change; referring to Fig. B26, girls now rated the creative possibilities with English in the curriculum the same as boys with a median value of 6.

The alternative analysis shown in Fig. A27 below, compares pupils who were not studying English with those who did study the subject.

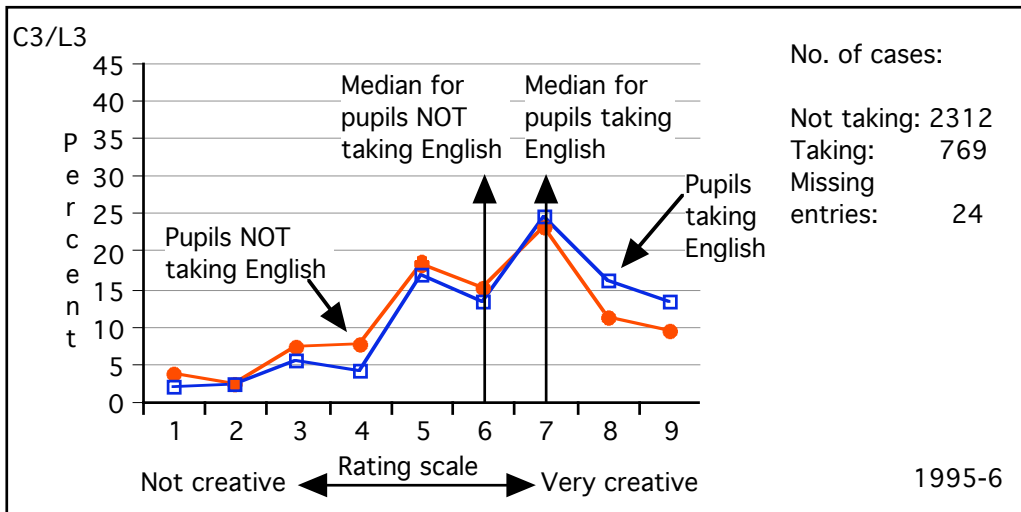


Fig. A27 - Creativity possible with English in the curriculum - Analysis by subject studied Comparison between pupils taking English and pupils not taking English

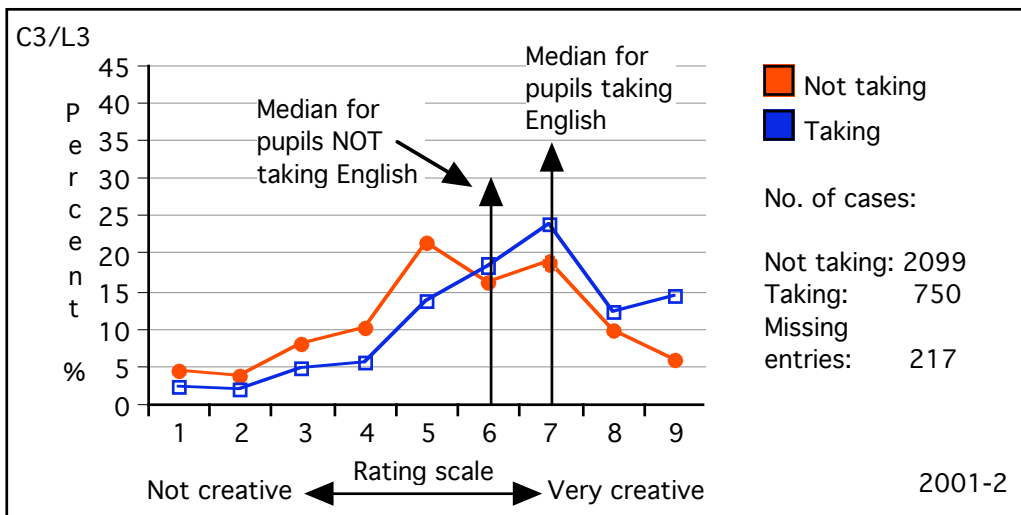


Fig. B27 - Creativity possible with English in the curriculum - Analysis by subject studied Comparison between pupils taking English and pupils not taking English

A comparison between Fig. A27 and B27 discloses no difference between the two surveys in terms of the medians; pupils not taking English valued the creative possibilities at 6, while pupils taking the subject recorded a median of 7.

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

From Fig. A28 below, it may be seen that girls thought we were more dependent on English than boys, with median values of 7 and 6 respectively in the survey of 1995-6.

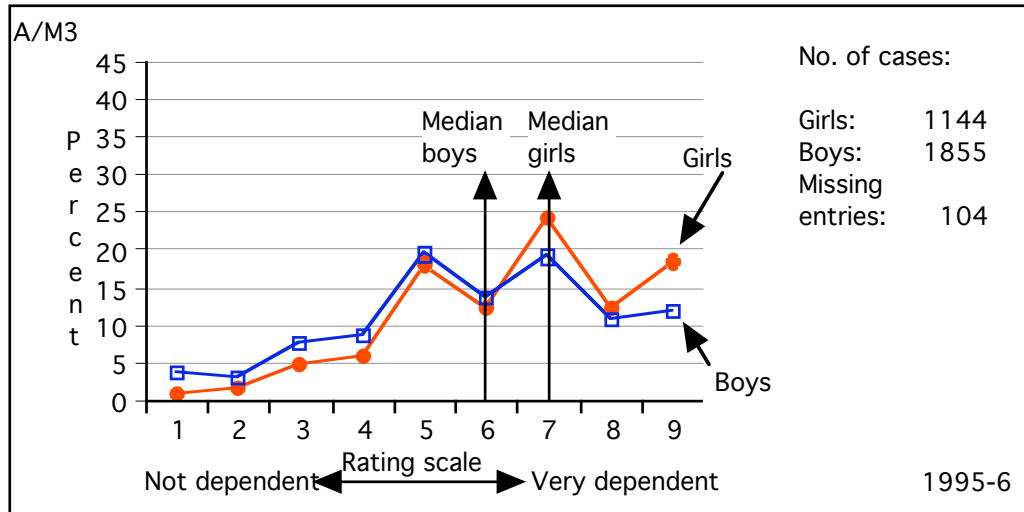


Fig. A28 - Dependency on English - Analysis by gender

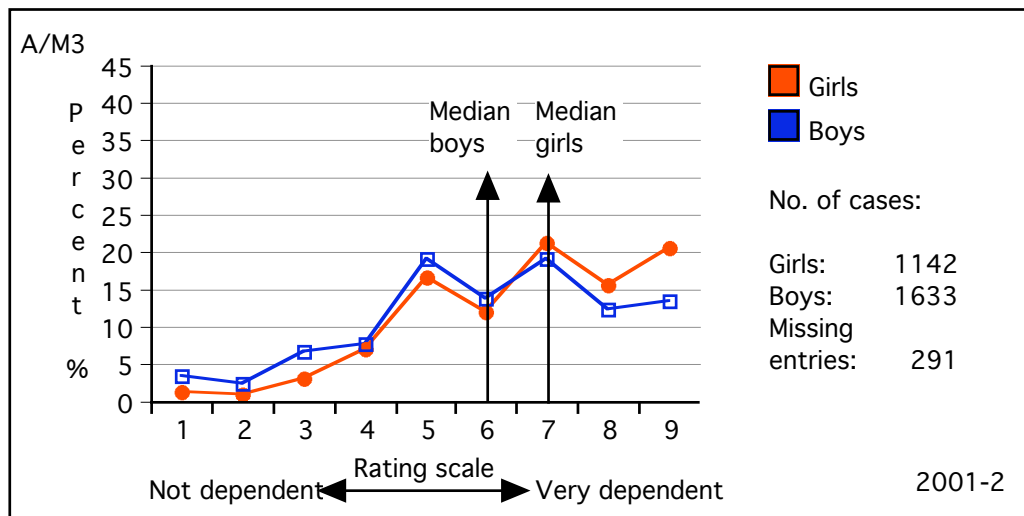


Fig. B28 - Dependency on English - Analysis by gender

From Fig. B28 above, it may be seen that girls continued to think we were more dependent on English than boys, with median values of 7 and 6 respectively in the survey of 2001-2.

Fig. A29 overleaf provides an analysis of our dependency on English as a society on the basis of pupils who did not take the subject, compared with pupils who did.

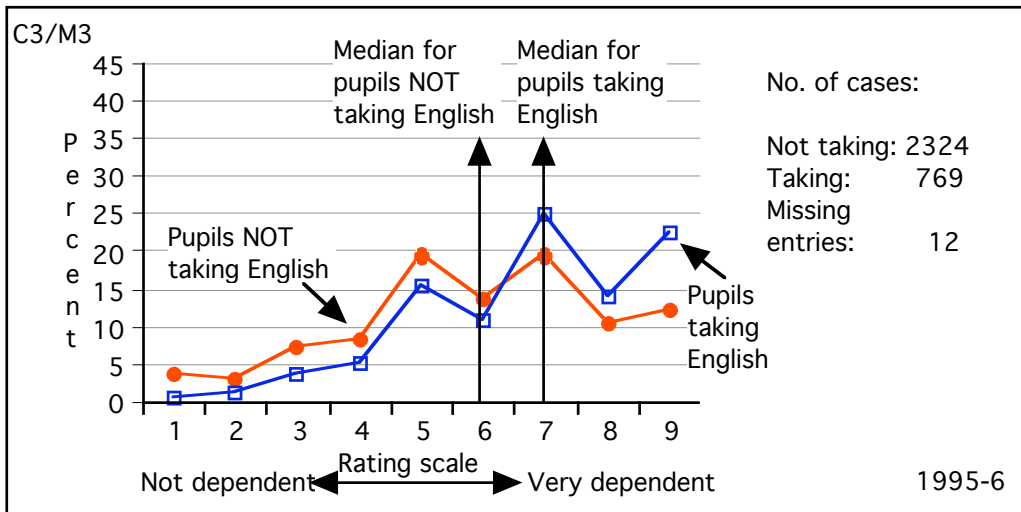


Fig. A29 - Dependency on English - Analysis by subject studied
Comparison between pupils taking English and pupils not taking English

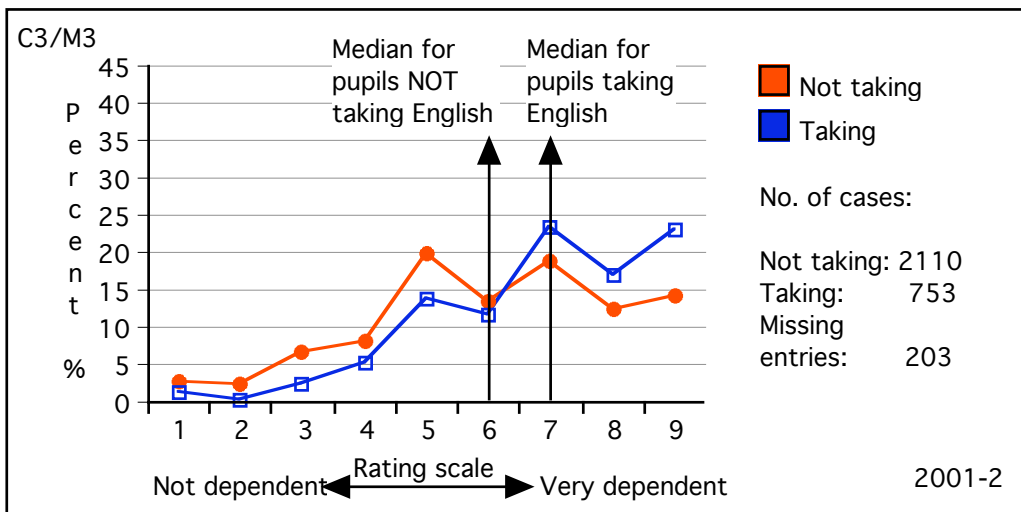


Fig. B29 - Dependency on English - Analysis by subject studied
Comparison between pupils taking English and pupils not taking English

A comparison of Figures A29 and B29 shows that the group studying English rated our dependency on the subject more highly than the group who were not studying the subject, and furthermore, there was no change between the two surveys; the median values were 7 and 6 respectively.

A3.02 - Summary of findings for English

The English language provides the primary communication vehicle for our society in all walks of life, and therefore has a pivotal role in the functioning of our society. Here, the findings are presented using the 1995-6 survey as the basis for comparison, Fig. AB30/1 below shows a summary of key changes in the parameters of analysis for those A-level students studying English.

Parameters of analysis -see below	Comparison of unrounded medians for A-level sample taking English		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level sample taking English - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
1.	7.90	7.47	77.50%	71.30%	-6.20%
2.	5.24	5.02	31.75%	25.64%	-6.11%
3.	8.21	8.07	84.80%	84.70%	-0.10%
4.	6.45	6.32	49.50%	47.50%	-2.00%
5.	6.94	7.06	60.60%	63.90%	+3.30%
6.	6.68	6.55	54.60%	51.1%	-3.50%
7.	6.97	7.10	62.00%	64.00%	+2.00%

Parameters of analysis :
 1. How much interest do you have in English? - (C3/D2)
 2. In your opinion, how difficult is the subject of English? - (C3/E2)
 3. When it comes to getting a job, how important do you consider English? - (C3/F2)
 4. In the context of EIU*, how important do you consider English? - (C3/J3)
 5. How much do you think the way we live now has been influenced by English? - C3/K3
 6. How creative does the curriculum allow you to be in English? - (C3/L3)
 7. As a modern society, how dependent do you think we are on English? - (C3/M3)
 * Economic and Industrial Understanding

Fig. AB30/1 - Summary of changes between surveys for the parameters of analysis by students taking English

Fig. AB30/1 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for students taking English. The greatest degree of comprehension of the importance of the subject should be among these students. As a summary, Fig. AB30/1 presents a worrying picture:

- A comparison of the parameters of analysis from 1995-6 to 2001-2 shows two were positive, four were negative, and one effectively unchanged. Similar trend movements occurred in the unrounded medians.
- The interest shown by pupils taking English fell by 6.2%.
- English was thought to be a less difficult subject with a decline of 6.1%.
- Students taking English thought it highly important when it came to getting a job showing the highest total in this table for ratings 7, 8 and 9 at 84.8% and 84.7% respectively.
- In the context of EIU both surveys recorded less than 50%, so comprehension of how we

earn our way in the world was at an unsatisfactory level.

- The greatest positive trend was in response to parameter 5; the influence of English on the way we live now increased by 3.3%.
- In parameter 6, the creativity perceived as allowable in the curriculum fell by 3.5%.
- For parameter 7, our dependency on English showed a positive trend from 62% to 64%.

Fig. AB30/2 below provides a summary of changes in the parameters of analysis for those A-level students NOT studying English.

Parameters of analysis -see below	Comparison of unrounded medians for A-level sample NOT taking English		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level sample NOT taking English - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
1.	2.83	2.63	6.85%	6.94%	+0.09%
2.	5.25	5.32	29.37%	31.25%	+1.88%
3.	7.32	7.07	69.00%	62.30%	-6.70%
4.	5.53	5.38	35.54%	33.15%	-2.39%
5.	5.85	6.11	39.29%	43.60%	+4.31%
6.	6.11	5.59	44.01%	34.91%	-9.10%
7.	6.00	6.20	42.80%	45.90%	+3.10%

Parameters of analysis :
 1. How much interest do you have in English? - (C3/D2)
 2. In your opinion, how difficult is the subject of English? - (C3/E2)
 3. When it comes to getting a job, how important do you consider English? - (C3/F2)
 4. In the context of EIU*, how important do you consider English? - (C3/J3)
 5. How much do you think the way we live now has been influenced by English? - C3/K3
 6. How creative does the curriculum allow you to be in English? - (C3/L3)
 7. As a modern society, how dependent do you think we are on English? - (C3/M3)
 * Economic and Industrial Understanding

Fig. AB30/2 - Summary of changes between surveys for the parameters of analysis by students NOT taking English

Students NOT studying English are nonetheless totally dependent on communication; from their earliest days they were socialised into using language and developing communication skills. The main points from Fig. AB30/2 above were:

- A comparison of the parameters of analysis from 1995-6 to 2001-2 shows two were positive, three were negative, and two changed by less than 2%. Similar trend movements occurred in the unrounded medians.
- At the high end of the scale for rating scale 7, 8 and 9, the interest in English was low at less than 7% in both surveys indicating little grasp of language dependency.
- For parameter 2, the difficulty perceived with English remained at a low total at the high end of the rating scale.
- When it comes to getting a job, English was perceived as less important by 6.7%.

- From a low total of 35.5%, parameter 4 shows a decline by more than 2% for the importance of English in the context of EIU.
- The highest score was for parameter 5; English was perceived as more influential in the way we live now and by more than 4%.
- The greatest negative trend movement was for parameter 6; the perceived creativity in the curriculum for English fell by more than 9%.
- A positive trend for was evident for parameter 7; our dependency on English as a modern society increased by more than 3%.

Fig. AB30/3 below provides a summary of changes in the parameters of analysis for girls including those A-level students not studying and studying English.

Parameters of analysis -see below	Comparison of unrounded medians for A-level Girls whether taking English or not		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for Girls whether taking English or not - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
1.	5.11	5.06	39.24%	36.44%	-2.80%
2.	5.08	5.11	26.84%	26.94%	+0.10%
3.	8.07	7.71	80.80%	74.80%	-6.00%
4.	6.42	6.15	49.10%	45.00%	-4.10%
5.	6.53	6.78	50.80%	56.20%	+5.40%
6.	6.66	6.26	54.30%	45.80%	-8.50%
7.	6.72	6.88	55.50%	58.20%	+2.70%

Parameters of analysis :
 1. How much interest do you have in English? - (A/D2)
 2. In your opinion, how difficult is the subject of English? - (A/E2)
 3. When it comes to getting a job, how important do you consider English? - (A/F2)
 4. In the context of EIU*, how important do you consider English? - (A/J3)
 5. How much do you think the way we live now has been influenced by English? - A/K3
 6. How creative does the curriculum allow you to be in English? - (A/L3)
 7. As a modern society, how dependent do you think we are on English? - (A/M3)
 * Economic and Industrial Understanding

Fig. AB30/3 - Summary of changes between surveys for the parameters of analysis by GIRLS taking and not taking English

All girls whether they are studying English or not are nonetheless totally dependent on language to function as individuals within society; from their earliest days they have been socialised into developing language skills. The main points from Fig. AB30/3 include:

- A comparison of the parameters of analysis from 1995-6 to 2001-2 shows two were positive, four were negative, and one effectively unchanged in the combined percentage totals for ratings 7, 8 and 9. Similar trend movements occurred in the unrounded medians.
- Interest in English declined by more than 2% from a low starting point of 39%.
- English was perceived as not very difficult; the percentage totals in both surveys for

ratings 7, 8 and 9 were less than 27%. This is a serious cause for concern.

- Parameter 3 elicited the highest responses in both surveys, so English was perceived to be important for getting a job. However, both the rounded median and the percentage totals for ratings 7, 8 and 9 declined, the latter by 6% from 80.8%.
- The importance of English in the context of Economic and Industrial Understanding also declined and by some 4% from 49%.
- English was seen to be more influential in the way we live now, and by more than 5%.
- The greatest negative trend movement was for parameter 6; the perceived creativity in the curriculum for English fell by more than 8% from 54%.
- The response to parameter 7 was positive; our perceived dependence on English as a modern society increased.

Fig. AB30/4 below provides a summary of changes in the parameters of analysis for boys including those A-level students not studying and studying English.

Parameters of analysis -see below	Comparison of unrounded medians for A-level Boys whether taking English or not		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for Boys whether taking English or not - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
1.	3.12	2.87	16.65%	16.18%	-0.47%
2.	5.37	5.34	31.90%	31.56%	-0.34%
3.	7.27	7.11	68.60%	63.80%	-4.80%
4.	5.42	5.28	33.08%	31.18%	-1.90%
5.	5.93	6.14	40.55%	44.40%	+3.85%
6.	6.02	5.62	42.31%	35.19%	-7.12%
7.	5.96	6.19	42.60%	45.60%	+3.00%

Parameters of analysis :
 1. How much interest do you have in English? - (A/D2)
 2. In your opinion, how difficult is the subject of English? - (A/E2)
 3. When it comes to getting a job, how important do you consider English? - (A/F2)
 4. In the context of EIU*, how important do you consider English? - (A/J3)
 5. How much do you think the way we live now has been influenced by English? - A/K3
 6. How creative does the curriculum allow you to be in English? - (A/L3)
 7. As a modern society, how dependent do you think we are on English? - (A/M3)
 * Economic and Industrial Understanding

Fig. AB30/4 - Summary of changes between surveys for the parameters of analysis by BOYS taking and not taking English

All boys whether they are studying English or not are nonetheless totally dependent on language to function as individuals within society; from their earliest days they have been socialised into developing language skills. The main points from Fig. AB30/4 include:

- Comparing the parameters of analysis from 2001-2 with 1995-6 shows two were positive, three were negative, and two were effectively unchanged in the combined percentage

totals for ratings 7, 8 and 9. Similar trend movements occurred in the unrounded medians.

- A comparison of Fig. AB30/3 with Fig. AB30/4 shows that the percentage totals for ratings 7, 8 and 9 were higher for girls in 6 of the parameters and by 10% or more; the exception was for parameter 2 showing boys perceived English as more difficult.
- Interest in English remained at a very low level of less than 17% for ratings 7, 8 and 9.
- English was perceived as not really difficult; the percentage totals in both surveys for ratings 7, 8 and 9 were less than 32%. This is a serious cause for concern.
- Parameter 3 elicited the highest responses in both surveys, so English was perceived to be important for getting a job. However, both the rounded median and the percentage totals for ratings 7, 8 and 9 declined, the latter by some 4% from 68%.
- The importance of English in the context of Economic and Industrial Understanding was not highly rated; the percentage totals for ratings 7, 8 and 9 remained below 34%.
- English was seen to be more influential in the way we live now, and by more than 3%.
- The greatest negative trend movement was for parameter 6; the perceived creativity in the curriculum for English fell by more than 7% from 42%.
- The response to parameter 7 was positive; our perceived dependence on English as a modern society increased by 3% from 42%.

A3.03 - Concluding statement for English

In the current issue of the national curriculum, 'the importance of English' was described as follows:

English is a vital way of communicating in school, in public life and internationally. Literature in English is rich and influential, reflecting the experience of people from many countries and times. In studying English pupils develop skills in speaking, listening, reading and writing. It enables them to express themselves creatively and imaginatively and to communicate with others effectively. Pupils learn to become enthusiastic and critical readers of stories, poetry and drama as well as non-fiction and media texts. The study of English helps pupils understand how language works by looking at its patterns, structures and origins. Using this knowledge pupils can choose and adapt what they say and write in different situations.

These results show that education still has a significant challenge; this statement in the curriculum highlights the importance of meeting that challenge effectively. Moreover, education urgently needs to reflect on the aspirations of the government for a 'prosperous economy', a 'knowledge economy', and to consider the role of English in that context. How we earn our living in the world needs to be understood and this means dropping the shackles of prejudice endorsed by the hidden curriculum.

Appendix 4

Comparison of 6th Form surveys: Maths in 1995-6 and 2001-2

A4.01 - Introduction

For this appendix, the following questions were asked with respect to Maths in education and industry so providing the parameters of analysis. The results are given according to this schedule, starting on the next page; they are presented as graphs two-to-a-page enabling direct comparison between the surveys. The data-gathering instrument questions were:

- 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 opinion, how creative does the curriculum allow you to be in Maths?
- As a modern society, how dependent do you think we are on Maths?

*Note: Economic and Industrial Understanding.

All the graphs are annotated with the questionnaire references in the top left corner, and the school year of the survey in the bottom right corner.

First sight inferences appear with each pair of graphs, and an overall summary for Maths appears at the end of the appendix.

How much interest do you have in Maths?

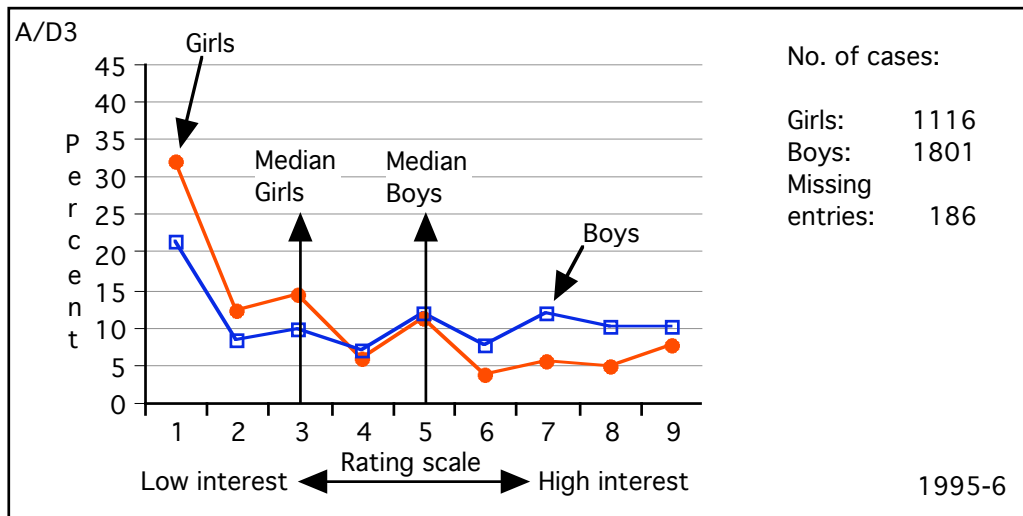


Fig. A31 - Interest in Maths - Analysis by gender

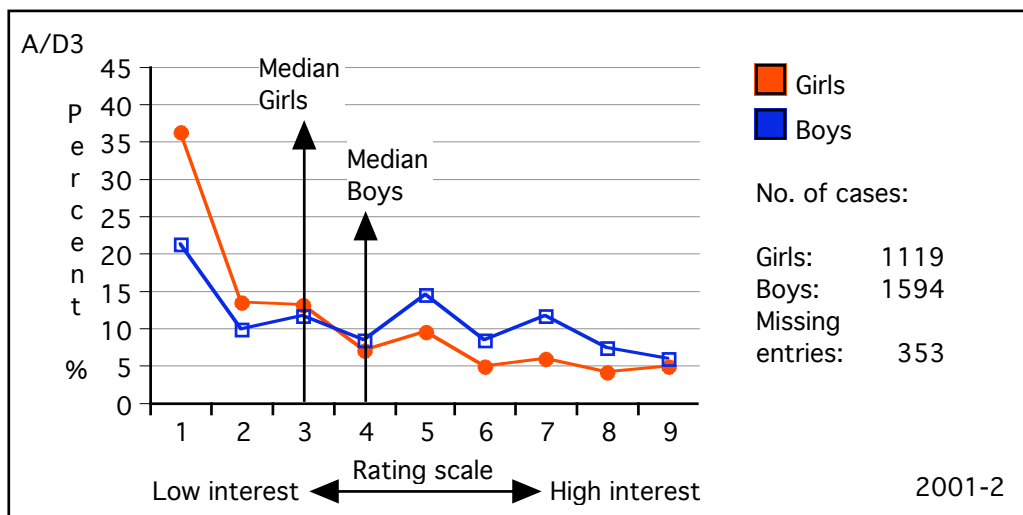


Fig. B31 - Interest in Maths - Analysis by gender

By inspection for the 1995-6 survey, Fig. A31 above shows that boys were more interested in Maths than girls, and by a margin of 2 median ratings. However, for the 2001-2 survey, Fig B31 shows that while there was no change in the median for girls at 3, the median for boys fell from 5 to 4. This has to be a cause for concern.

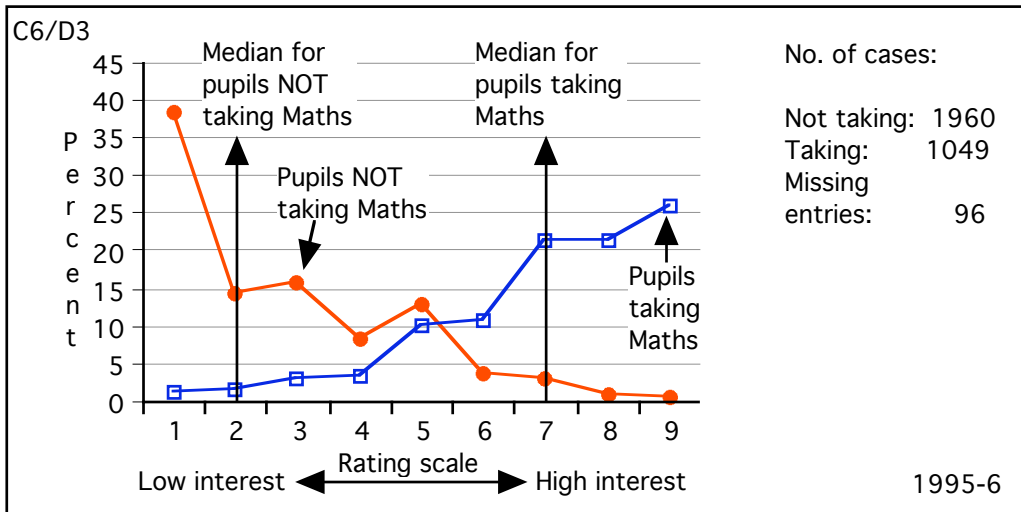


Fig. A32 - Interest in Maths - Analysis by subject studied
 Comparison between pupils taking Maths and pupils not taking Maths

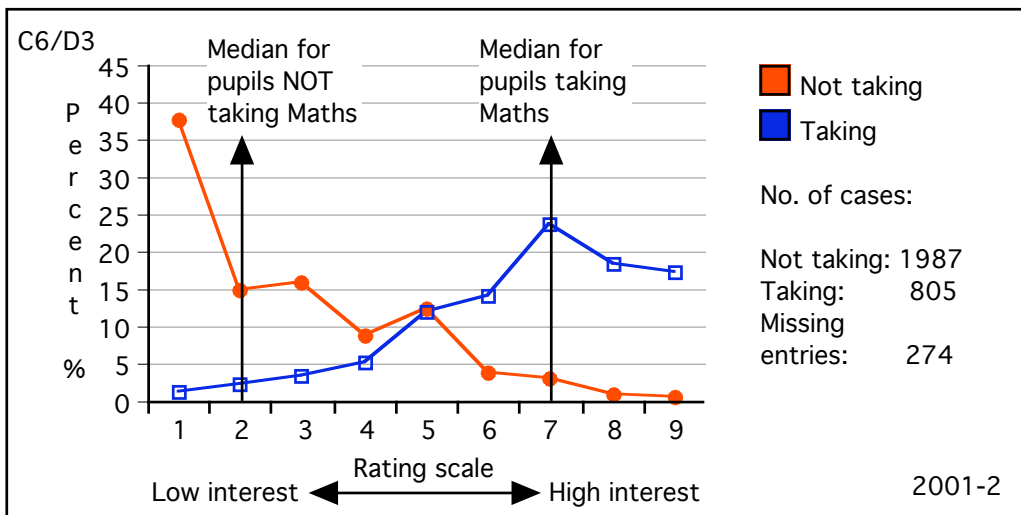


Fig. B32 - Interest in Maths - Analysis by subject studied
 Comparison between pupils taking Maths and pupils not taking Maths

Both surveys show two very different curves. For the 1995-6 survey, the median for students taking Maths was 7, and for those not taking Maths it was 2. However, whereas the curve for pupils taking Maths finished on an upward sweep in the 1995-6 study, the curve takes a downward trend in the latest survey; compare Fig. A32 with Fig. B32. For the 1995-6 survey the proportion at rating level 9 was 26.1%, and 17.5% in the 2001-2 survey.

In your opinion, how difficult is Maths?

From Fig. A33 below, it may be seen that both girls and boys regarded Maths as a difficult subject, with a common median value of 7 in the survey of 1995-6.

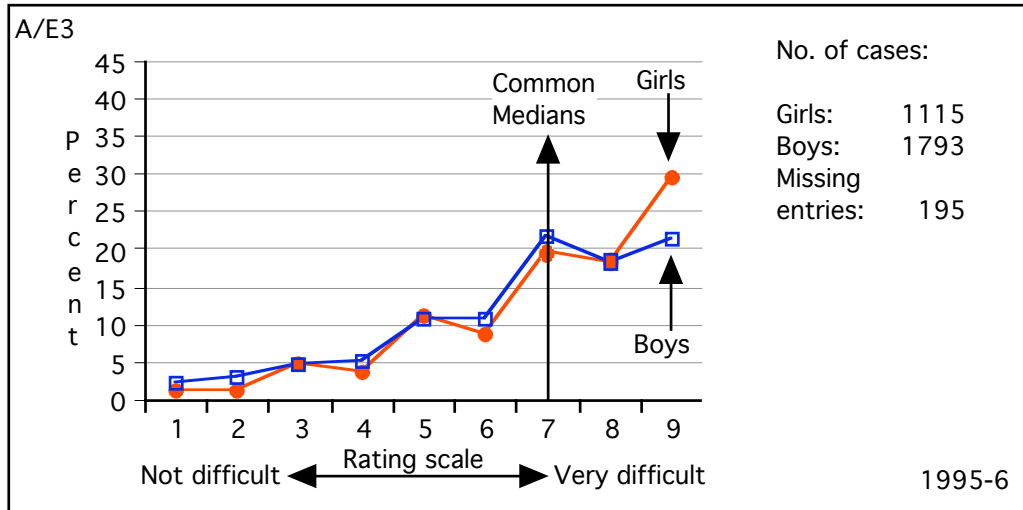


Fig. A33 - Difficulty with Maths - Analysis by gender

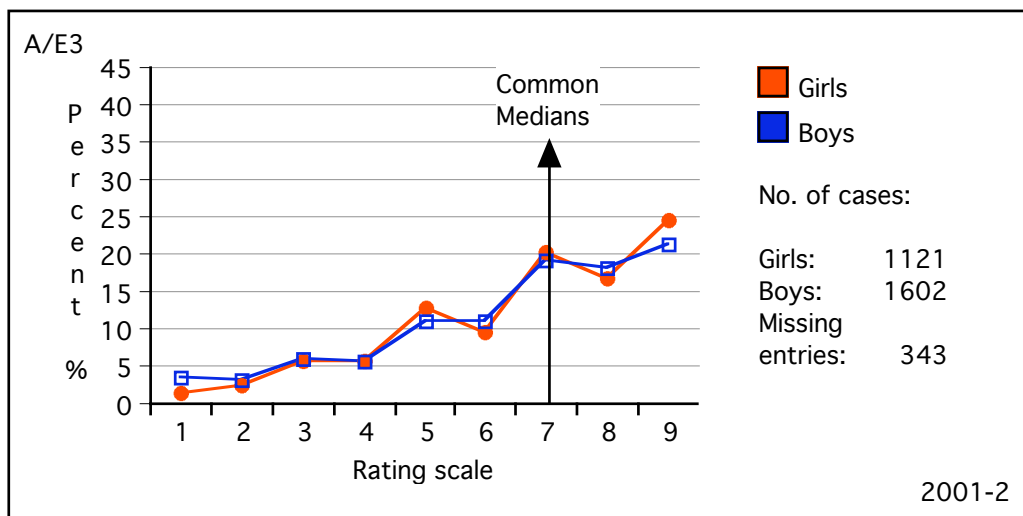


Fig. B33 - Difficulty with Maths - Analysis by gender

And Fig. B33 above, discloses that there were no changes in the median values for the survey of 2001-2; both girls and boys continued to regard Maths as a difficult subject, sharing common median values of 7.

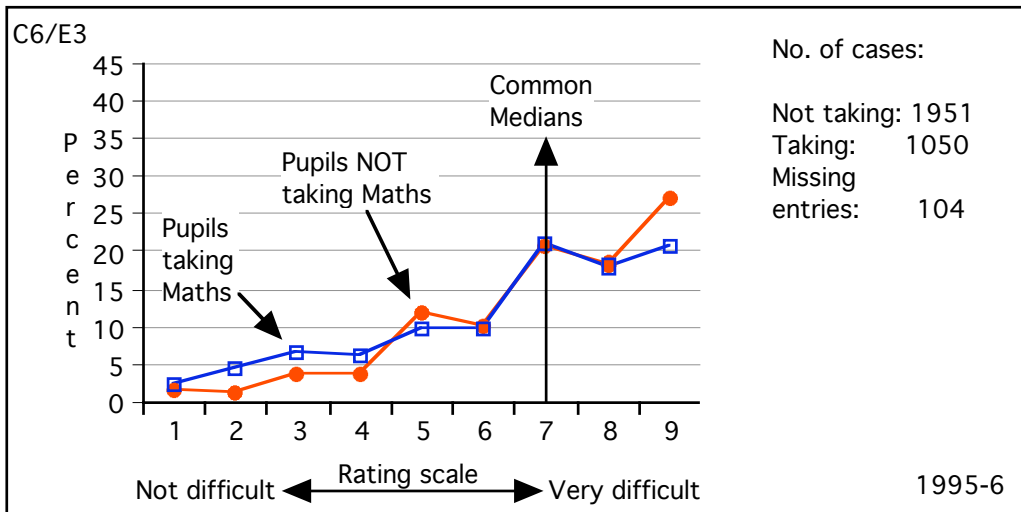


Fig. A34 - Difficulty with Maths - Analysis by subject studied
Comparison between pupils taking Maths and pupils not taking Maths

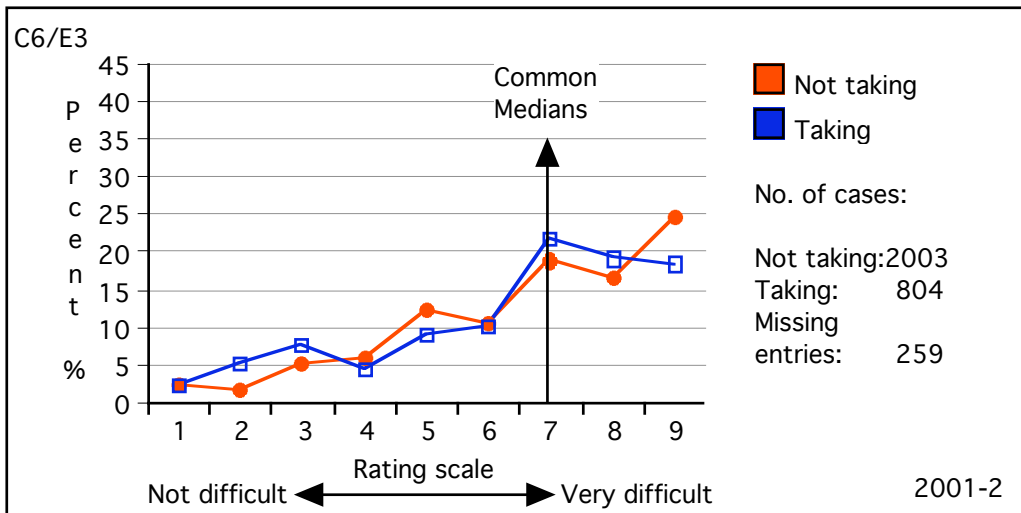


Fig. B34 - Difficulty with Maths - Analysis by subject studied
Comparison between pupils taking Maths and pupils not taking Maths

Fig. B34 above discloses that the survey of 2001-2 showed no change in status by comparison with the findings of 1995-6; pupils continued to find the subject of Maths relatively difficult, once again sharing a common median value of 7.

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

In the study of 1995-6, both girls and boys rated the importance of Maths very highly when seeking a job, as demonstrated in Fig. A35 by the common median values of 8.

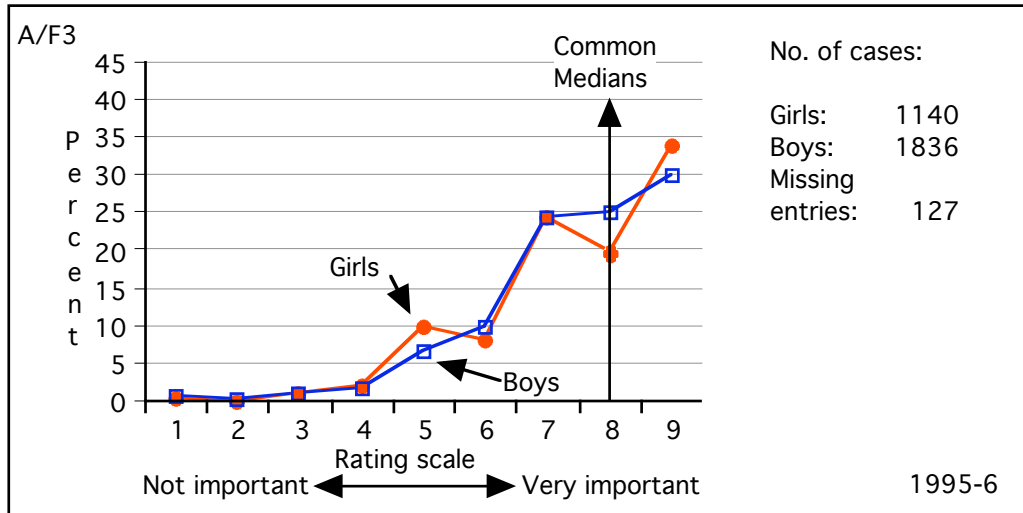


Fig. A35 - Importance of Maths when seeking a job - Analysis by gender

Reference to Fig. B35 below however, shows that in the 2001-2 survey, both genders considered Maths to be less important when seeking a job; they responded with common medians of 7. Also, in the first study the curves finished on an upward sweep, whereas for the second study they finished on a downward trend. For the 1995-6 survey, 34.1% of the girls and 30% of boys rated the importance at 9. For the 2001-2 survey, some 23.2% of girls and 24.3% of boys rated the importance at 9.

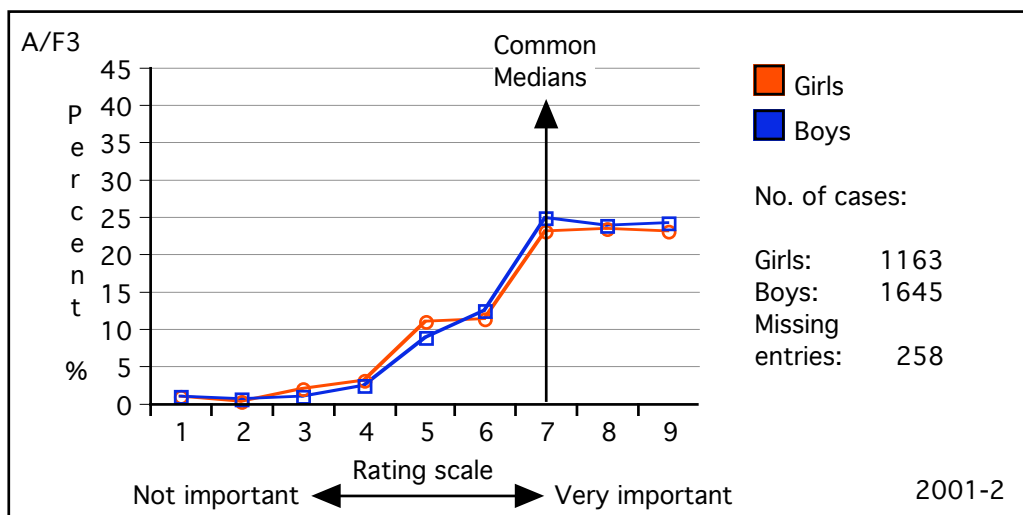


Fig. B35 - Importance of Maths when seeking a job - Analysis by gender

Analysis on the basis of pupils taking and not taking Maths revealed that the importance of the subject when seeking a job was rated 8 by both groups in the 1995-6 study, as shown by Fig. A36 below.

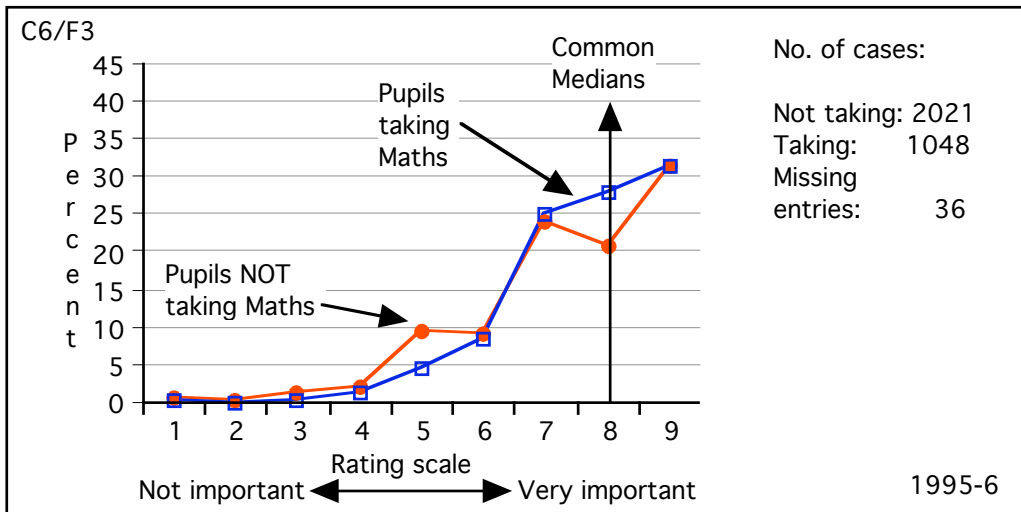


Fig. A36 - Importance of Maths when seeking a job - Analysis by subject studied Comparison between pupils taking Maths and pupils not taking Maths

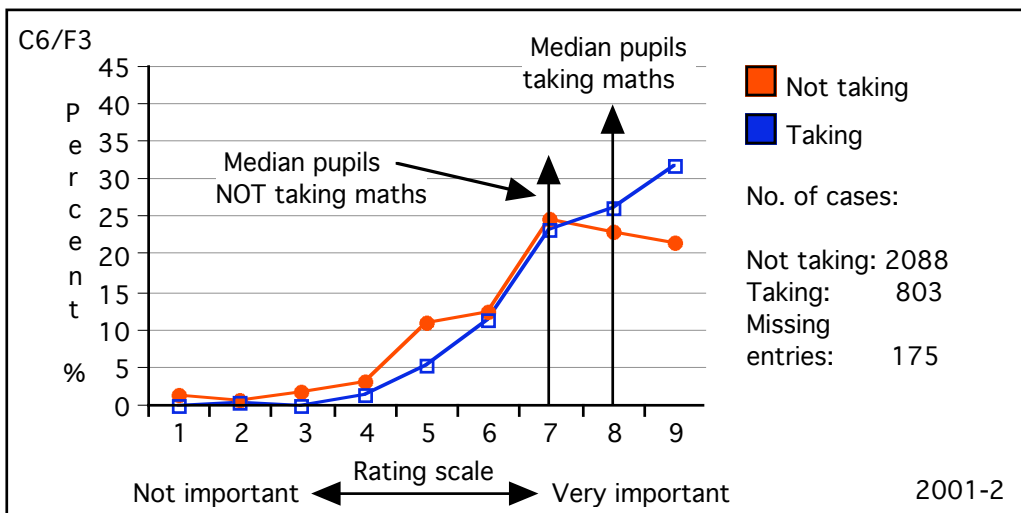


Fig. B36 - Importance of Maths when seeking a job - Analysis by subject studied Comparison between pupils taking Maths and pupils not taking Maths

However, a similar analysis in the 2001-2 study disclosed a change; those who were not taking Maths recorded a lower rating with a median of 7, as shown by Fig. B36 above. Those taking Maths still recorded a median of 8.

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

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. A37 below, which represents the status for the 1995-6 study.

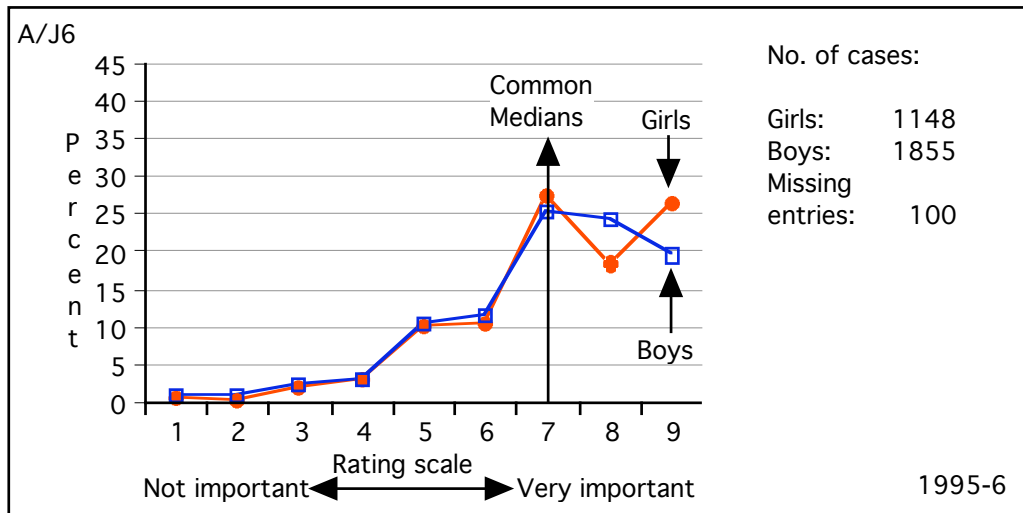


Fig. A37 - Importance of Maths in the context of EIU - Analysis by gender

For the 2001-2 survey, the importance of Maths in the context of EIU was similarly rated highly by both girls and boys, scoring common median values of 7; Fig. B37 below refers.

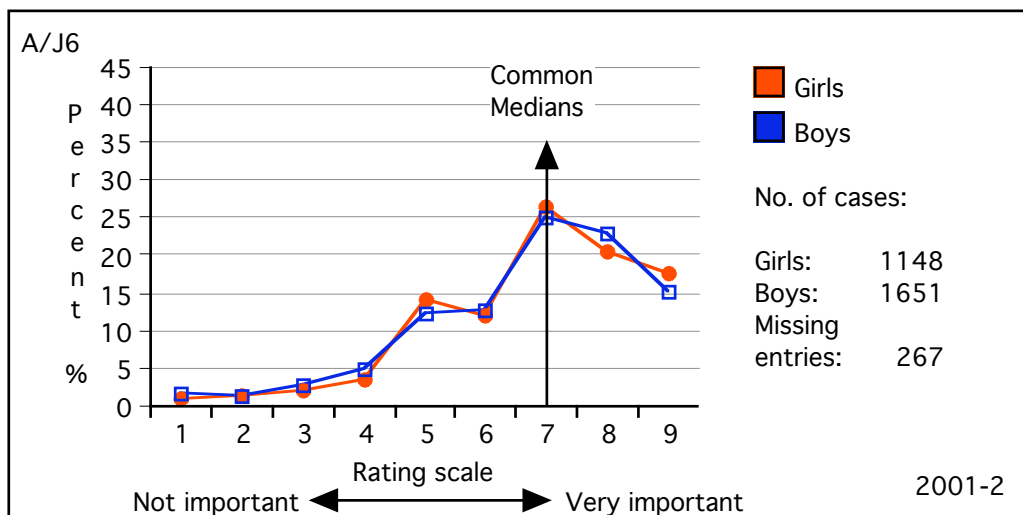


Fig. B37 - Importance of Maths in the context of EIU - Analysis by gender

Fig. A38 below 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 in the survey of 1995-6.

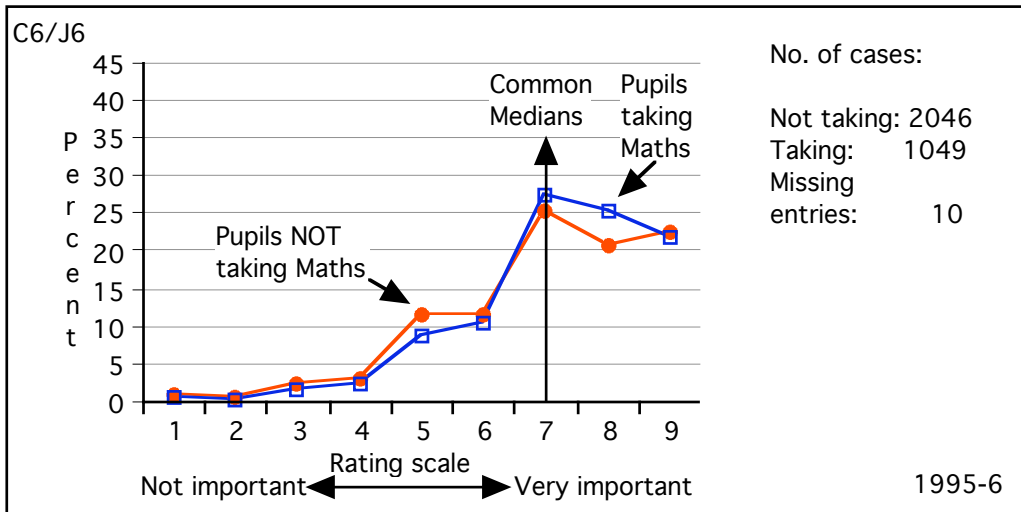


Fig. A38 - Importance of Maths in the context of EIU - Analysis by subject studied Comparison between pupils taking Maths and pupils not taking Maths

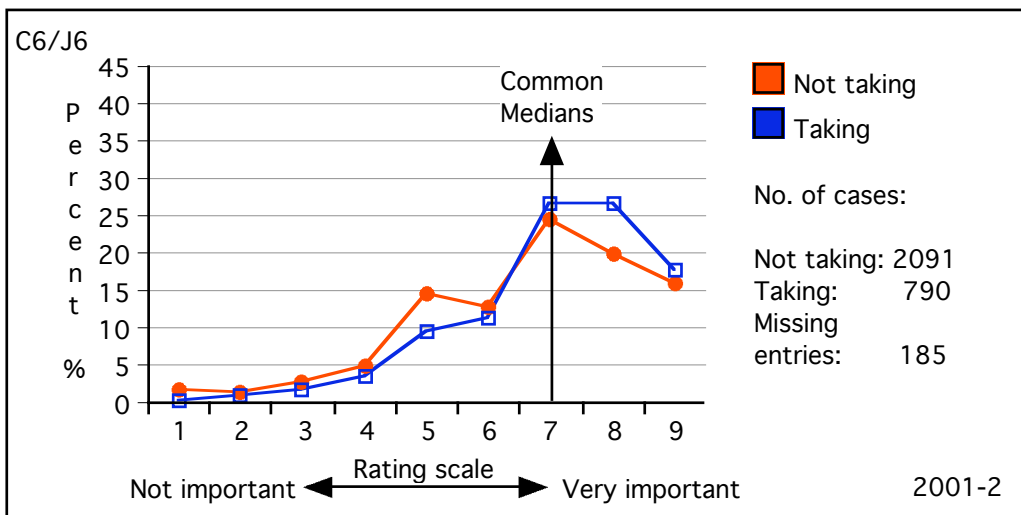


Fig. B38 - Importance of Maths in the context of EIU - Analysis by subject studied Comparison between pupils taking Maths and pupils not taking Maths

Fig. B38 above presents the status for the 2001-2 survey comparing pupils who took Maths with pupils who did not; in both instances the subject continued to be rated highly at a median of 7. For the 2001-2 survey, although there were no changes in the medians, the curves finished on a more pronounced declining trend, as demonstrated by a comparison of scores at rating 9. In the 1995-6 survey, 21.9% of boys and 22.4% of girls selected rating 9, whereas in 2001-2, there were 17.7% of boys and 16.2% of girls.

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

Referring to Fig. A39 below, both girls and boys rated the influence of Maths on the way we live now at a median value of 6 during the 1995-6 survey.

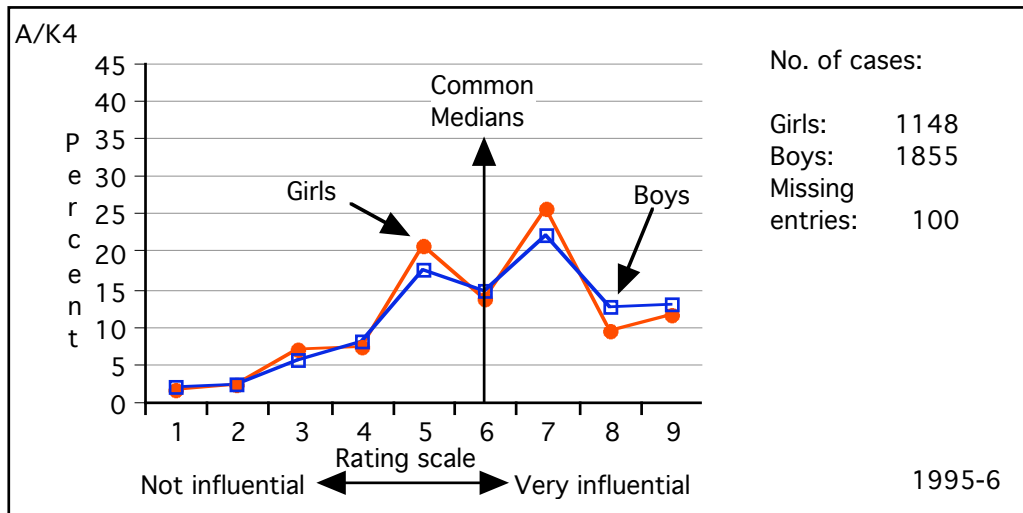


Fig. A39 - Influence of Maths on the way we live now - Analysis by gender

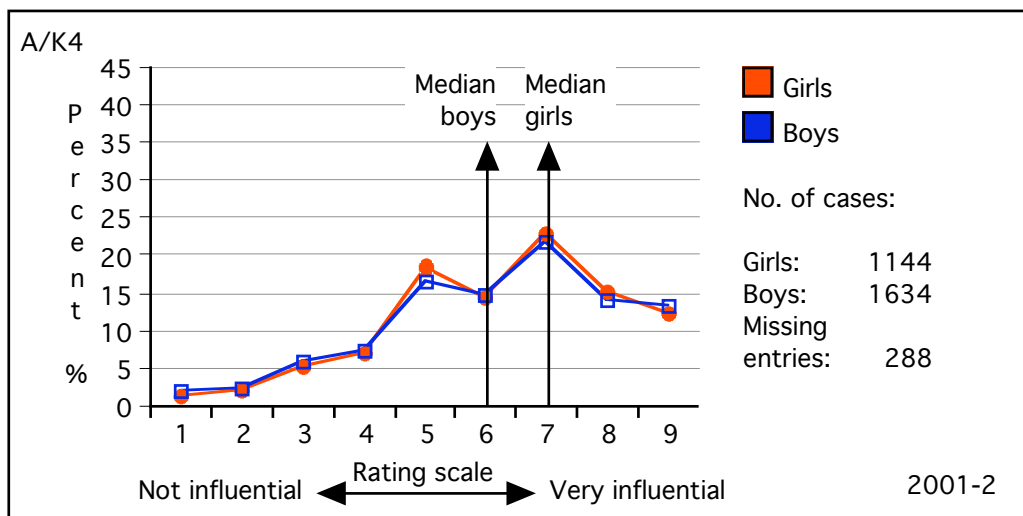


Fig. B39 - Influence of Maths on the way we live now - Analysis by gender

Referring to Fig. B39 above, girls rated the influence of Maths on the way we live now at a median value of 7 for the 2001-2 survey, while the rating for boys was 6. However, inspection shows the curves to be very close, and so further analysis is warranted. In the 1995-6 study, the Mean values were 6.054 and 6.143, the Standard Deviations were 1.900 and 1.979 for girls and boys respectively. For the 2001-2 study, the Mean values were 6.276 and 6.211, the Standard Deviations were 1.879 and 1.980 respectively for girls and boys.

The analysis in Fig. A40 below, 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 in the 1995-6 study.

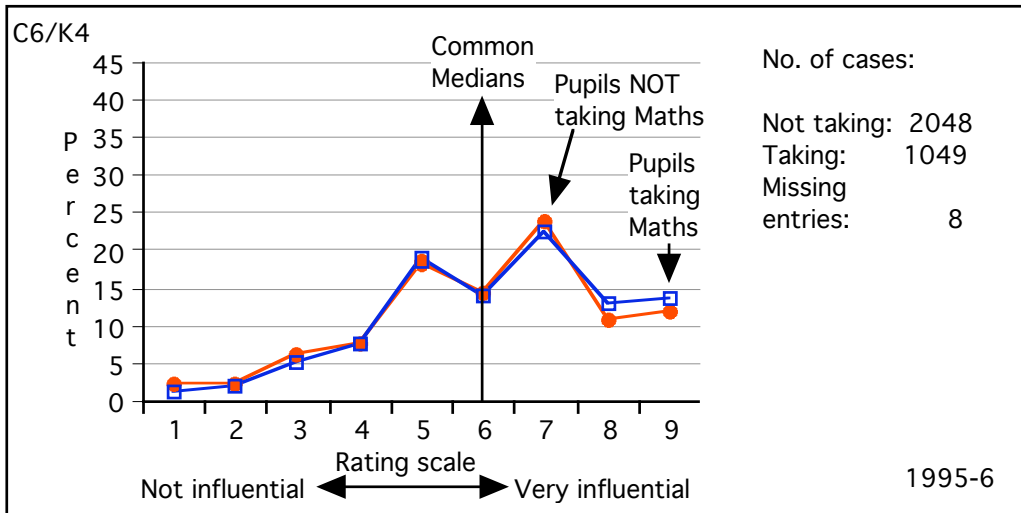


Fig. A40 - Influence of Maths on the way we live now - Analysis by subject studied Comparison between pupils taking Maths and pupils not taking Maths

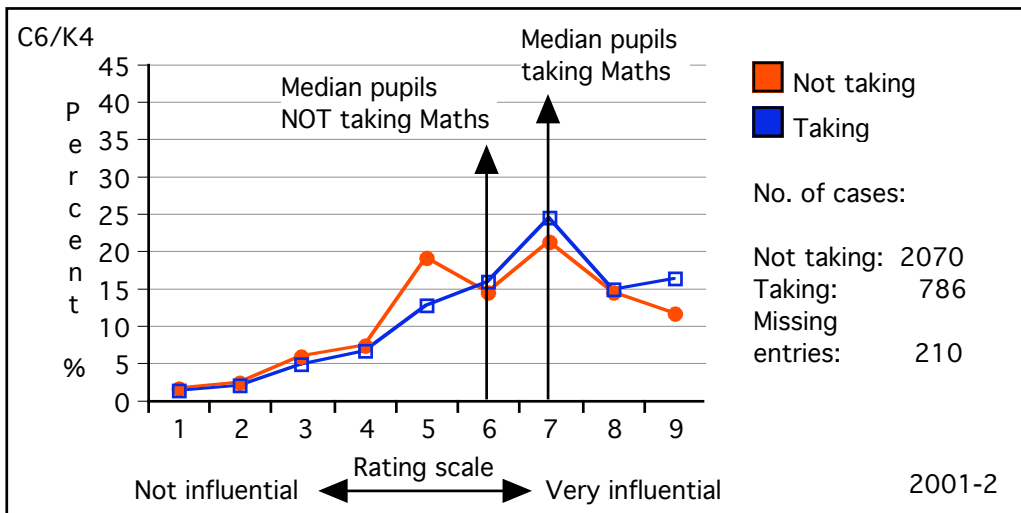


Fig. B40 - Influence of Maths on the way we live now - Analysis by subject studied Comparison between pupils taking Maths and pupils not taking Maths

The 2001-2 survey, summarised for these parameters in Fig. B40 above, shows that pupils who took Maths considered the influence of Maths in our society 1 rating higher at a median value of 7. There was no change for pupils who did not take Maths, as shown by the median of 6.

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

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. A41 below. The plots run so closely that the curves could not be separated for annotation.

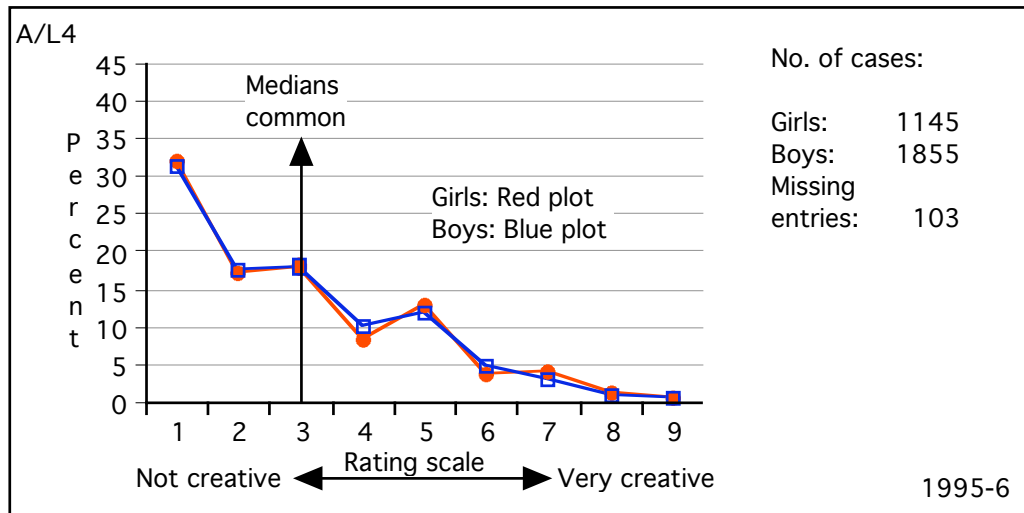


Fig. A41 - How creative does the curriculum allow you to be in Maths? - Analysis by gender

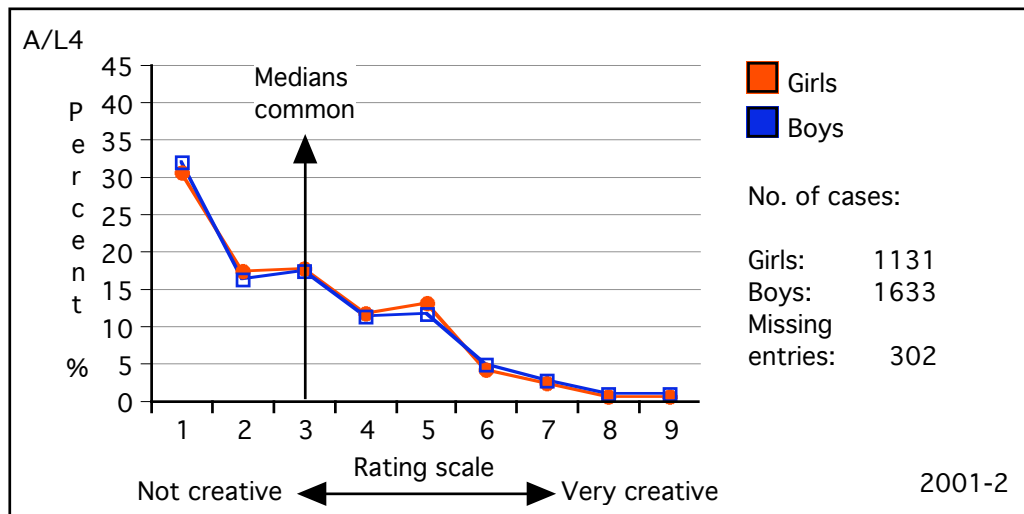


Fig. B41 - How creative does the curriculum allow you to be in Maths? - Analysis by gender

Similarly for the 2001-2 survey, the level of creativity perceived in the curriculum with Maths by both girls and boys remained low at a common median value of 3—Fig. B41 above.

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 in the 1995-6 survey—see Fig. A42 below.

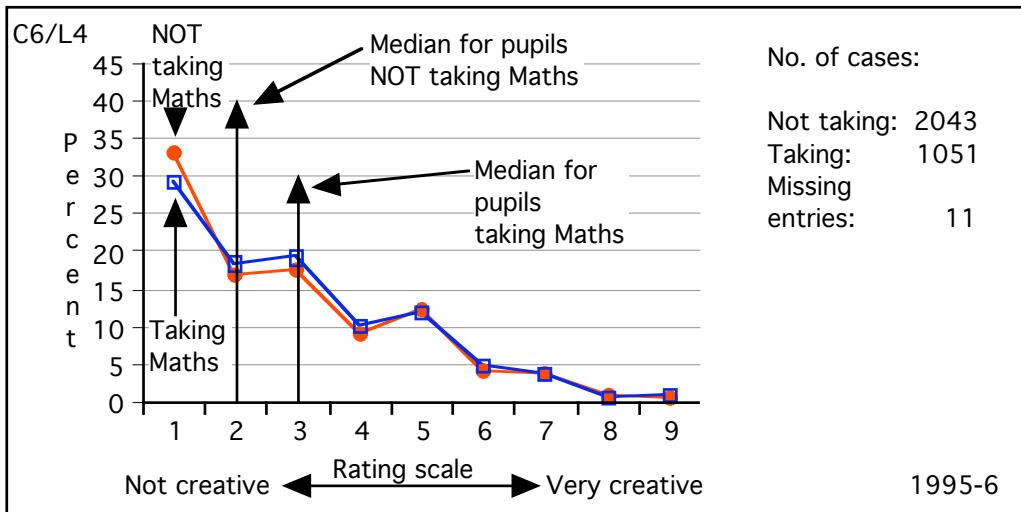


Fig. A42 - How creative does the curriculum allow you to be in Maths? - Analysis by subject studied Comparison between pupils taking Maths and pupils not taking Maths

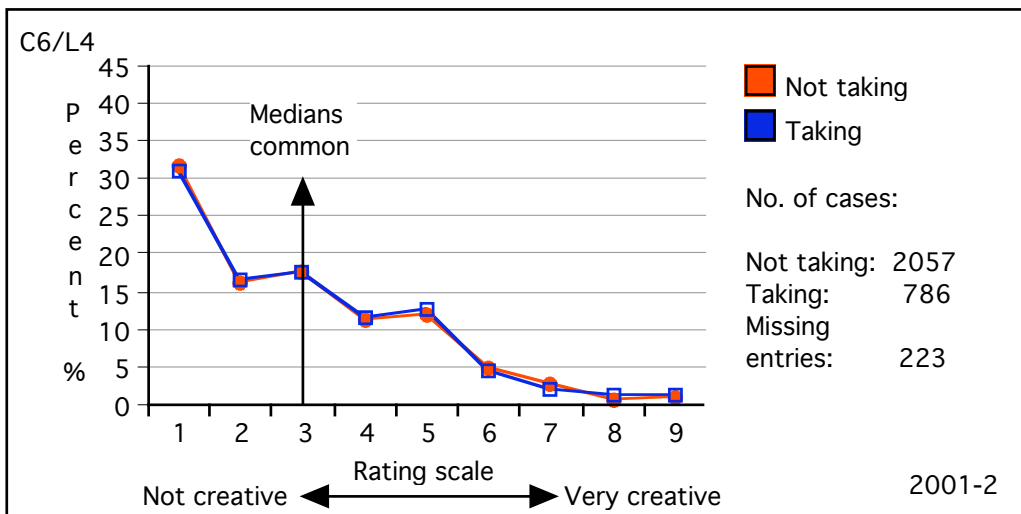


Fig. B42 - How creative does the curriculum allow you to be in Maths? - Analysis by subject studied Comparison between pupils taking Maths and pupils not taking Maths

The comparable analysis for 2001-2 disclosed a change: there were common medians of 3 for pupils studying Maths, and not studying the subject, as may be seen by reference to Fig. B42 above.

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

Fig. A43 below 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 in the 1995-6 study.

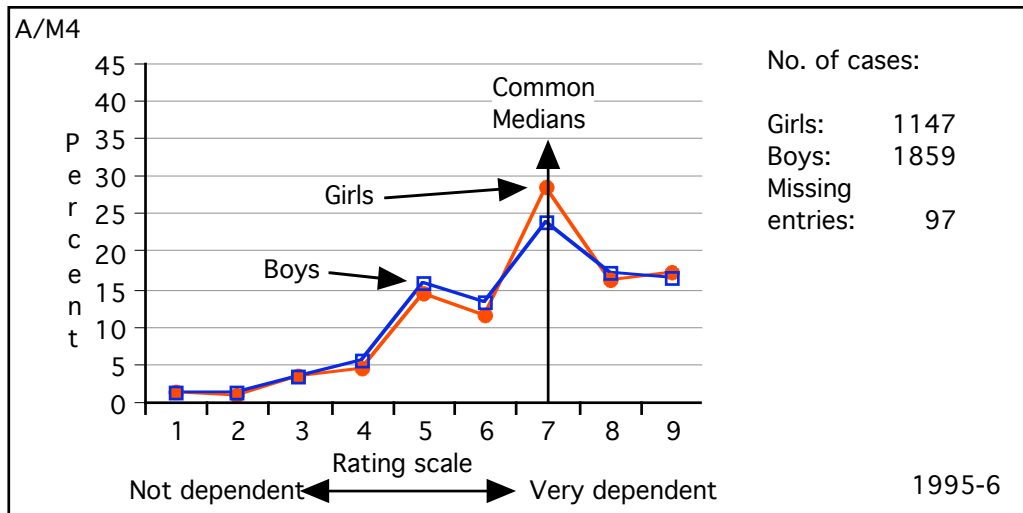


Fig. A43 - How dependent do you think we are on Maths? - Analysis by gender

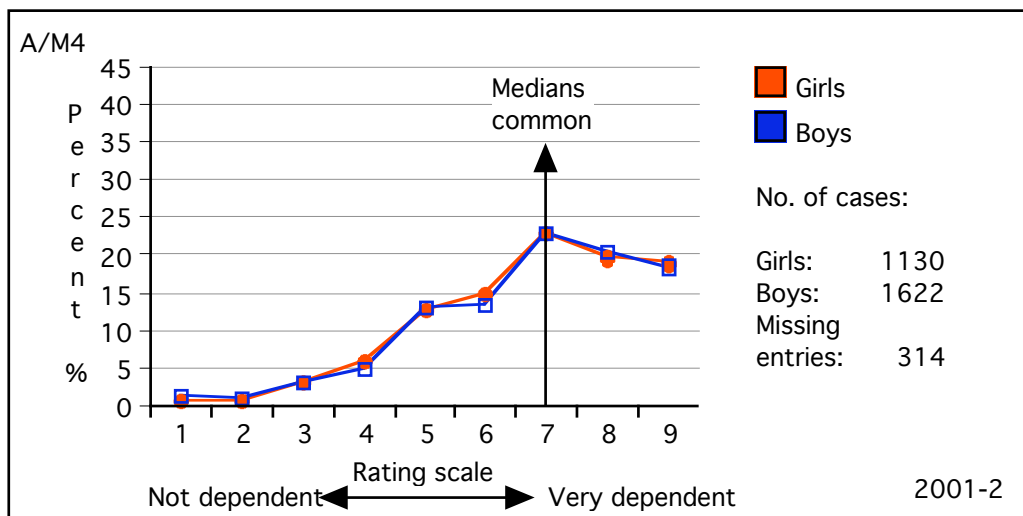


Fig. B43 - How dependent do you think we are on Maths? - Analysis by gender

For the 2001-2 survey, Fig. B43 above shows that boys and girls continued to rate our dependency on Maths as a society at a relatively high median value of 7. However, the curves in the latest survey were closer to each other as may be seen by inspection.

Similarly, Fig. A44 below 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; for the 1995-6 survey they shared common median values of 7.

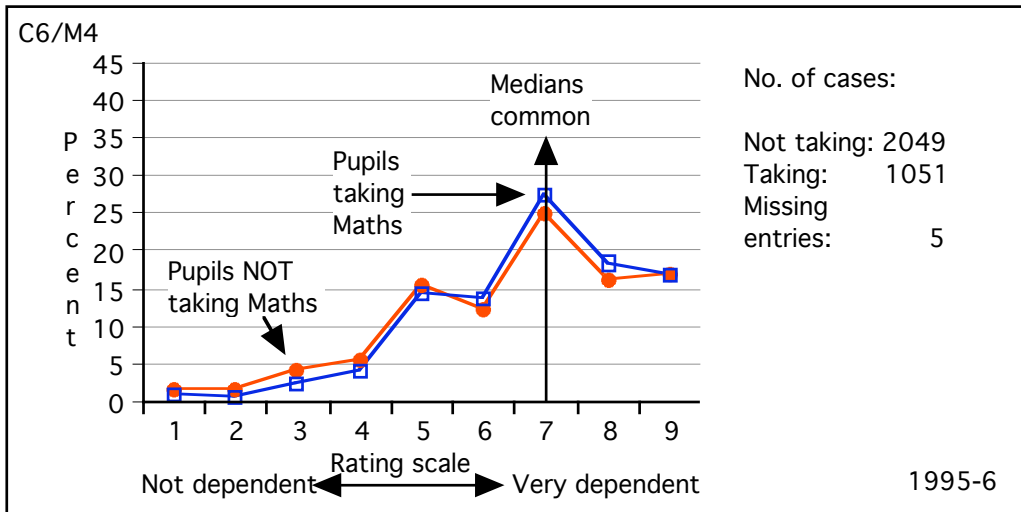


Fig. A44 - How dependent do you think we are on Maths? - Analysis by subject studied
Comparison between pupils taking Maths and pupils not taking Maths

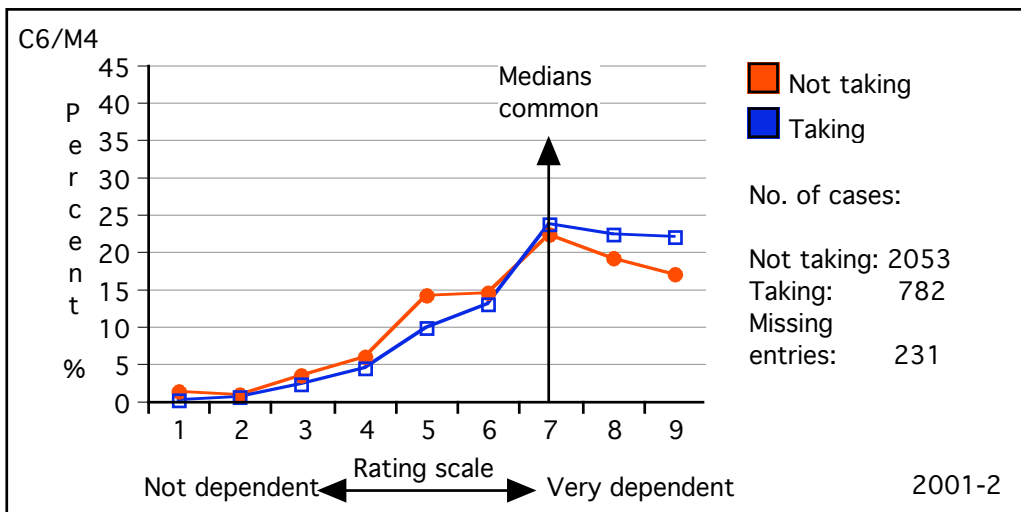


Fig. B44 - How dependent do you think we are on Maths? - Analysis by subject studied
Comparison between pupils taking Maths and pupils not taking Maths

For the 2001-2 survey, Fig. B44 above shows that there was also 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.

A4.02 - Summary of findings for Maths

Our functional dependency on Maths as individuals and as a society warrants closer scrutiny, and hence the detailed analysis shown below. Using the 1995-6 survey as the basis for comparison, Fig. AB45/1 shows a summary of key changes in the parameters of analysis for those A-level students studying Maths.

Parameters of analysis -see below	Comparison of unrounded medians for A-level sample taking Maths		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level sample taking Maths - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
1.	7.37	6.93	68.80%	60.20%	-8.60%
2.	6.96	6.94	59.80%	59.60%	-0.20%
3.	7.83	7.80	84.50%	81.40%	-3.10%
4.	7.39	7.30	74.60%	71.20%	-3.40%
5.	6.48	6.74	49.70%	56.00%	+6.30%
6.	2.62	2.62	5.62%	5.09%	-0.53%
7.	6.98	7.27	63.20%	68.40%	+5.20%

Parameters of analysis :
 1. How much interest do you have in Maths? - (C6/D3)
 2. In your opinion, how difficult is the subject of Maths? - (C6/E3)
 3. When it comes to getting a job, how important do you consider Maths? - (C6/F3)
 4. In the context of EIU*, how important do you consider Maths? - (C6/J6)
 5. How much do you think the way we live now has been influenced by Maths? - C6/K4
 6. How creative does the curriculum allow you to be in Maths? - (C6/L4)
 7. As a modern society, how dependent do you think we are on Maths? - (C6/M4)
 * Economic and Industrial Understanding

Fig. AB45/1 - Summary of changes between surveys for the parameters of analysis by students taking Maths

For students taking Maths, Fig. AB45/1 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9. The greatest degree of comprehension of the importance of the subject should be expected among students studying Maths. As a summary, Fig. AB45/1 presents a worrying picture:

- A comparison of the parameters of analysis for the totals of ratings 7, 8 and 9 shows two were positive, three were negative, and two changed by less than 2%. Similar trend movements occurred in the unrounded medians.
- Interest in Maths declined sharply by 8.6% from 68.8% to 60.2%, and a disturbing trend given that it was among students taking Maths.
- There was no change in the perceived difficulty with Maths.
- Maths was seen to be important for getting a job with both results above 80%, but there was still a decline by more than 3%.
- Maths was seen to be relatively important in the context of EIU with combined

percentages above 70%, but there was a decline of more than 3%.

- For parameter 5 there was an improvement in excess of 6%. However Maths has been extremely influential on the way we live now (eg the longitude problem), so even the 56% score in the latest survey was disappointing.
- The creativity perceived possible within the curriculum among students taking Maths was exceptionally low; totals for rating scale 7, 8 and 9 in both surveys were less than 6%.
- Our perceived dependence on Maths was above 60% with an increase of more than 5% in the latest survey.

Fig. AB45/2 below provides a summary of changes in the parameters of analysis for those A-level students NOT studying Maths.

Parameters of analysis -see below	Comparison of unrounded medians for A-level sample NOT taking Maths		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level sample NOT taking Maths - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
	1.	2.30	2.29	5.25%	5.24%
2.	7.29	7.07	66.20%	60.50%	-5.70%
3.	7.60	7.27	76.20%	68.70%	-7.50%
4.	7.22	6.95	68.40%	61.00%	-7.40%
5.	6.31	6.38	47.30%	48.20%	+0.90%
6.	2.48	2.58	5.58%	4.82%	-0.76%
7.	6.84	6.90	58.60%	58.90%	+0.30%

Parameters of analysis :
 1. How much interest do you have in Maths? - (C6/D3)
 2. In your opinion, how difficult is the subject of Maths? - (C6/E3)
 3. When it comes to getting a job, how important do you consider Maths? - (C6/F3)
 4. In the context of EIU*, how important do you consider Maths? - (C6/J6)
 5. How much do you think the way we live now has been influenced by Maths? - C6/K4
 6. How creative does the curriculum allow you to be in Maths? - (C6/L4)
 7. As a modern society, how dependent do you think we are on Maths? - (C6/M4)
 * Economic and Industrial Understanding

Fig. AB45/2 - Summary of changes between surveys for the parameters of analysis by students NOT taking Maths

Students NOT taking Maths have benefited nevertheless from the outcomes of mathematical application in all forms of technology, and in every field of human experience; thus Maths has contributed significantly to the way we now live. Fig. AB45/2 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The main points include:

- Since this group did not take Maths interest was sure to be low, and was confirmed by the aggregations of rating scale values 7, 8 and 9; both surveys gave totals of less than 6%.
- Maths was thought to be a less difficult subject declining by 5.7% from 66.2% to 60.5%.

- Maths was considered less important for getting a job, declining by 7.5% from 76.2% to 68.7%; among this group these were still acceptable results.
- In the context of EIU, Maths was seen to be less important, declining by 7.4% from 68.4% to 61%.
- The application of Maths has figured strongly in the way we now live, but this is not evident in these results with scores of less than 50% for the totals of rating scale values 7, 8 and 9. This was not much better than for those taking Maths—see Fig. 45/1 above.
- The creativity perceived possible within the curriculum among students NOT taking Maths was also low; totals for rating scale 7, 8 and 9 in both surveys were less than 6%.
- There was no real change in parameter 7 between the two surveys. The scores just below 60% for these students NOT taking Maths were respectable.

Fig. AB45/3 below provides a summary of changes in the parameters of analysis for girls including those A-level students not studying and studying Maths.

Parameters of analysis -see below	Comparison of unrounded medians for A-level Girls whether taking Maths or not		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for Girls whether taking Maths or not - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
1.	2.85	2.50	18.73%	15.11%	-3.62%
2.	7.40	7.08	67.80%	61.70%	-6.10%
3.	7.69	7.37	78.10%	70.10%	-8.00%
4.	7.31	7.06	72.30%	64.70%	-7.60%
5.	6.27	6.54	46.79%	50.90%	+4.11%
6.	2.51	2.59	6.47%	4.33%	-2.14%
7.	6.93	6.99	62.30%	61.10%	-1.20%

Parameters of analysis :
 1. How much interest do you have in Maths? - (A/D3)
 2. In your opinion, how difficult is the subject of Maths? - (A/E3)
 3. When it comes to getting a job, how important do you consider Maths? - (A/F3)
 4. In the context of EIU*, how important do you consider Maths? - (A/J6)
 5. How much do you think the way we live now has been influenced by Maths? - A/K4
 6. How creative does the curriculum allow you to be in Maths? - (A/L4)
 7. As a modern society, how dependent do you think we are on Maths? - (A/M4)
 * Economic and Industrial Understanding

Fig. AB45/3 - Summary of changes between surveys for the parameters of analysis by GIRLS taking and not taking Maths

All girls whether studying Maths or not have benefited nevertheless from the outcomes of mathematical application in all forms of technology, and in every field of human experience; thus Maths has contributed significantly to the way we now live. Fig. AB45/3 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The main points include:

- Interest in Maths was low in the first survey, but declined by more than 3% from 18.7% to 15.1% in the second survey.
- In the context of difficulty with Maths, the combined total for ratings 7, 8 and 9 in the first survey was more than 67%. This fell by more than 6% in the second survey; so girls perceived Maths as a less difficult subject.
- At more than 78% for the total of rating scale 7, 8 and 9 in the first survey, Maths was seen as important for getting a job. This fell by 8% in the second survey so Maths was seen as less important.
- In the first survey, Maths was seen as relatively important in the context of EIU at more than 72% for rating scale 7, 8 and 9. However, this fell by more than 7% to less than 65% in the second survey.
- In the first survey the perceived influence of Maths on the way we live now was relatively low at less than 47% for rating scale 7, 8 and 9. The second survey showed an improvement by some 4%.
- Girls thought the creativity allowed in the curriculum for Maths was very low with a total of less than 7% for rating scale 7, 8 and 9 in the first survey. This fell by more than 2% in the second survey.
- Our dependency on Maths was seen as more than 60% in both surveys.

Fig. AB45/4 overleaf provides a summary of changes in the parameters of analysis for boys including those A-level students not studying and studying Maths.

All boys whether studying Maths or not have benefited nevertheless from the outcomes of mathematical application in all forms of technology, and in every field of human experience; thus Maths has contributed significantly to the way we now live. Fig. AB45/4 overleaf compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The main points include:

- Interest in Maths among boys also declined and by more than 7% from 32.9% to 25%. This would be explained at least in part by the 22% fall in students taking Maths.
- There was a decline in the perceived difficulty with Maths of more than 2% from 61.8% to 59.1%.
- In the context of getting a job, Maths was considered fairly important with combined totals for ratings 7, 8 and 9 of more than 70% in both surveys. However, there was a decline of more than 6% from 79.4% to 73.3%.
- The perceived importance of Maths in the context of EIU also fell by more than 6% from 69.5% to 63.1%.
- Approximately 1 in 2 among this sample of A-level boys considered Maths was influential in the way we live now.
- The perceived creativity in the curriculum for Maths at rating scale 7, 8 and 9 was very low at about 5% in both surveys.
- As a modern society our dependency on Maths was fairly highly rated; the combined total at rating scale 7, 8 and 9 rose by more than 3% from 58.3% to 61.8% although there was a 22% fall in students taking Maths.

Parameters of analysis -see below	Comparison of unrounded medians for A-level Boys whether taking Maths or not		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for Boys whether taking Maths or not - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
	1.	4.76	4.28	32.90%	25.00%
2.	7.04	6.98	61.80%	59.10%	-2.70%
3.	7.71	7.44	79.40%	73.30%	-6.10%
4.	7.26	7.03	69.50%	63.10%	-6.40%
5.	6.39	6.49	48.30%	49.90%	+1.60%
6.	2.53	2.57	5.01%	5.14%	+0.12%
7.	6.84	7.01	58.30%	61.80%	+3.50%

Parameters of analysis :
 1. How much interest do you have in Maths? - (A/D3)
 2. In your opinion, how difficult is the subject of Maths? - (A/E3)
 3. When it comes to getting a job, how important do you consider Maths? - (A/F3)
 4. In the context of EU*, how important do you consider Maths? - (A/J6)
 5. How much do you think the way we live now has been influenced by Maths? - A/K4
 6. How creative does the curriculum allow you to be in Maths? - (A/L4)
 7. As a modern society, how dependent do you think we are on Maths? - (A/M4)
 * Economic and Industrial Understanding

Fig. AB45/4 - Summary of changes between surveys for the parameters of analysis by BOYS taking and not taking Maths

In the current issue of the national curriculum (2003), 'the importance of Mathematics' was described as follows:

Mathematics equips pupils with a uniquely powerful set of tools to understand and change the world. These tools include logical reasoning, problem-solving skills, and the ability to think in abstract ways. Mathematics is important in everyday life, many forms of employment, science and technology, medicine, the economy, the environment and development, and in public decision-making. Different cultures have contributed to the development and application of mathematics. Today, the subject transcends cultural boundaries and its importance is universally recognised. Mathematics is a creative discipline. It can stimulate moments of pleasure and wonder when a pupil solves a problem for the first time, discovers a more elegant solution to that problem, or suddenly sees hidden connections.

These results show that education faces a significant challenge, and this statement in the curriculum highlights the importance of meeting that challenge effectively. Moreover, education needs to reflect on the governments aspirations for a 'prosperous economy', a 'knowledge economy', and to consider the role of Maths in that context. How we earn our living in the world needs to be understood and this means dropping the shackles of prejudice endorsed by the hidden curriculum.

Appendix 5

Comparison of 6th Form surveys: Science in 1995-6 and 2001-2

A5.01 - Introduction

For this appendix, the following questions were asked with respect to Science in education and industry so providing the parameters of analysis. The results are given according to this schedule, starting on the next page; they are presented as graphs two-to-a-page enabling direct comparison between the surveys. The data-gathering instrument questions were:

- 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 opinion, how creative does the curriculum allow you to be in Science?
- As a modern society, how dependent do you think we are on Science?

*Note: Economic and Industrial Understanding.

All the graphs are annotated with the questionnaire references in the top left corner, and the school year of the survey in the bottom right corner.

First sight inferences appear with each pair of graphs, and an overall summary for Science appears at the end of the appendix.

How much interest do you have in Science?

In the survey of 1995-6, boys were more interested in Science than girls; the median ratings were 5 and 3 respectively as may be seen in Fig. A46 below.

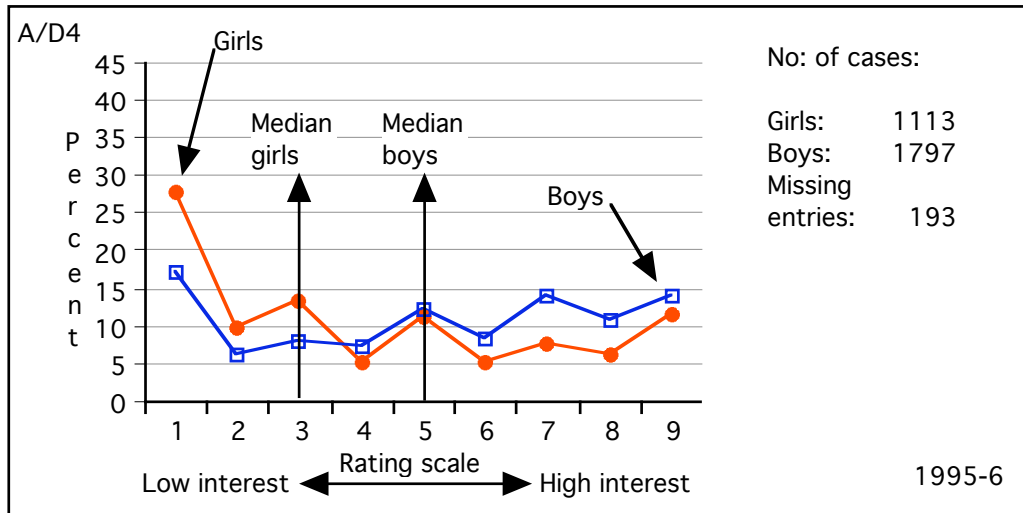


Fig. A46 - Interest in Science - Analysis by gender

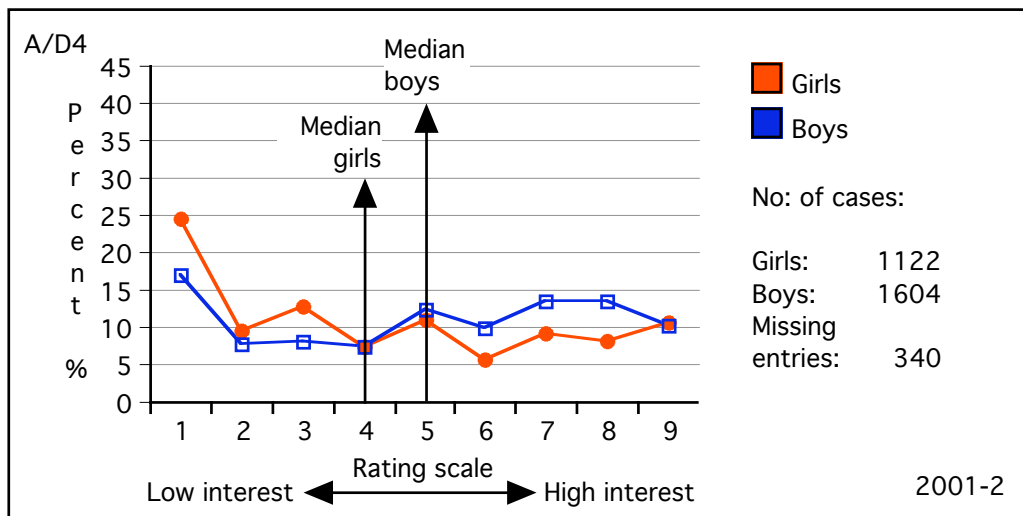


Fig. B46 - Interest in Science - Analysis by gender

For the 2001-2 survey, boys continued to show more interested in Science than girls; however, the median ratings were now 5 and 4 respectively, so they had closed by one rating, see—Fig.B46 above.

By inspection, Fig. A47 below, shows that for the 1995-6 survey 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.

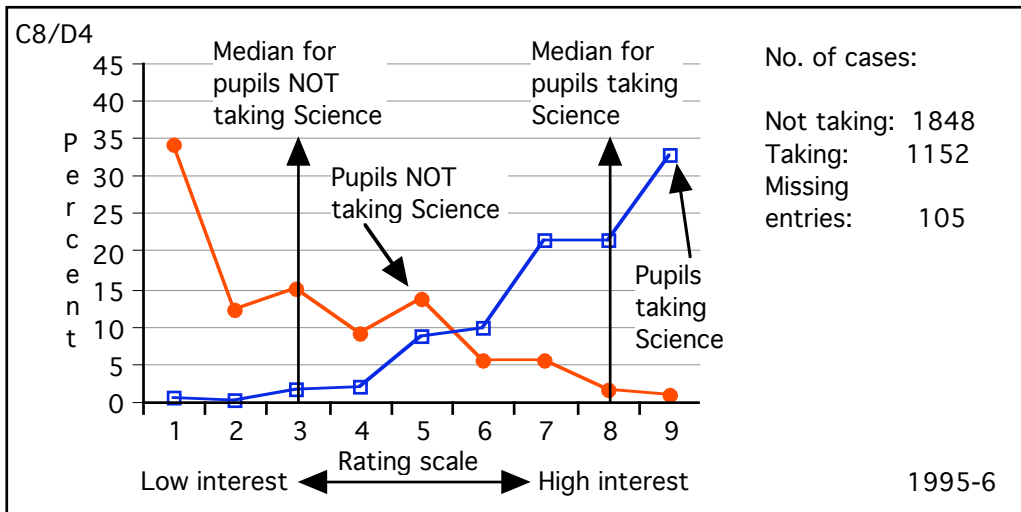


Fig. A47 - Interest in Science - Analysis by subject studied
Comparison between pupils taking Science and pupils not taking Science

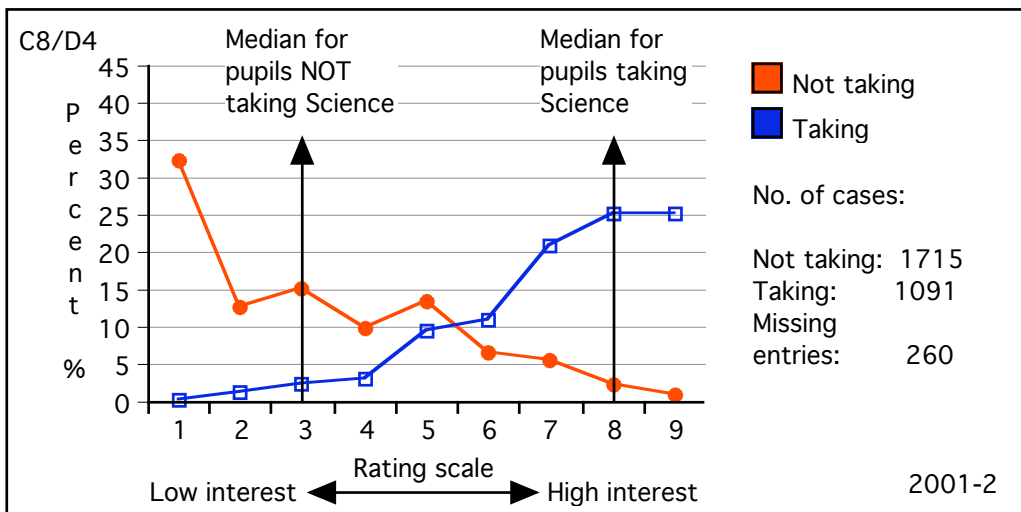


Fig. B47 - Interest in Science - Analysis by subject studied
Comparison between pupils taking Science and pupils not taking Science

Examination of Fig. B47 above shows that the separation of the medians was maintained for the survey of 2001-2, and the values were the same; 8 for pupils taking Science, and 3 for students not taking the subject. However, there is one noticeable difference in the graph curves; eg in the first study some 33% of pupils taking Science gave a 9 rating for interest, whereas for the most recent study, only 25% gave a 9 rating.

In your opinion, how difficult is Science?

For the survey of 1995-6, both genders attributed the level of difficulty with Science at a median value of 7, and is represented in Fig. A48 below.

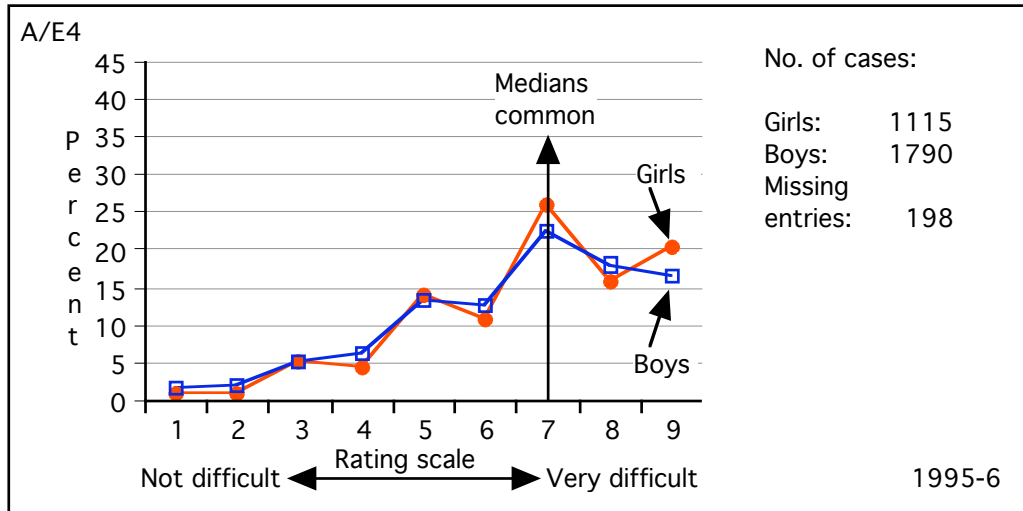


Fig. A48 - Difficulty with Science - Analysis by gender

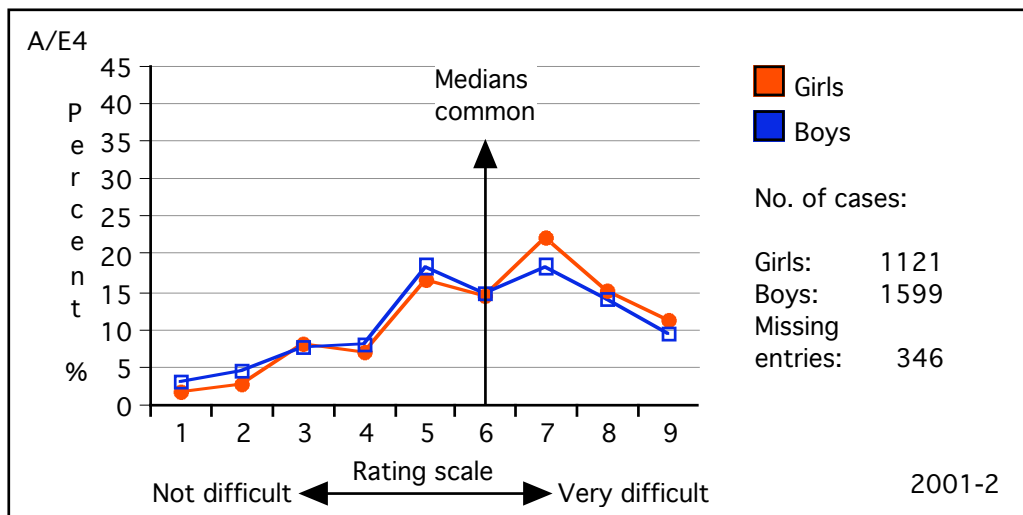


Fig. B48 - Difficulty with Science - Analysis by gender

The outcomes for the 2001-2 study appear in Fig. B48 above showing that both genders attributed a lower level of difficulty with Science at a median value of 6. These results were supported by a notable change in the mean values: for the first study they were 6.71 and 6.48, for the second survey they were 6.12 and 5.83 for girls and boys respectively.

The analysis of students taking Science, compared with pupils not taking the subject for the 1995-6 survey yielded common medians of 7 as shown by Fig. A49 below.

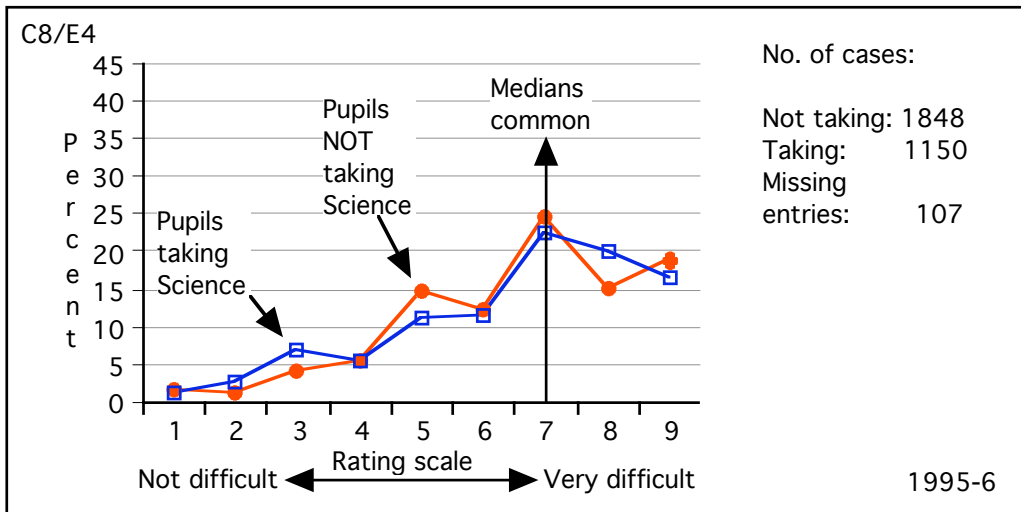


Fig. A49 - Difficulty with Science - Analysis by subject studied
 Comparison between pupils taking Science and pupils not taking Science

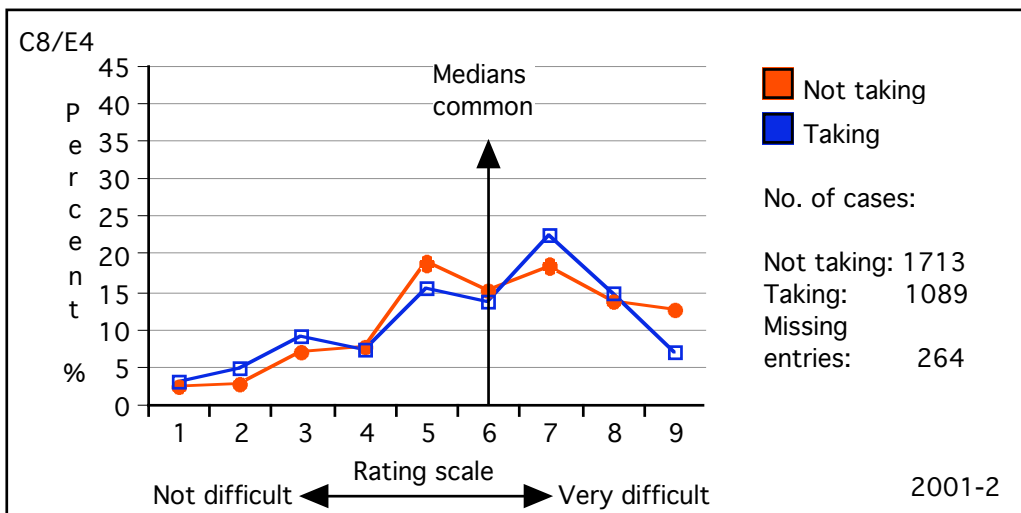


Fig. B49 - Difficulty with Science - Analysis by subject studied
 Comparison between pupils taking Science and pupils not taking Science

However, the 2001-2 survey gave a different result: although students taking Science, compared with pupils not taking the subject gave common medians, they were one rating lower at 6 as shown by Fig. B49 above. This was accompanied by a change in the mean values: for the 1995-6 survey they were 6.60 and 6.49, while for the 2001-2 study they were 6.06 and 5.79 for students not taking and taking Science respectively.

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

By inspection, Fig. A50 for the 1995-6 survey shows that when it comes to getting a job, boys considered Science more important than girls; the medians were 7 and 6 respectively.

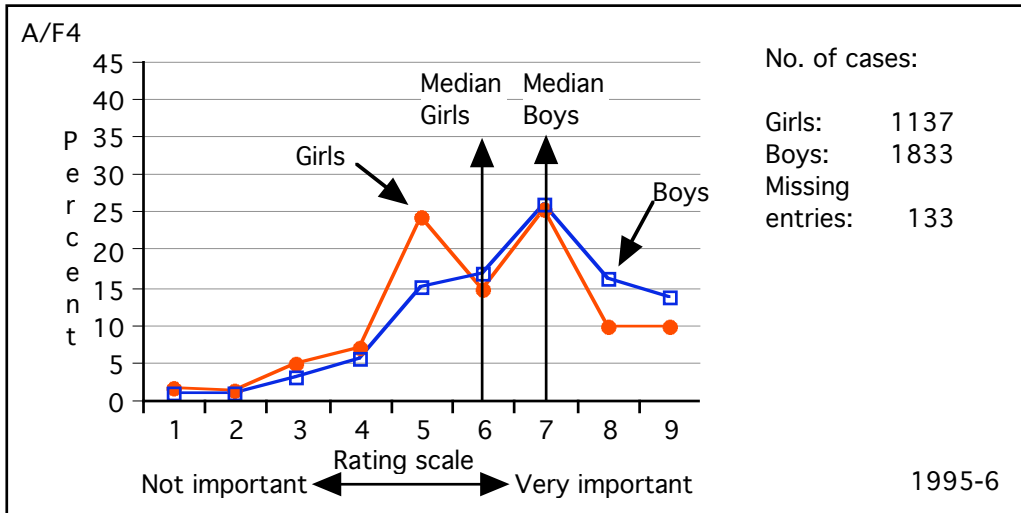


Fig. A50- Importance of Science when seeking a job - Analysis by gender

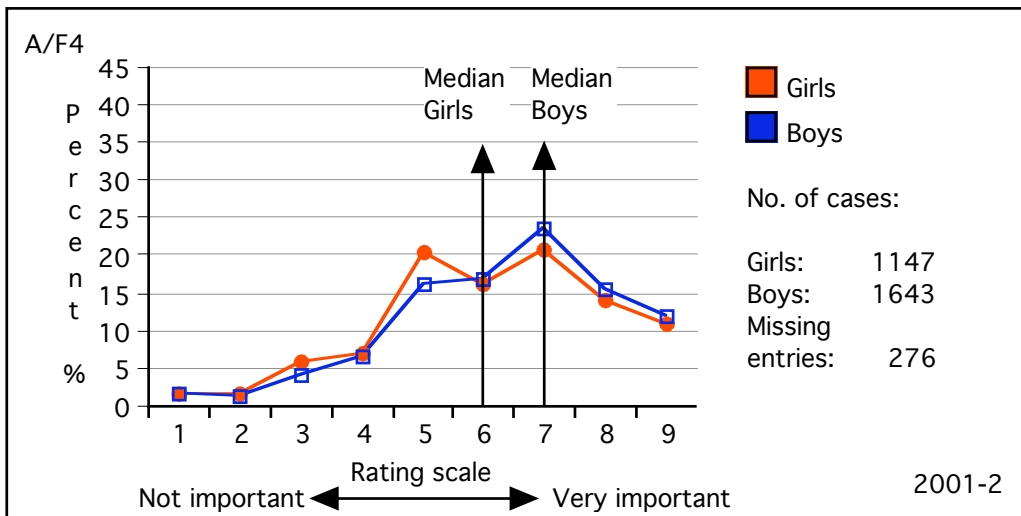


Fig. B50 - Importance of Science when seeking a job - Analysis by gender

And Fig. B50 above shows that a similar result was obtained for the 2001-2 survey: boys continued to think Science more important than girls when it comes to getting a job since the medians were 7 and 6 respectively.

From Fig. A51 below, 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 survey for 1995-6.

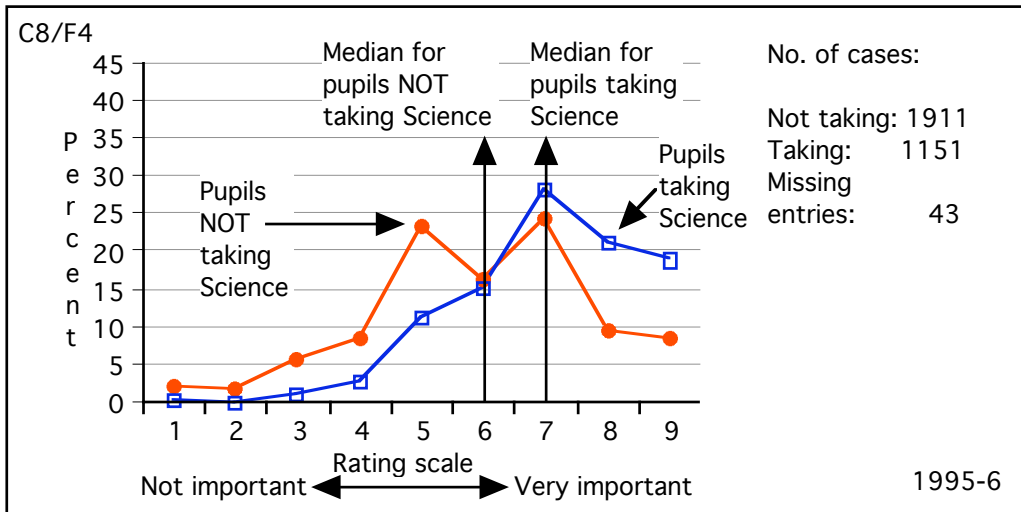


Fig. A51 - Importance of Science when seeking a job - Analysis by subject studied Comparison between pupils taking Science and pupils not taking Science

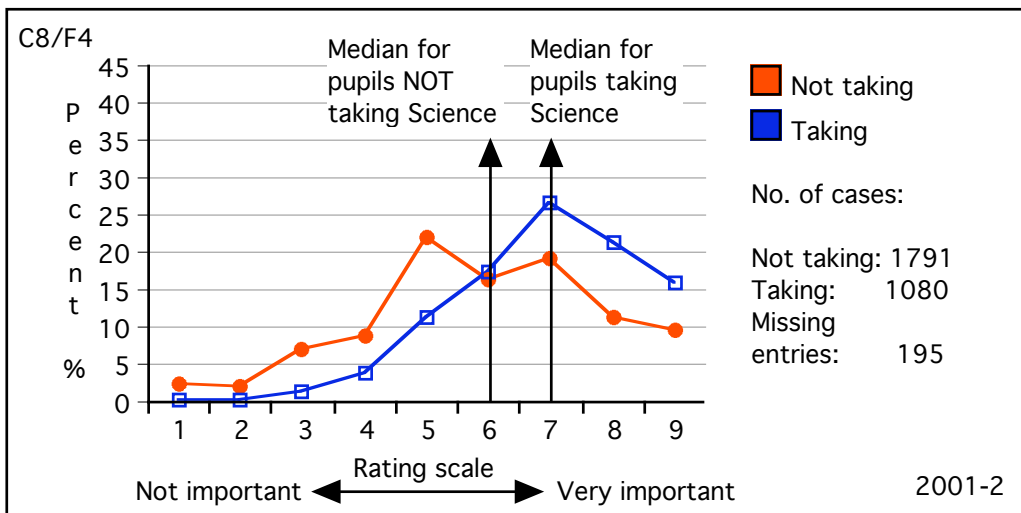


Fig. B51 - Importance of Science when seeking a job - Analysis by subject studied Comparison between pupils taking Science and pupils not taking Science

The 2001-2 survey showed that there was no change in the medians over the first study as may be seen by reference to Fig. B51 above—the importance of Science when seeking a job was still more highly valued by pupils who took the subject than students who did not; the median values were 7 and 6 respectively. The result for students taking Science is understandable, but the median of 6 for students not taking Science is interesting.

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

The 1995-6 survey showed that the importance of Science in the context of EIU was quite well understood by girls and boys with a common median value of 7 see Fig. A52 below.

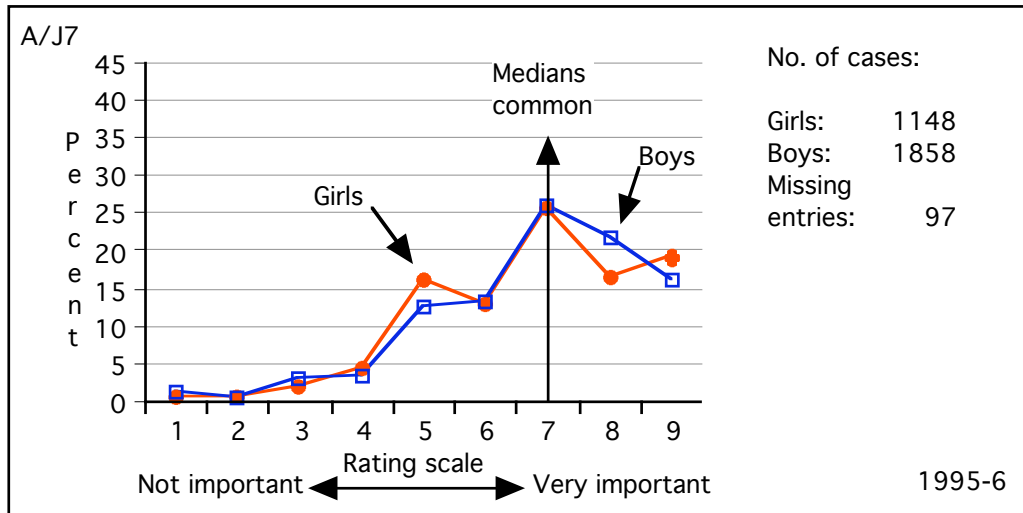


Fig. A52 - Importance of Science in the context of EIU - Analysis by gender

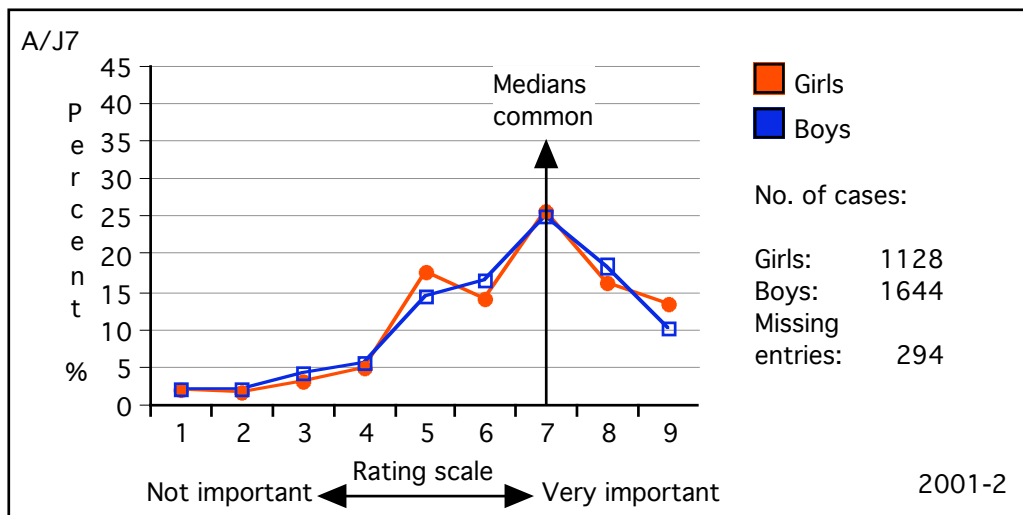


Fig. B52 - Importance of Science in the context of EIU - Analysis by gender

Similar results were obtained in the study for 2001-2; the importance of Science in the context of EIU continued to be quite well understood by both girls and boys with a common median value of 7—see Fig. B52 above. However, there is a difference at the higher end of the graphs; for the first survey the curves finished in the range 15 to 20%, whereas for the latest study they finished in the range 10 to 15%.

The 1995-6 survey showed that the importance of Science in the context of EIU was quite well understood also when comparing pupils who did not take the subject with those who did take the subject; common median values of 7 were recorded as may be seen by reference to Fig. A53 below.

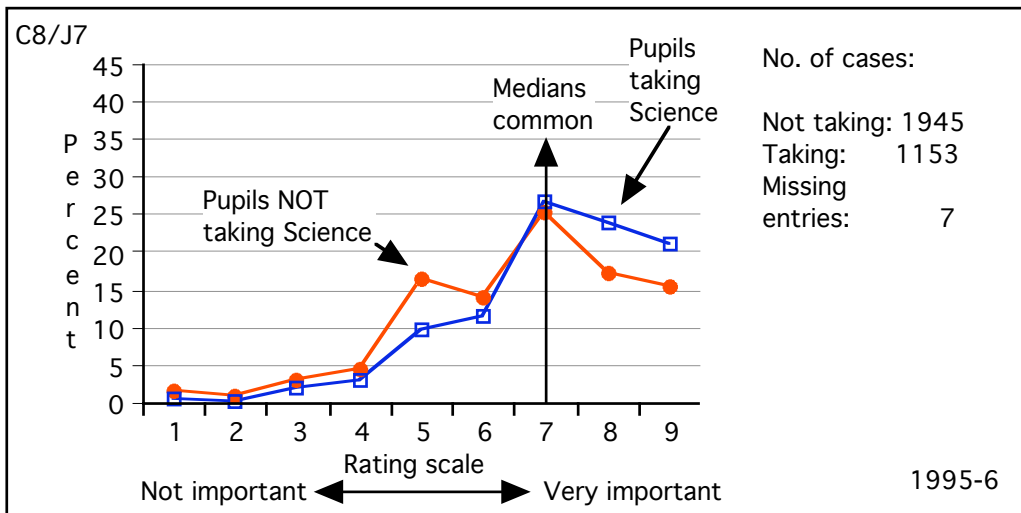


Fig. A53 - Importance of Science in the context of EIU - Analysis by subject studied Comparison between pupils taking Science and pupils not taking Science

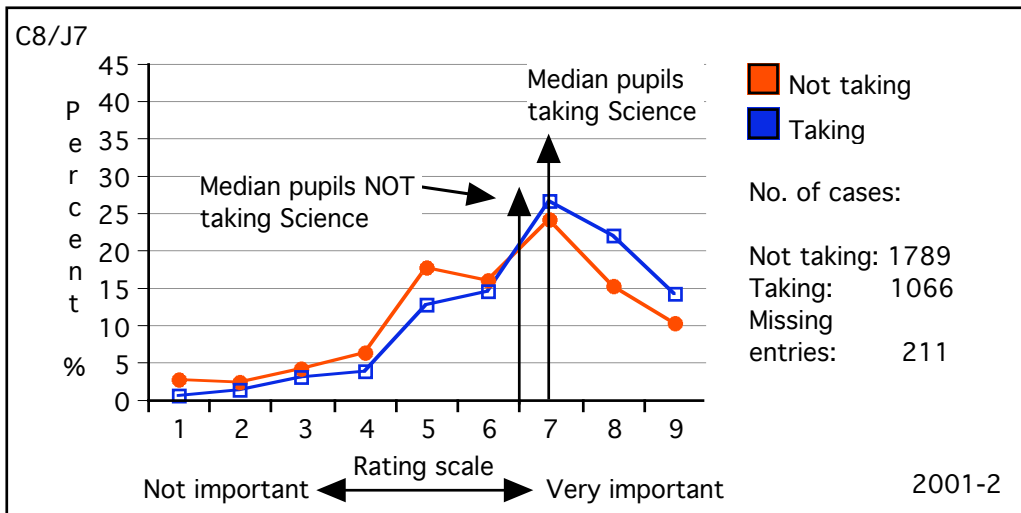


Fig. B53 - Importance of Science in the context of EIU - Analysis by subject studied Comparison between pupils taking Science and pupils not taking Science

However, there was a change for the 2001-2 survey as presented in Fig. B53 above. The median for those who did not take Science was 6.5, while pupils taking the subject continued to rate the importance of Science in the context of EIU at a median of 7. Hence further data comparisons become necessary. In the first study, the mean values were 6.59 and 7.11, while the standard deviations were 1.80 and 1.59 respectively for pupils not taking and taking Science. For the second study, the mean values were 6.19 and 6.75, and the standard deviations were 1.92 and 1.68 respectively.

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

The influence of Science in our society was very well understood by both girls and boys in the 1995-6 survey; there was a common median value of 8—see Fig. A54 below.

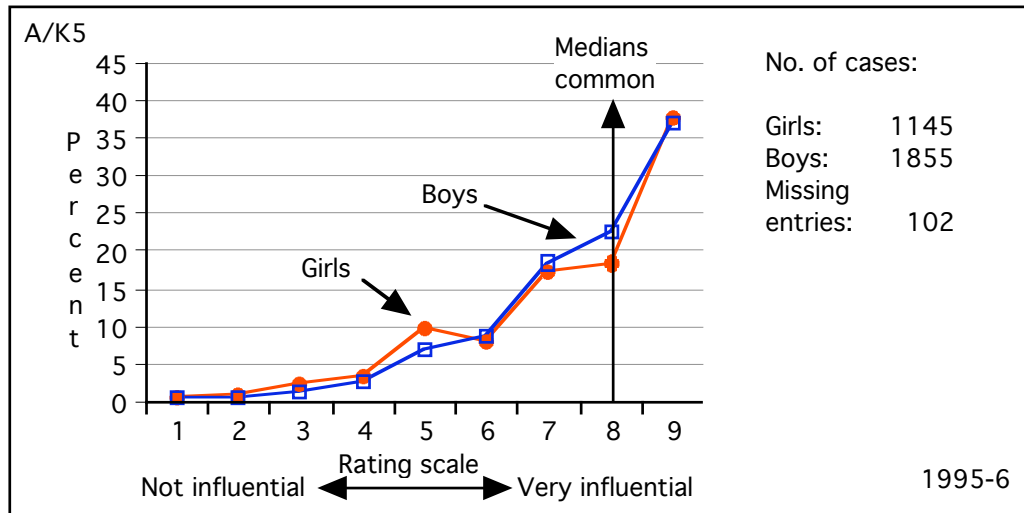


Fig. A54 - Influence of Science on the way we live now - Analysis by gender

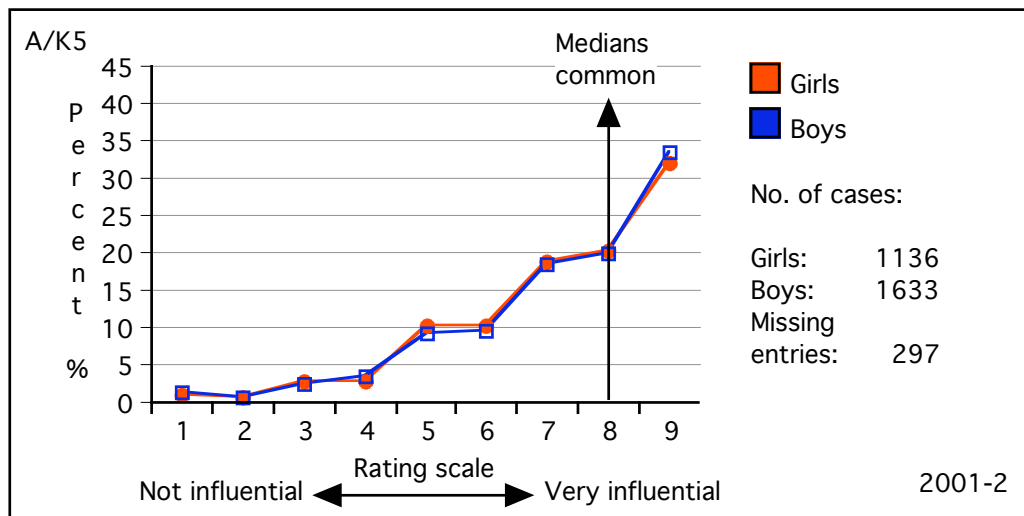


Fig. B54 - Influence of Science on the way we live now - Analysis by gender

The 2001-2 survey produced a similar result showing that both girls and boys continued to understand the influence of Science in our society; the median values were once again common at 8—see Fig. B54 above. However, at the top end the curves were different; for the first study they finished in the range 35 to 40%, while for the second survey they finished in the range 30 to 35%.

Similarly, for the survey of 1995-6, Fig. A55 below shows that the median value of 8 for pupils not studying Science was the same as for students taking the subject.

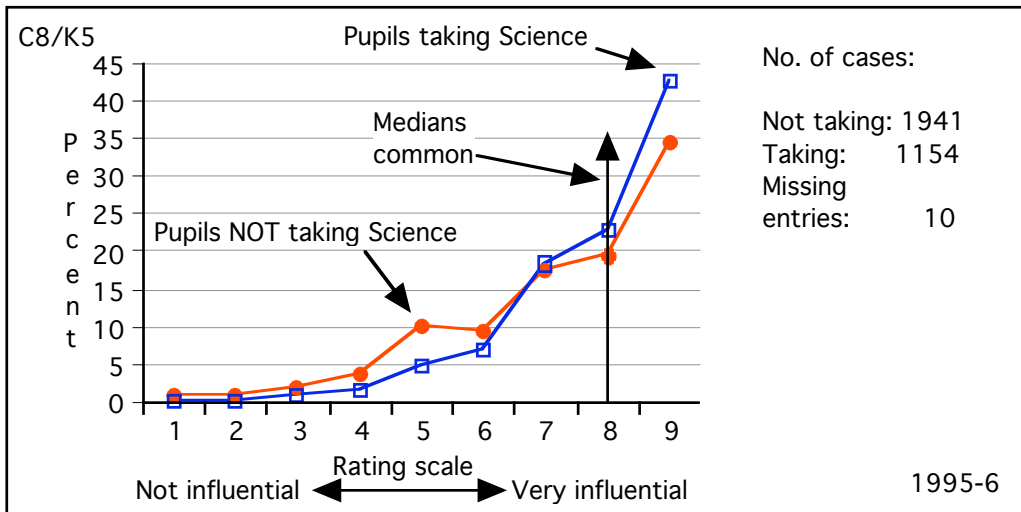


Fig. A55 - Influence of Science on the way we live now - Analysis by subject studied Comparison between pupils taking Science and pupils not taking Science

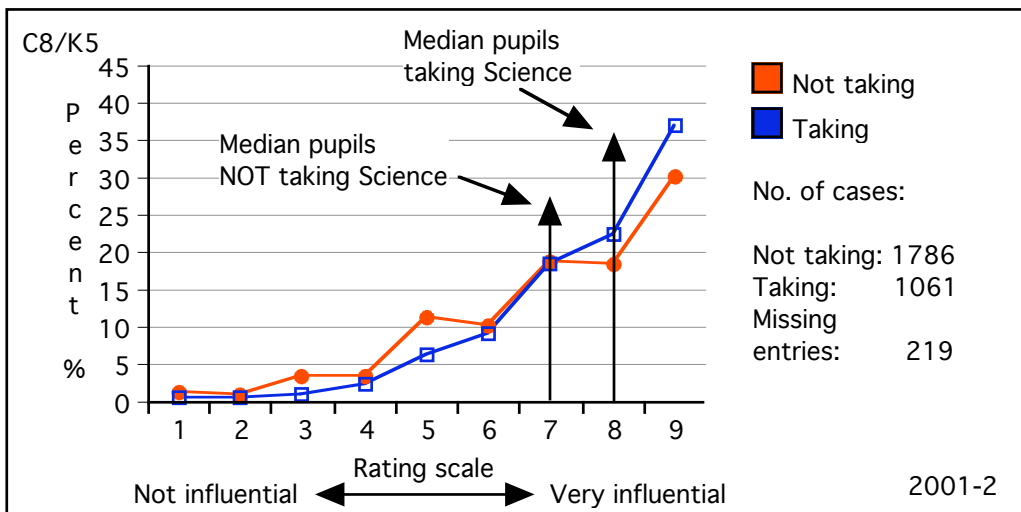


Fig. B55 - Influence of Science on the way we live now - Analysis by subject studied Comparison between pupils taking Science and pupils not taking Science

The 2001-2 survey produced a different result as shown in Fig. B55 above; the median value for pupils not studying Science was now 7, while the median for students taking the subject was once again 8.

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

For Science, the perceived level of creativity in the curriculum by both girls and boys equated to a median of 4 in the 1995-6 survey—see Fig. A56 below. The individual plots were so close that they could only be separated by the colour coding.

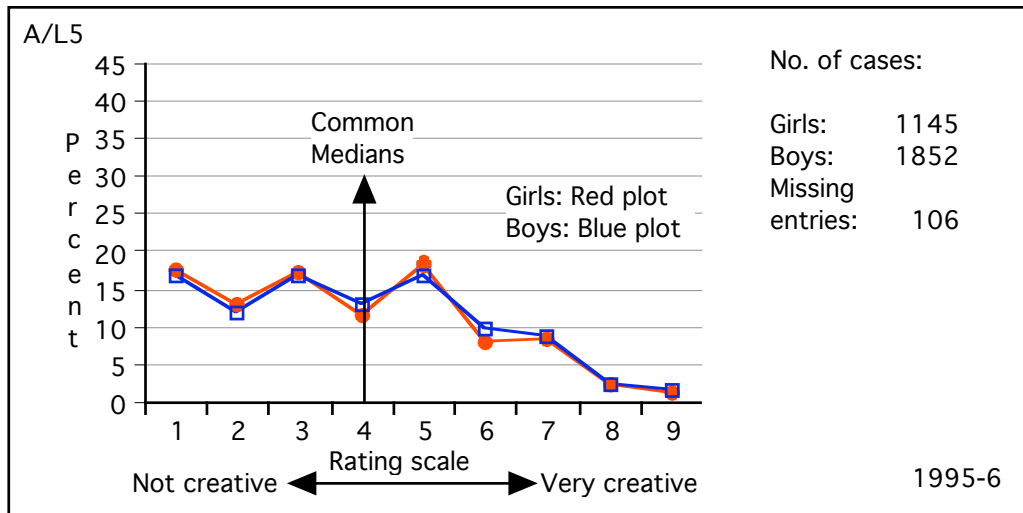


Fig. A56 - How creative does the curriculum allow you to be in Science? - Analysis by gender

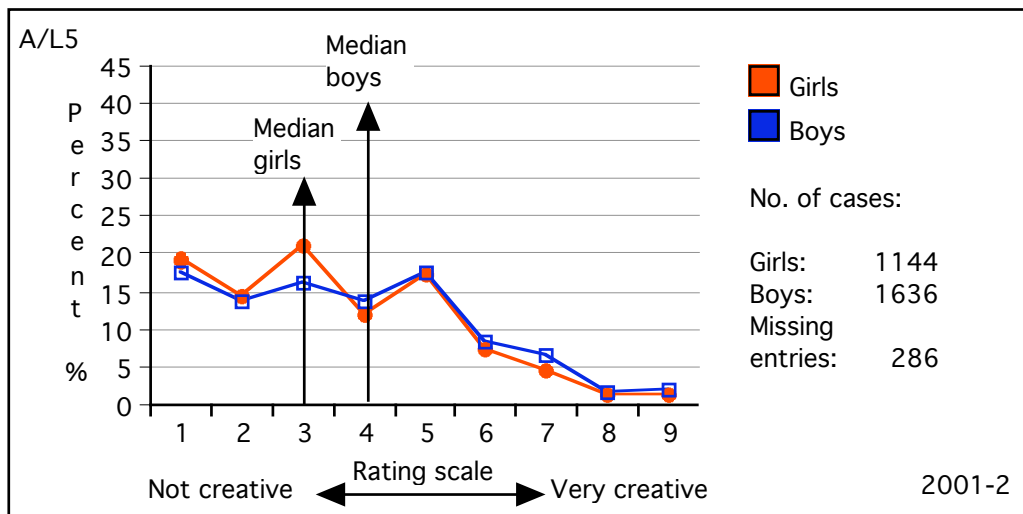


Fig. B56 - How creative does the curriculum allow you to be in Science? - Analysis by gender

The 2001-2 survey produced a change; girls rated the level of creativity at a median of 3, and boys rated a median of 4—see Fig. B56 above. Further analysis supports these changes: for the study in 1995-6, the mean values were 3.81 and 3.91. Comparable figures for the 2001-2 survey were mean values of 3.51 and 3.77.

Fig. A57 below records 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; both groups produced a median value of 4 in the survey of 1995-6.

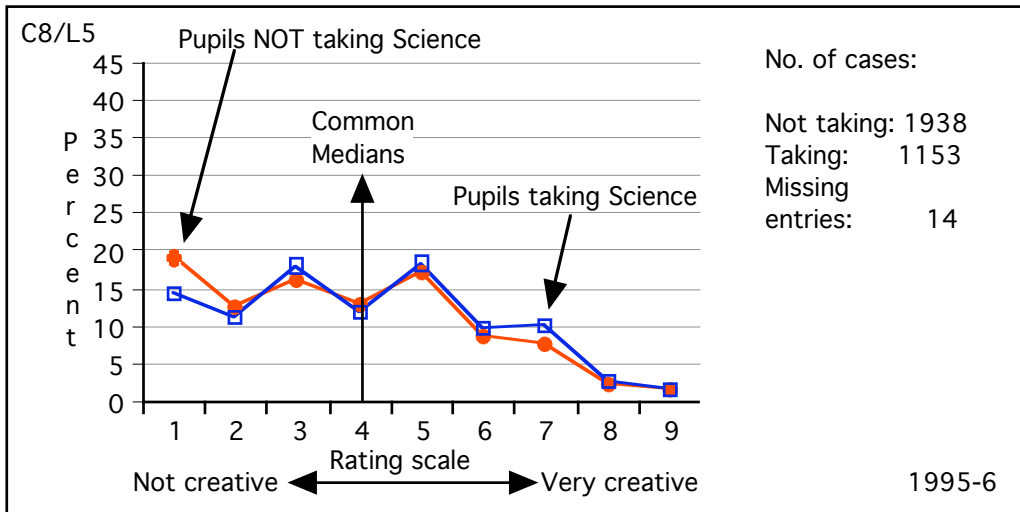


Fig. A57 - How creative does the curriculum allow you to be in Science? - Analysis by subject studied Comparison between pupils taking Science and pupils not taking Science

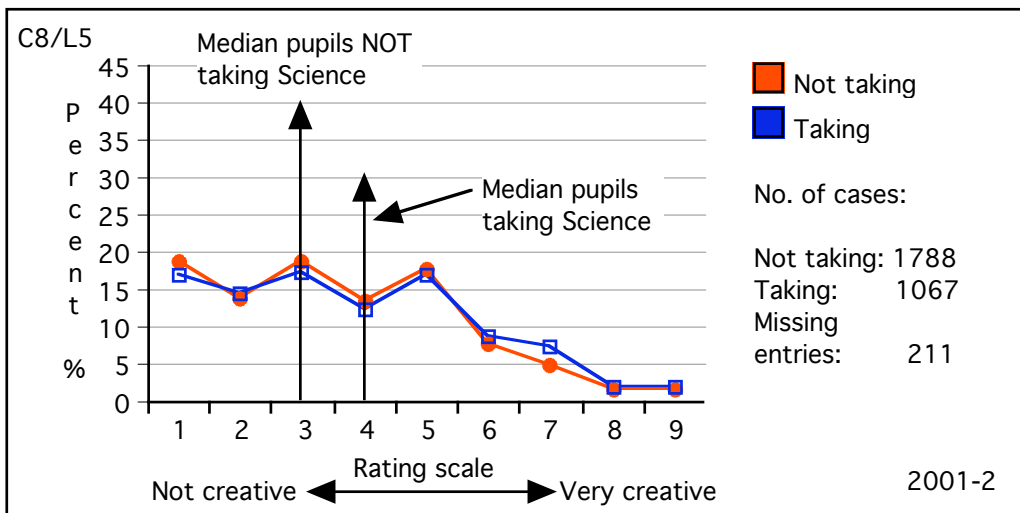


Fig. B57 - How creative does the curriculum allow you to be in Science? - Analysis by subject studied Comparison between pupils taking Science and pupils not taking Science

The 2001-2 survey produced a change as recorded in Fig. B57 above; the degree of creativity for Science allowed in the curriculum perceived by pupils not taking the subject was rated at a median value of 3, while students who did take Science, rated a median value of 4.

Further analysis supports the changed results: for the 1995-6 survey, the mean value for students not taking Science was 3.76, and for those taking the subject was 4.08. The Standard Deviations were 2.09 and 2.10 respectively. In the 2001-2 survey, the mean value for students not taking Science was 3.59, and for those taking the subject was 3.79. The Standard Deviations were 1.99 and 2.09 respectively.

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

As a modern society, both genders attributed a high level of dependency on Science, recording median values of 8—Fig. A58.

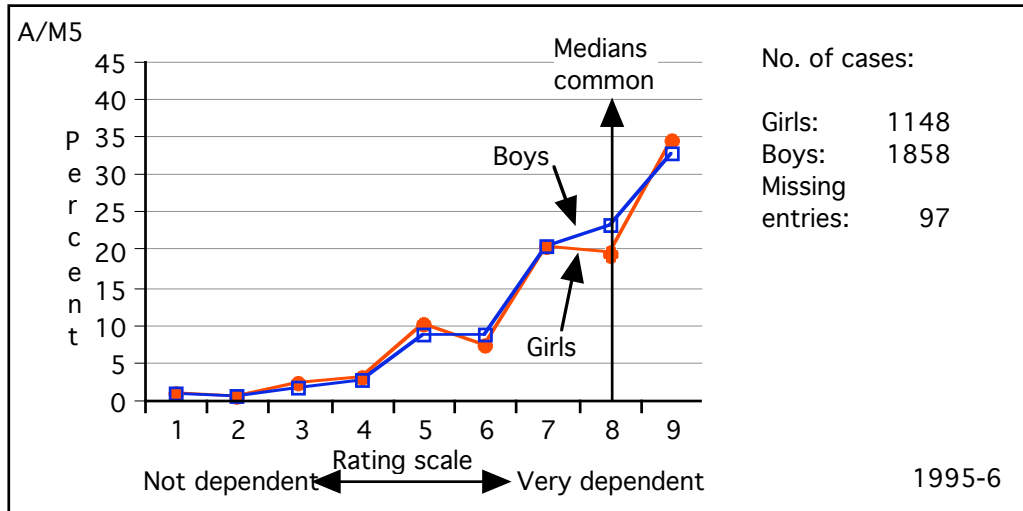


Fig. A58 - How dependent do you think we are on Science? - Analysis by gender

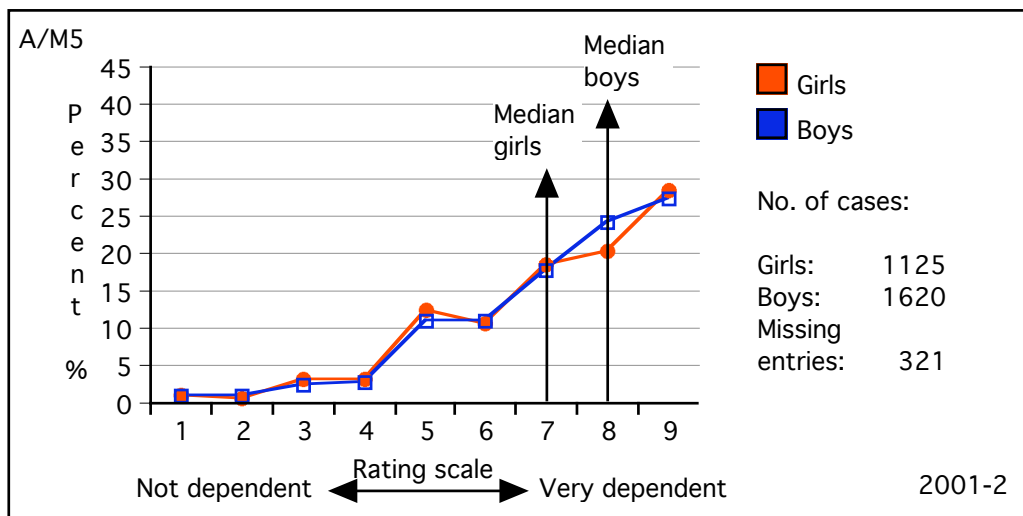


Fig. B58 - How dependent do you think we are on Science? - Analysis by gender

Fig. B58 above discloses a change in the survey of 2001-2; girls rated our dependency at a median of 7 instead of 8, and is a cause for concern. Boys remained at a median of 8.

The alternative analysis by subject studied appears in Figures A59 and B59 below. With common medians of 8 for students taking and not taking science, our dependency on the subject as a modern society was highly rated in the first survey of 1995-6.

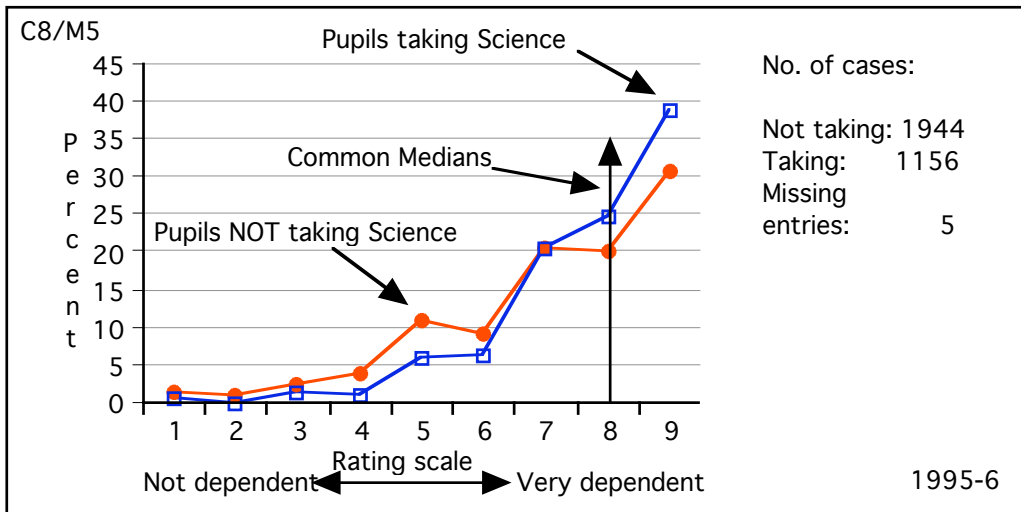


Fig. A59 - How dependent do you think we are on Science? - Analysis by subject studied
 Comparison between pupils taking Science and pupils not taking Science

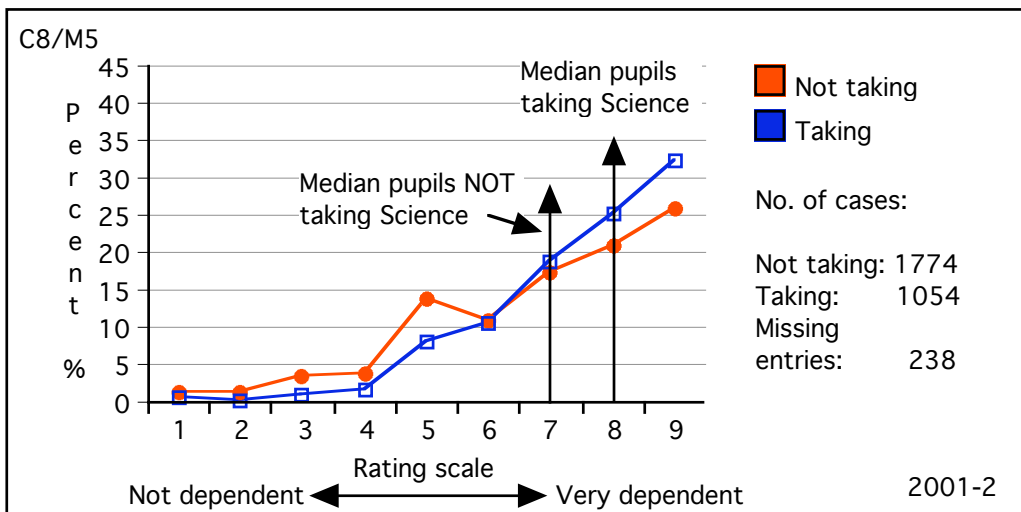


Fig. B59 - How dependent do you think we are on Science? - Analysis by subject studied
 Comparison between pupils taking Science and pupils not taking Science

However, as a modern society the 2001-2 survey produced a change in perception; students not studying Science gave a median rating of 7, while students taking the subject gave a rating of 8—see Fig. B59 above.

A5.02 - Summary of findings for Science

Our dependency on scientific discovery as individuals and as a society warrants closer scrutiny, and hence the detailed analysis shown here. Using the 1995-6 survey as the basis for comparison, Fig. AB60/1 shows a summary of key changes in the parameters of analysis for those A-level students studying Science.

Parameters of analysis -see below	Comparison of unrounded medians for A-level sample taking Science		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level sample taking Science - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
	1.	7.70	7.53	76.00%	71.60%
2.	6.91	6.14	59.30%	44.95%	-14.35%
3.	7.15	7.04	68.60%	64.50%	-4.10%
4.	7.31	6.99	71.90%	63.20%	-8.70%
5.	8.18	7.94	84.30%	78.20%	-6.10%
6.	3.99	3.54	15.44%	11.90%	-3.54%
7.	8.10	7.81	84.00%	76.80%	-7.20%

Parameters of analysis :
 1. How much interest do you have in Science? - (C8/D4)
 2. In your opinion, how difficult is the subject of Science? - (C8/E4)
 3. When it comes to getting a job, how important do you consider Science? - (C8/F4)
 4. In the context of EIU*, how important do you consider Science? - (C8/J7)
 5. How much do you think the way we live now has been influenced by Science? -C8/K5
 6. How creative does the curriculum allow you to be in Science? - (C8/L5)
 7. As a modern society, how dependent do you think we are on Science? - (C8/M5)
 * Economic and Industrial Understanding

Fig. AB60/1 - Summary of changes between surveys for the parameters of analysis by students taking Science

For students taking Science, Fig. AB60/1 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9. The greatest degree of comprehension of the importance of the subject should be expected among students studying Science. As a summary, Fig. AB60/1 presents a worrying picture:

- A comparison of the analyses shows negative trends in the unrounded medians, and in the totals for ratings 7, 8 and 9 for all 7 parameters.
- Interest in Science declined by more than 4% from 76% to 71.6%. This has to be set against a 4% reduction in the numbers taking Science.
- Science was perceived as a less difficult subject declining by more than 14% from 59.3% to about 45%.
- By these samples, Science was seen as a fairly important subject for getting a job. Never the less there was a fall from 68.6% to 64.5%.
- With a score of 71.9% in the first survey, Science was seen to be relatively important in

the context of EIU. However, for the second survey this fell by more than 8% to 63.2%.

- For parameter 5, Science was seen as very influential on the way we live now with a score in excess of 84%. This fell by more than 6% to 78.2% for the second survey.
- The creativity perceived possible within the curriculum among students taking Science was low; the total for rating scale 7, 8 and 9 in the first survey was less than 16%. This fell by more than 3% to 11.9%.
- Our perceived dependence on Science totalled 84% for rating scale 7, 8 and 9 in the first survey. This fell by more than 7% to 76.8% in the second survey.

Fig. AB60/2 below provides a summary of changes in the parameters of analysis for those A-level students NOT studying Science.

Parameters of analysis -see below	Comparison of unrounded medians for A-level sample NOT taking Science		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level sample NOT taking Science - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
	1.	2.70	2.80	8.77%	9.21%
2.	6.88	6.20	59.30%	45.40%	-13.90%
3.	6.03	5.93	42.36%	40.66%	-1.70%
4.	6.84	6.50	58.40%	49.90%	-8.50%
5.	7.70	7.45	71.90%	67.90%	-4.00%
6.	3.60	3.38	11.80%	8.39%	-3.41%
7.	7.52	7.32	70.90%	64.40%	-6.50%

Parameters of analysis :

1. How much interest do you have in Science? - (C8/D4)
2. In your opinion, how difficult is the subject of Science? - (C8/E4)
3. When it comes to getting a job, how important do you consider Science? - (C8/F4)
4. In the context of EIU*, how important do you consider Science? - (C8/J7)
5. How much do you think the way we live now has been influenced by Science? -C8/K5
6. How creative does the curriculum allow you to be in Science? - (C8/L5)
7. As a modern society, how dependent do you think we are on Science? - (C8/M5)

* Economic and Industrial Understanding

Fig. AB60/2 - Summary of changes between surveys for the parameters of analysis by students NOT taking Science

Students NOT taking Science have benefited nevertheless from the outcomes of scientific discovery and application through all forms of technology, and in every field of human experience; thus Science has contributed significantly to the way we now live. Fig. AB60/2 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The main points include:

- Since this group did not take Science interest was sure to be low. This was confirmed by the addition of rating scale values 7, 8 and 9; both surveys gave totals of about 9%.
- The difficulty perceived with Science fell by more than 13% from 59.3% to 45.4% for the

combined rating scale values of 7, 8 and 9.

- By these samples Science was considered less important for getting a job; both surveys gave results just above 40%.
- In the context of EIU, the sample in the first survey returned a total of 58.4% for rating scale 7, 8 and 9. This fell by more than 8% to 49.9% in the second survey.
- The influence of Science on the way we live now scored more than 71% for the total of rating scale values 7, 8 and 9 in the first survey. This fell by 4% in the second survey.
- The creativity seen possible within the curriculum in these samples was low; the total for rating scale 7, 8 and 9 in the first survey was less than 12%, declining by more than 3%.
- Dependency on Science in the first survey scored a respectable 70.9%. However, this fell by more than 6% in the second survey to 64.4%.

Fig. AB60/3 below provides a summary of changes in the parameters of analysis for girls including those A-level students not studying and studying Science.

Parameters of analysis -see below	Comparison of unrounded medians for A-level Girls whether taking Science or not		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for Girls whether taking Science or not - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
	1.	3.39	3.86	26.27%	28.35%
2.	6.98	6.42	62.60%	48.90%	-13.70%
3.	6.19	6.24	45.40%	45.80%	+0.40%
4.	6.95	6.72	61.60%	55.60%	-6.00%
5.	7.84	7.62	73.80%	71.00%	-2.80%
6.	3.61	3.25	12.64%	7.61%	-5.03%
7.	7.72	7.46	74.70%	67.80%	-6.90%

Parameters of analysis :
 1. How much interest do you have in Science? - (A/D4)
 2. In your opinion, how difficult is the subject of Science? - (A/E4)
 3. When it comes to getting a job, how important do you consider Science? - (A/F4)
 4. In the context of EIU*, how important do you consider Science? - (A/J7)
 5. How much do you think the way we live now has been influenced by Science? - A/K5
 6. How creative does the curriculum allow you to be in Science? - (A/L5)
 7. As a modern society, how dependent do you think we are on Science? - (A/M5)
 * Economic and Industrial Understanding

Fig. AB60/3 - Summary of changes between surveys for the parameters of analysis by GIRLS taking and not taking Science

All girls whether studying Science or not have benefited nevertheless from the outcomes of scientific discovery and subsequent application through all forms of technology, and in every field of human experience; thus Science has contributed significantly to the way we now live. Fig. AB60/3 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The main points include:

- Interest in Science in these two samples was low; the combined total for ratings 7, 8 and 9 in the first survey was 26%, and 28% in the second survey.
- In the context of difficulty with Science, the combined total for ratings 7, 8 and 9 in the first survey was more than 62%. In the second survey this fell by more than 13%; so girls perceived Science as a less difficult subject.
- When it comes to getting a job, Science scored less than 46% in both surveys for rating scale 7, 8 and 9.
- In the context of EIU Science scored 61.6% for rating scale 7, 8 and 9 in the first survey, and fell by 6% in the second survey to 55.6%.
- In the first survey girls perceived the influence of Science on the way we live now at 73.8% for rating scale 7, 8 and 9. The second survey remained relatively high at 71%.
- Girls considered the creativity allowed in the curriculum for Science was less than 13% for rating scale 7, 8 and 9 in the first survey; this fell by some 5% in the second survey.
- Girls perceived our dependency on Science as more than 74% in the first survey; this fell by more than 6% to 67.8%.

Fig. AB60/4 overleaf provides a summary of changes in the parameters of analysis for boys including those A-level students not studying and studying Science.

All boys whether studying Science or not have benefited nevertheless from the outcomes of scientific discovery and subsequent application through all forms of technology, and in every field of human experience; thus Science has contributed significantly to the way we now live. Fig. AB60/4 overleaf compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The main points include:

- The trends in all parameters of analysis for ratings 7, 8 and 9 were negative, and by more than 2% in every case. The unrounded medians also showed negative trends in all parameters.
- Interest in Science was higher among boys than girls—see the previous section. The combined total for rating scale 7, 8 and 9 in the first survey was more than 39%. For the second survey it was 37%.
- There was a decline in the perceived difficulty with Science of more than 15% from more than 57% to less than 43%.
- In the context of getting a job, Science scored 56.6% for ratings 7, 8 and 9 in the first survey. This fell to 51.7% in the second survey.
- Science was seen as important in the context of EIU at 64.4% for ratings 7, 8 and 9 in the first survey; this fell by more than 10% to 54.1%.
- Among boys Science was seen as influential in the way we live now, scoring 78.1% for ratings 7, 8 and 9 in the first survey. This fell by 6% to 72.1% in the second survey.
- In the first survey, the perceived creativity in the curriculum for Science was less than 14% for the combined total rating scale 7, 8 and 9.
- As a modern society our dependency on Science was highly rated in the first survey; the combined total at rating scale 7, 8 and 9 was more than 76%. This fell by more than 6% to 69.8%.

Parameters of analysis -see below	Comparison of unrounded medians for A-level Boys whether taking Science or not		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for Boys whether taking Science or not - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
1.	5.36	5.26	39.80%	37.10%	-2.70%
2.	6.84	6.00	57.60%	42.47%	-15.13%
3.	6.75	6.57	56.60%	51.70%	-4.90%
4.	7.05	6.66	64.40%	54.10%	-10.30%
5.	7.93	7.70	78.10%	72.10%	-6.00%
6.	3.77	3.62	13.43%	10.94%	-2.49%
7.	7.75	7.58	76.10%	69.80%	-6.30%

Parameters of analysis :
 1. How much interest do you have in Science? - (A/D4)
 2. In your opinion, how difficult is the subject of Science? - (A/E4)
 3. When it comes to getting a job, how important do you consider Science? - (A/F4)
 4. In the context of EU*, how important do you consider Science? - (A/J7)
 5. How much do you think the way we live now has been influenced by Science? - A/K5
 6. How creative does the curriculum allow you to be in Science? - (A/L5)
 7. As a modern society, how dependent do you think we are on Science? - (A/M5)
 * Economic and Industrial Understanding

Fig. AB60/4 - Summary of changes between surveys for the parameters of analysis by BOYS taking and not taking Science

In the current issue of the national curriculum (2003), 'the importance of Science' was described as follows:

Science stimulates and excites pupils' curiosity about phenomena and events in the world around them. It also satisfies this curiosity with knowledge. Because science links direct practical experience with ideas, it can engage learners at many levels. Scientific method is about developing and evaluating explanations through experimental evidence and modelling. This is a spur to critical and creative thought. Through science, pupils understand how major scientific ideas contribute to technological change – impacting on industry, business and medicine and improving quality of life. Pupils recognise the cultural significance of science and trace its world-wide development. They learn to question and discuss science-based issues that may affect their own lives, the direction of society and the future of the world.

These results show that education faces a significant challenge, and this statement in the curriculum highlights the importance of meeting that challenge effectively. Moreover, education needs to reflect on the governments aspirations for a 'prosperous economy', a 'knowledge economy', and to consider the role of Science in that context. How we earn our living in the world needs to be comprehended and this means dropping the shackles of prejudice endorsed by the hidden curriculum.

Appendix 6

Comparison of 6th Form surveys: Art in 1995-6 and 2001-2

A6.01 - Introduction

Art and design 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 & Design?
- In our society, how much do you think the way we live now has been influenced by Art & Design?
- In your opinion, how creative does the curriculum allow you to be in Art & Design?
- As a modern society, how dependent do you think we are on Art & Design?

*Note: Economic and Industrial Understanding.

There are only four parameters of analysis in this appendix rather than the seven used earlier. The same subset of questions was not used throughout the questionnaire to avoid a fourth page, considered a possible deterrent for teachers contemplating participation in this research.

These four questions provided the parameters of analysis and the results are presented according to this schedule, starting on the next page. The results are shown as graphs and presented two-to-a-page to enable direct comparison between the surveys.

All the graphs are annotated with the questionnaire references in the top left corner, and the school year of the survey in the bottom right corner.

First sight inferences appear with each pair of graphs, and an overall summary for Art & Design appears at the end of the appendix.

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

For the 1995-6 survey, 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. A61 below.

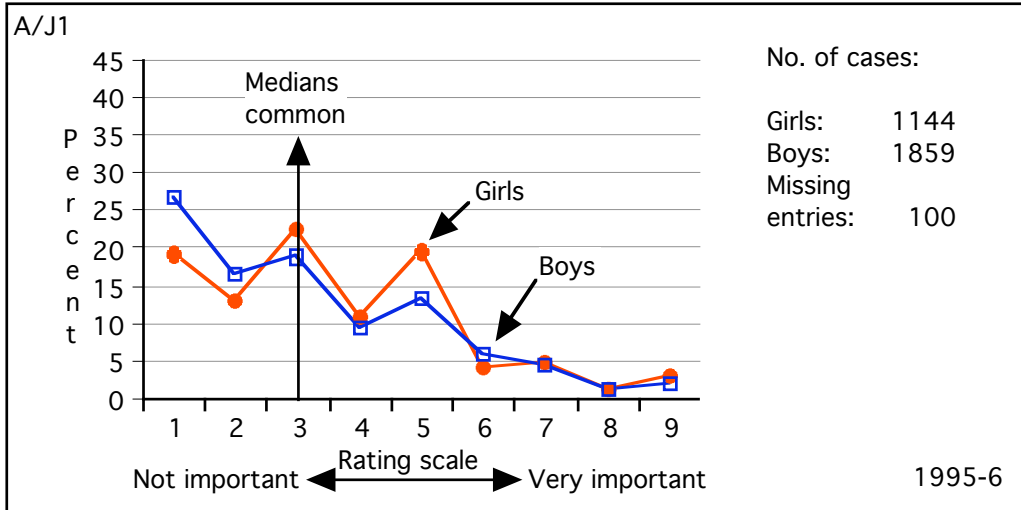


Fig. A61 - Importance of Art & Design in the context of EIU - Analysis by gender

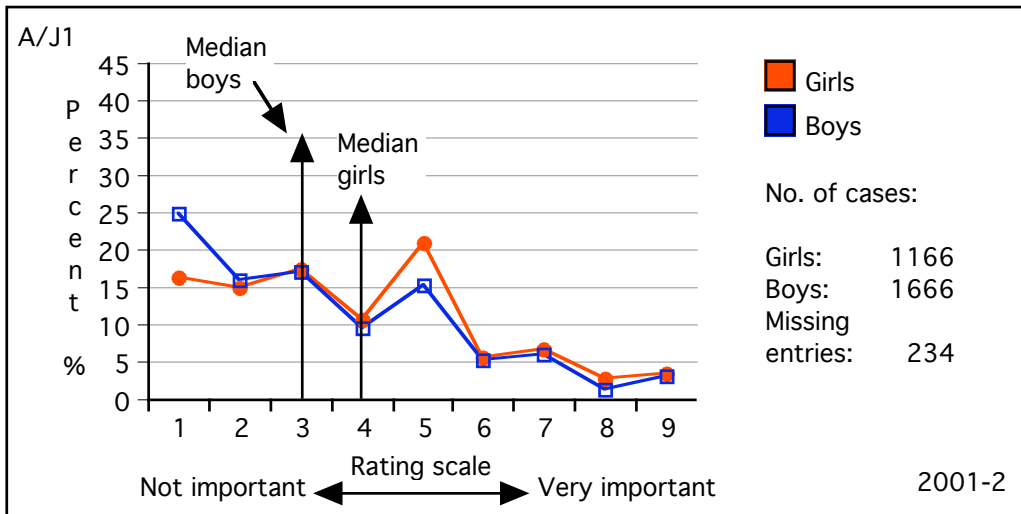


Fig. B61 - Importance of Art & Design in the context of EIU - Analysis by gender

The 2001-2 survey produced a change; in the context of EIU girls and boys rated the importance of Art and Design at medians of 4 and 3 respectively—see Fig. B61 above.

Fig. A62 below shows that students who were not studying Art in the 1995-6 survey rated the importance of the subject in the context of EIU at a median of 3, while pupils who were taking Art recorded a median of 4.

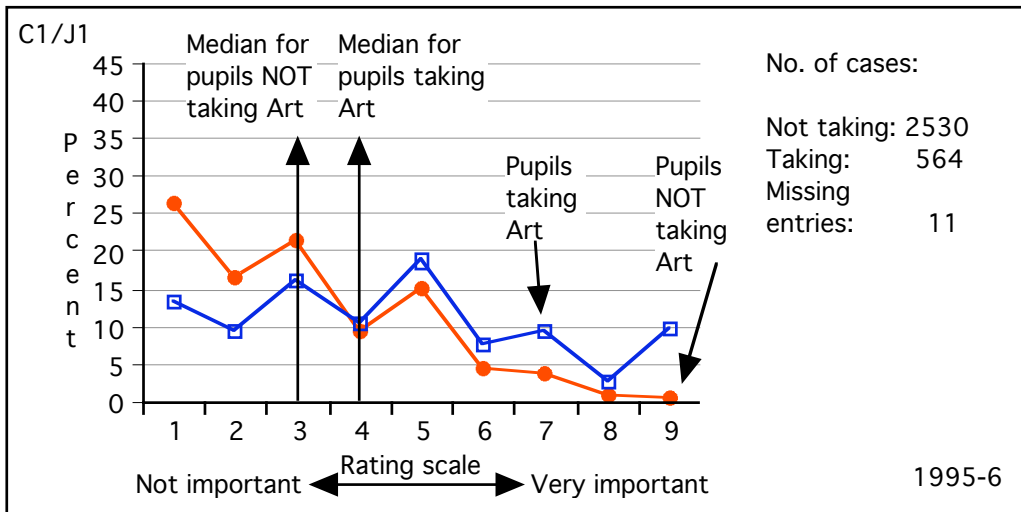


Fig. A62 - Importance of Art & Design in the context of EIU - Analysis by subject studied Comparison between pupils taking Art & Design and pupils not taking Art & Design

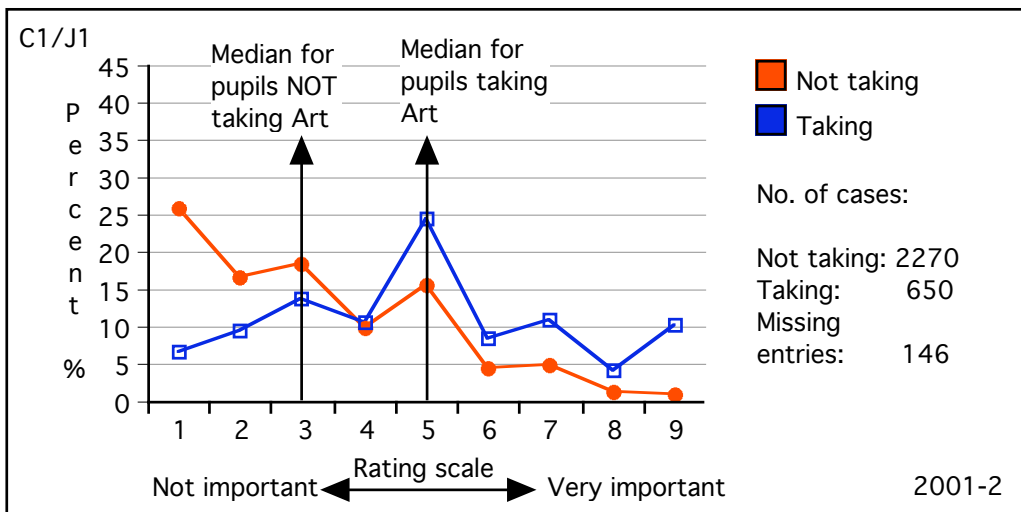


Fig. B62 - Importance of Art & Design in the context of EIU - Analysis by subject studied Comparison between pupils taking Art & Design and pupils not taking Art & Design

The 2001-2002 survey recorded a better result than the 1995-6 survey; Fig. B62 above shows that students who were not studying Art & Design continued to rate the importance of the subject in the context of EIU at a median of 3, but pupils who were taking Art & Design recorded a median of 5.

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

For the 1995-6 survey, girls and boys were in agreement about the influence of Art & Design on the way we live now; they recorded median values of 5 as shown in Fig. A63 below.

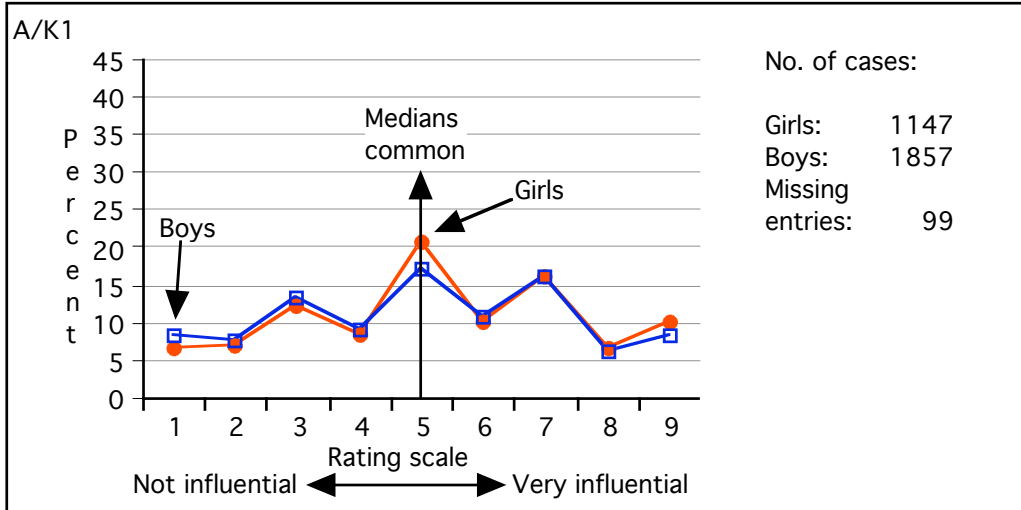


Fig. A63 - Influence of Art & Design on the way we live now - Analysis by gender

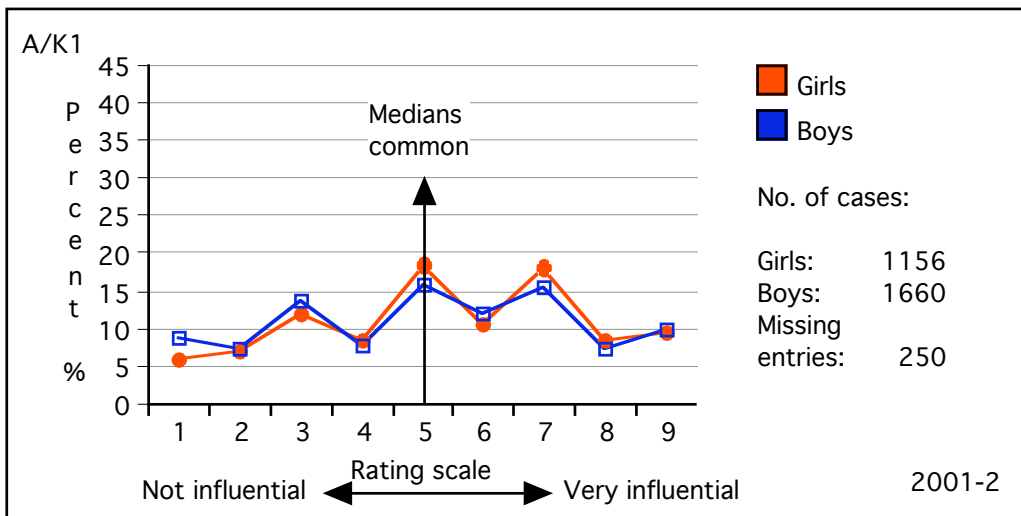


Fig. B63 - Influence of Art & Design on the way we live now - Analysis by gender

With the 2001-2 survey there was no change in perception; girls and boys continued to rate the influence of Art & Design on the way we live now at median values of 5—see Fig. B63 above.

The influence of Art & Design on the way we live now in the 1995-6 survey was rated at a median value of 5 by pupils not studying the subject, but at a median of 7 by students taking Art & Design, as shown in Fig. A64 below.

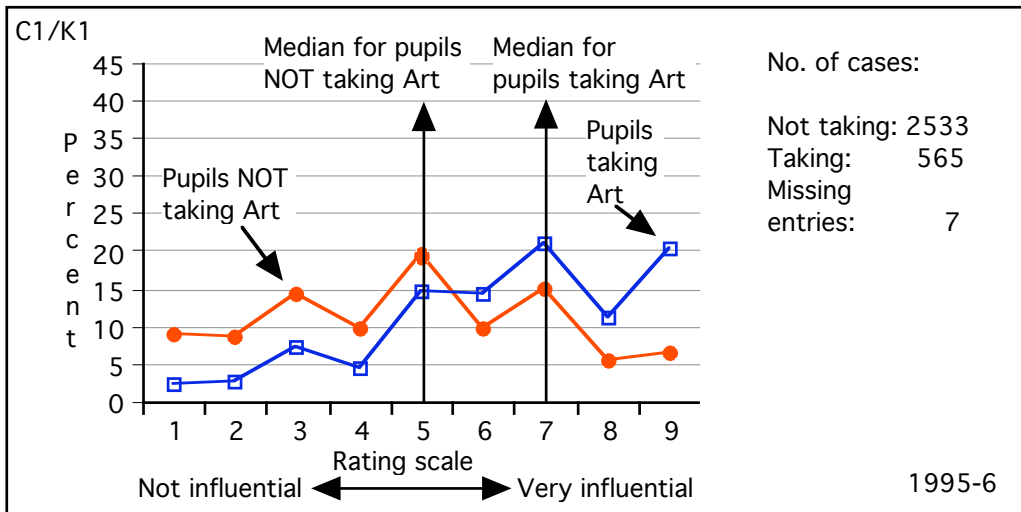


Fig. A64 - Influence of Art & Design on the way we live now - Analysis by subject studied Comparison between pupils taking Art & Design and pupils not taking Art & Design

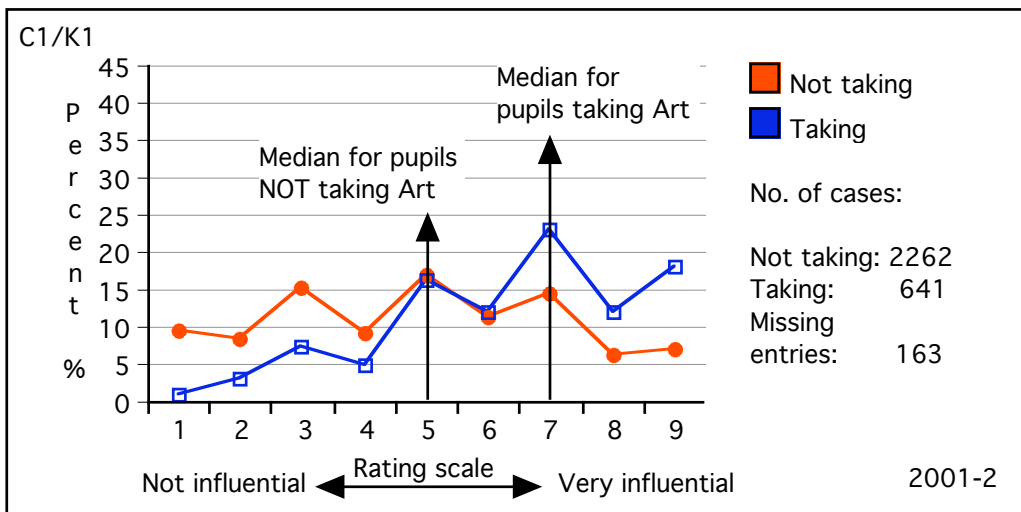


Fig. B64 - Influence of Art & Design on the way we live now - Analysis by subject studied Comparison between pupils taking Art & Design and pupils not taking Art & Design

The 2001-2 study disclosed no change; the influence of Art & Design on the way we live now was rated at a median value of 5 by pupils not studying the subject, and continued at 7 by students taking Art & Design—see Fig. B64 above.

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

The creative possibilities within the curriculum were highly rated for the subject of Art & Design in the 1995-6 survey; the median values were common at 8 for both girls and boys—see Fig. A65.

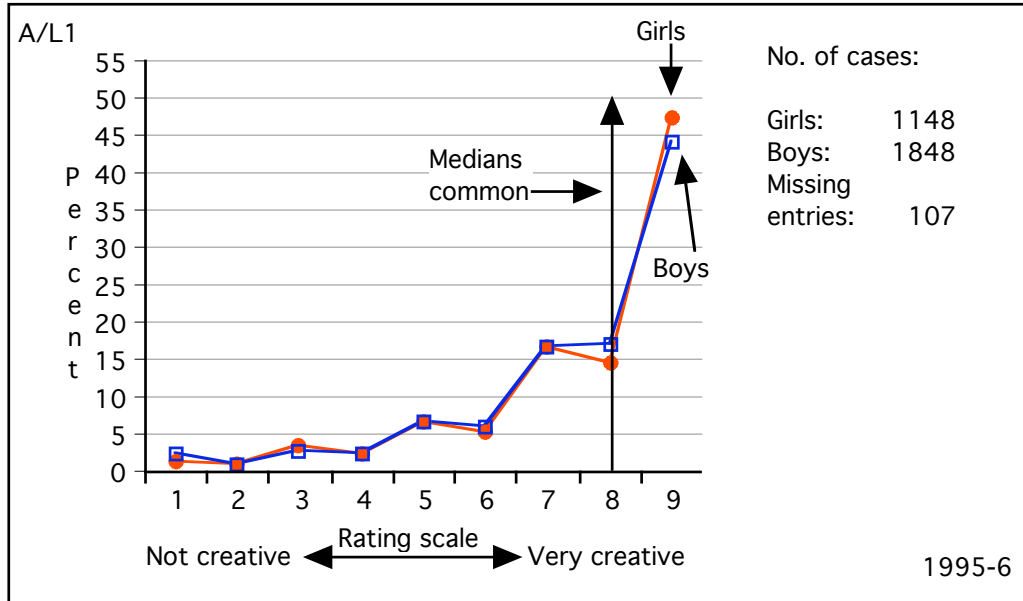


Fig. A65 - How creative does the curriculum allow you to be in Art & Design? - Analysis by gender

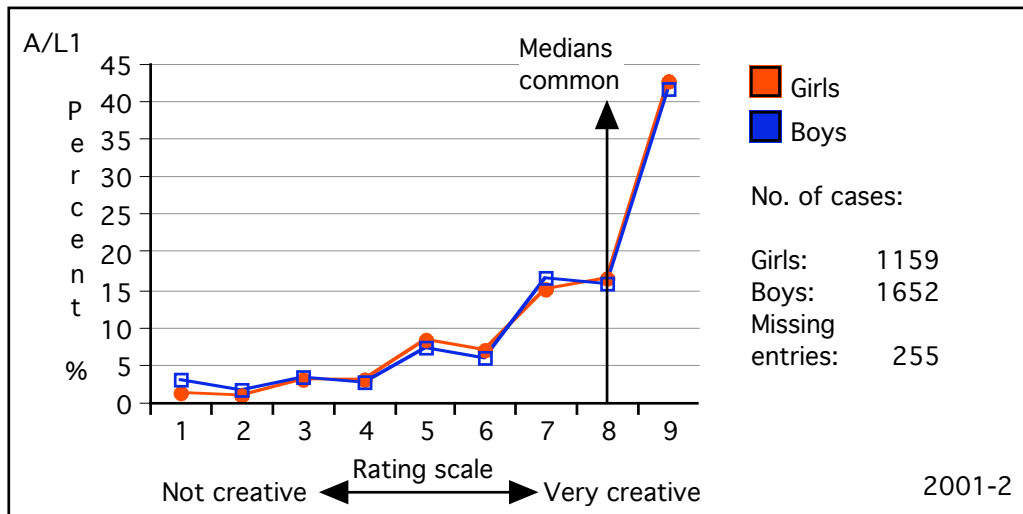


Fig. B65 - How creative does the curriculum allow you to be in Art & Design? - Analysis by gender

While the 2001-2 survey produced a change at the top of the scale, the creative possibilities for Art & Design in the curriculum remained highly rated; the median values were the same at 8 for girls and boys—see Fig. B65 above. The change at the top of the scale was evident with the shorter vertical 'Y' axis.

For the subject of Art & Design, the creative possibilities in the curriculum were highly rated during the survey of 1995-6; pupils not taking Art & Design rated the creativity at a median of 8, but students taking the subject produced a maximum median value of 9—see Fig. A66.

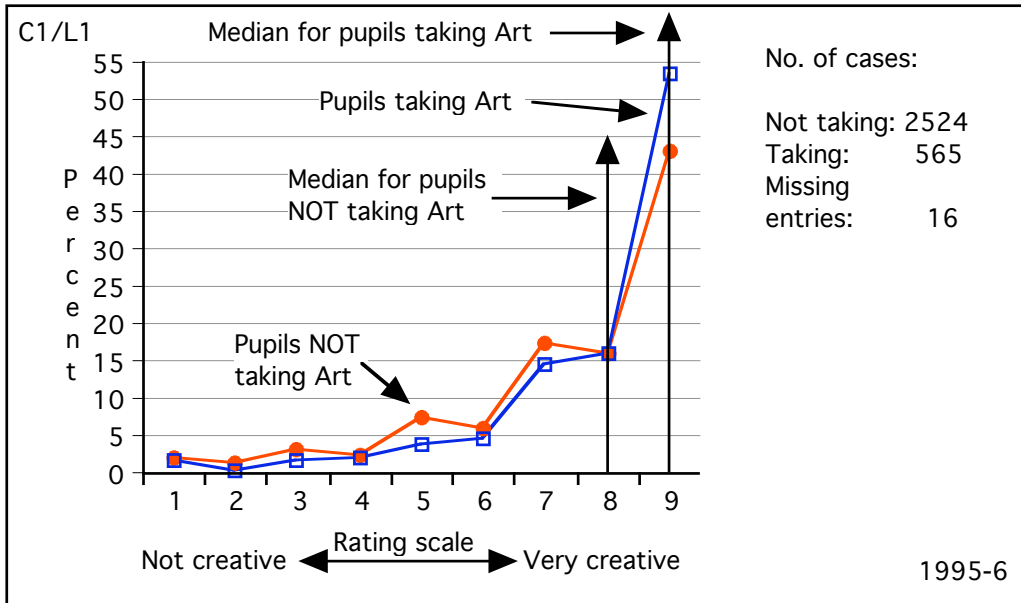


Fig. A66 - How creative does the curriculum allow you to be in Art & Design? - Analysis by subject studied
 Comparison between pupils taking Art & Design and pupils not taking Art

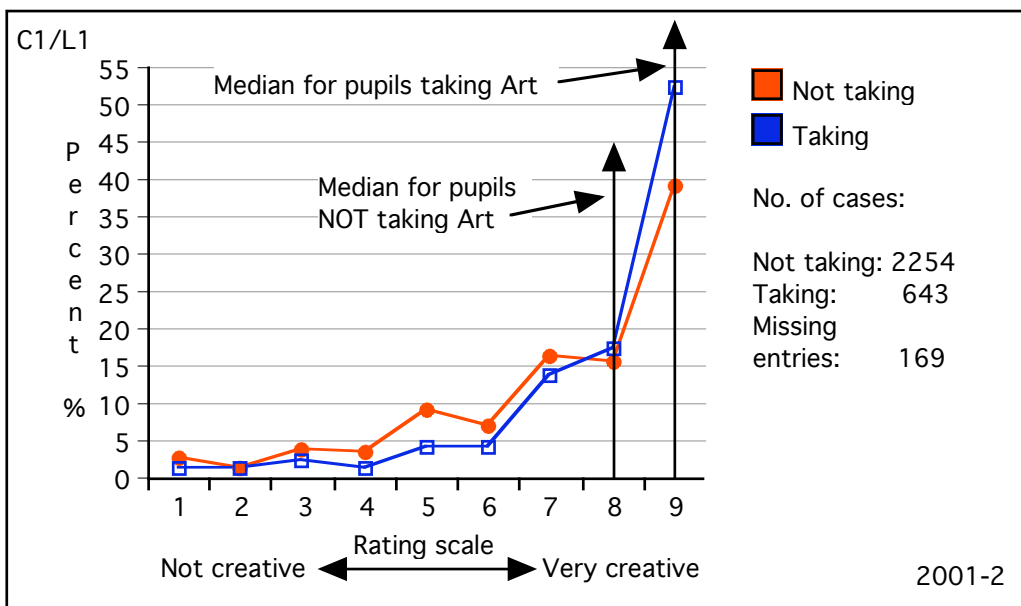


Fig. B66 - How creative does the curriculum allow you to be in Art & Design? - Analysis by subject studied
 Comparison between pupils taking Art & Design and pupils not taking Art & Design

These high ratings were maintained in 2001-2 survey; pupils not taking Art & Design rated the creative possibilities at a median of 8, and once again students taking the subject scored a maximum median value of 9—see Fig. B66 above.

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

Recording a median value of 4, girls rated our dependency on Art & Design more highly than boys, at a median value of 3 in the 1995-6 survey—see Fig. A67.

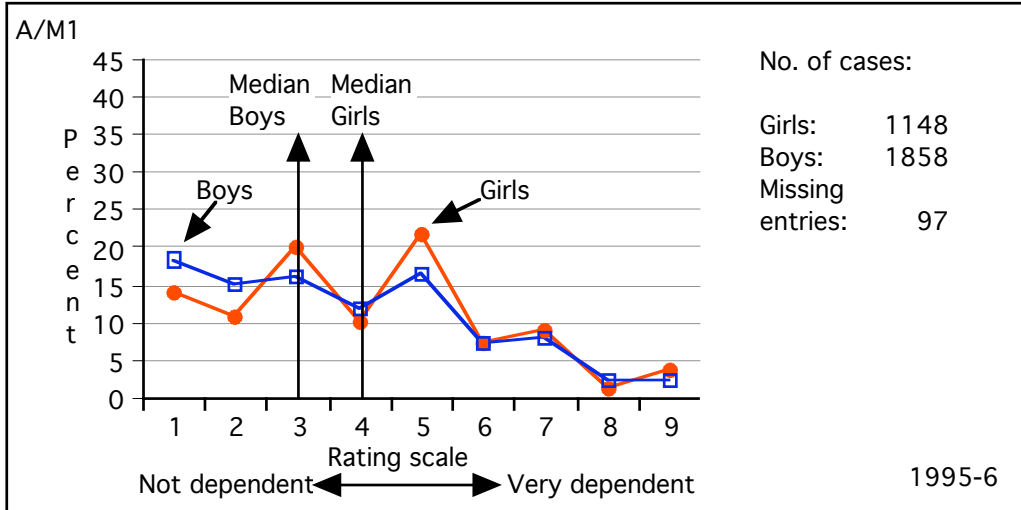


Fig. A67 - How dependent do you think we are on Art & Design? - Analysis by gender

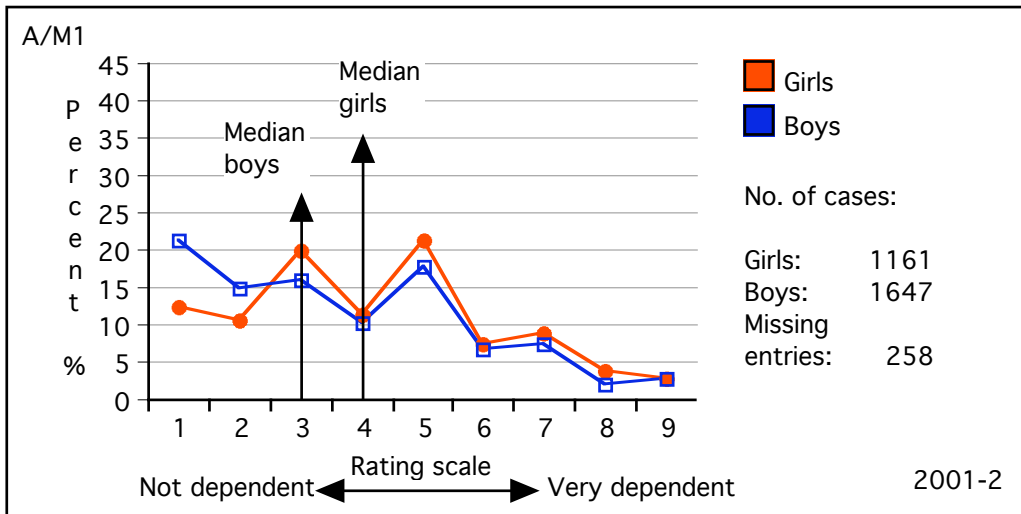


Fig. B67 - How dependent do you think we are on Art & Design? - Analysis by gender

No changes were produced by the 2001-2 survey as illustrated by Fig. B67 above: with a median value of 4, girls continued to rate our dependency on Art & Design more highly than boys at a median value of 3.

For the 1995-6 survey, pupils who were studying the subject rated our dependency on Art & Design as a modern society at a median level of 5, while students not taking Art & Design recorded a median of 3—see Fig. A68 below.

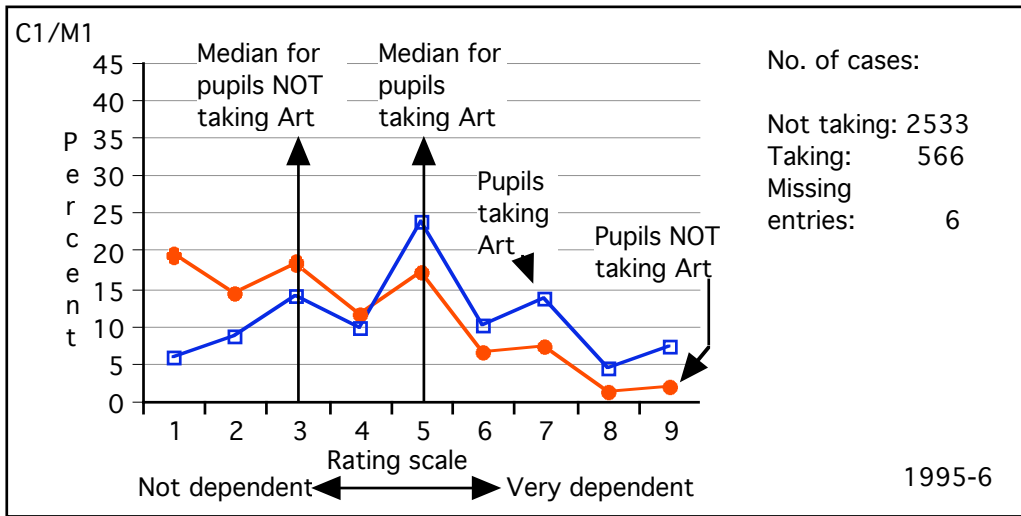


Fig. A68 - How dependent do you think we are on Art & Design? - Analysis by subject studied Comparison between pupils taking Art & Design and pupils not taking Art & Design

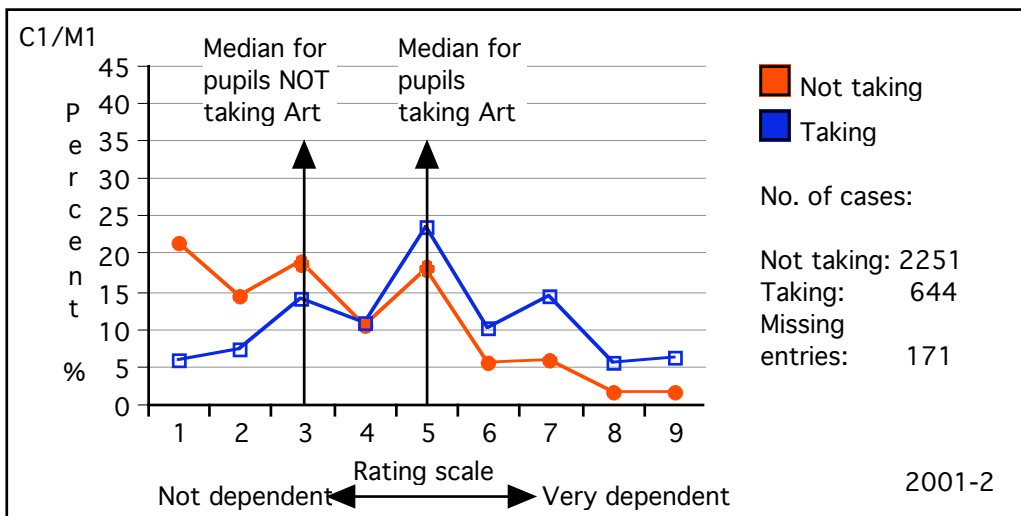


Fig. B68 - How dependent do you think we are on Art & Design? - Analysis by subject studied Comparison between pupils taking Art & Design and pupils not taking Art & Design

There was no change in the 2001-2 study, pupils who were studying the subject rated our dependency on Art & Design as a modern society at a median level of 5, while students not taking Art & Design once again recorded a median of 3—see Fig. B68 above.

08.01 - Summary of findings for Art & Design

Our dependency on artistic application as individuals and as a society warrants closer scrutiny, and hence the detailed analysis shown here. Although this examination of Art & Design covered only four parameters of analysis, instead of seven as used for D&T, English, Maths and Science, there were a number of significant results to consider. Using the 1995-6 survey as the basis for comparison, Fig. AB69/1 below shows a summary of key changes in the parameters of analysis for those A-level students studying Art & Design.

Parameters of analysis -see below	Comparison of unrounded medians for A-level sample taking Art & Design		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level sample taking Art & Design - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
4.	4.42	4.85	22.67%	25.51%	+2.84%
5.	6.62	6.66	52.80%	53.60%	+0.80%
6.	8.57	8.55	84.60%	83.80%	-0.80%
7.	4.93	4.95	26.19%	26.87%	+0.68%

Parameters of analysis :
 4. In the context of EIU*, how important do you consider Art & Design? - (C1/J1)
 5. How much do you think the way we live now has been influenced by Art? - (C1/K1)
 6. How creative does the curriculum allow you to be in Art & Design? - (C1/L1)
 7. As a modern society, how dependent do you think we are on Art & Design?-(C1/M1)
 * Economic and Industrial Understanding

Fig. AB69/1 - Summary of changes between surveys for the parameters of analysis by students taking Art & Design

For students taking Art & Design, Fig. AB69/1 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The greatest degree of comprehension of the importance of the subject should be expected among students studying Art & Design. As a summary, Fig. AB69/1 presents causes for concern:

- In the context of EIU, Art & Design was not considered very important; the total for rating scale 7, 8 and 9 in the first survey was less than 23% for students taking the subject. Although the second survey disclosed a rise, the total was still less than 26%.
- The influence of Art & Design on the way we live now produced a better result; the total for rating scale 7, 8 and 9 in the first survey was more than 52% for students taking the subject. This compares with more than 53% for the second survey.
- The creativity perceived permissible within the curriculum was extremely high. The total for rating scale 7, 8 and 9 in the first survey was more than 84% for students taking the subject, and compares with more than 83% in the second survey.
- As a modern society our dependency on Art & Design was not highly valued. In both surveys, the totals for rating scale 7, 8 and 9 were less than 27% for students taking the subject.

Fig. AB69/2 below provides a summary of changes in the parameters of analysis for those A-level students NOT studying Art & Design.

Parameters of analysis -see below	Comparison of unrounded medians for A-level sample NOT taking Art & Design		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level sample NOT taking Art & Design - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
4.	2.82	2.86	5.73%	7.71%	+1.98%
5.	4.88	4.92	27.76%	28.63%	+0.87%
6.	8.09	7.83	76.90%	71.70%	-5.20%
7.	3.34	3.23	11.12%	9.91%	-1.21%

Parameters of analysis :
 4. In the context of EIU*, how important do you consider Art & Design? - (C1/J1)
 5. How much do you think the way we live now has been influenced by Art? - (C1/K1)
 6. How creative does the curriculum allow you to be in Art & Design? - (C1/L1)
 7. As a modern society, how dependent do you think we are on Art & Design?-(C1/M1)
 * Economic and Industrial Understanding

Fig. AB69/2 - Summary of changes between surveys for the parameters of analysis by students NOT taking Art & Design

Students NOT taking Art & Design have benefited nevertheless from the outcomes of artistic application in many fields of human experience. Thus Art & Design has contributed significantly to the way we now live. Fig. AB69/2 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The main points include:

- In the context of EIU, Art & Design was considered unimportant; the total for rating scale 7, 8 and 9 in both surveys was less than 8% for students NOT taking the subject.
- The influence of Art & Design on the way we live now was also disappointing. The totals for rating scale 7, 8 and 9 in both surveys was less than 29% for students NOT taking the subject.
- The creativity perceived permissible within the curriculum was relatively high. The total for rating scale 7, 8 and 9 in the first survey was more than 76% for students NOT taking the subject; this fell by 5% to less than 72% in the second survey.
- As a modern society our dependency on Art & Design was seriously underrated. In both surveys, the totals for rating scale 7, 8 and 9 were less than 12%.

Fig. AB69/3 below provides a summary of changes in the parameters of analysis for girls including those A-level students not studying and studying Art & Design.

Parameters of analysis -see below	Comparison of unrounded medians for A-level Girls whether taking Art & Design or not		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for Girls taking and not Art & Design - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
4.	3.27	3.57	9.95%	13.21%	+3.26%
5.	5.21	5.35	33.69%	36.38%	+2.69%
6.	8.33	8.07	79.10%	74.60%	-4.50%
7.	3.93	4.05	14.81%	15.76%	+0.95%

Parameters of analysis :
 4. In the context of EIU*, how important do you consider Art & Design? - (A/J1)
 5. How much do you think the way we live now has been influenced by Art? - (A/K1)
 6. How creative does the curriculum allow you to be in Art & Design? - (A/L1)
 7. As a modern society, how dependent do you think we are on Art & Design? - (A/M1)
 * Economic and Industrial Understanding

Fig. AB69/3 - Summary of changes between surveys for the parameters of analysis by GIRLS taking and not taking Art & Design

All girls whether studying Art & Design or not have benefited nevertheless from the outcomes of artistic application in many fields of human experience. Thus Art & Design has contributed significantly to the way we now live. Fig. AB69/3 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The main points include:

- In the context of EIU, Art & Design was considered relatively unimportant by girls; the total for rating scale 7, 8 and 9 in both surveys was less than 14%.
- Girls perceived the influence of Art & Design on the way we live now at less than 37% for the sum of rating scale 7, 8 and 9 in both surveys.
- Girls considered the creativity allowed in the curriculum for Art & Design was more than 79% for rating scale 7, 8 and 9 in the first survey; this fell by some 4% in the second survey.
- Girls perceived our dependency on Art & Design at less than 16% for rating scale 7, 8 and 9 in both surveys.

Fig. AB69/4 overleaf provides a summary of changes in the parameters of analysis for boys including those A-level students not studying and studying Art & Design.

Parameters of analysis -see below	Comparison of unrounded medians for A-level Boys whether taking Art & Design or not		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for Boys taking and not Art & Design - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
	4.	2.83	3.00	8.28%	10.56%
5.	5.09	5.22	31.74%	33.15%	+1.41%
6.	8.17	8.00	78.30%	74.80%	-3.50%
7.	3.47	3.34	13.22%	12.33%	-0.89%

Parameters of analysis :
 4. In the context of EIU*, how important do you consider Art & Design? - (A/J1)
 5. How much do you think the way we live now has been influenced by Art? - (A/K1)
 6. How creative does the curriculum allow you to be in Art & Design? - (A/L1)
 7. As a modern society, how dependent do you think we are on Art & Design? - (A/M1)
 * Economic and Industrial Understanding

Fig. AB69/4 - Summary of changes between surveys for the parameters of analysis by BOYS taking and not taking Art & Design

All boys whether studying Art & Design or not have benefited nevertheless from the outcomes of artistic application in many fields of human experience. Thus Art & Design has contributed significantly to the way we now live. Fig. AB69/4 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The main points include:

- In the context of EIU, Art & Design was also considered relatively unimportant by boys; the total for rating scale 7, 8 and 9 in both surveys was less than 11%.
- Boys perceived the influence of Art & Design on the way we live now at less than 34% for the sum of rating scale 7, 8 and 9 in both surveys.
- In the first survey, boys considered the creativity allowed in the curriculum for Art & Design was more than 78% for the sum of rating scale 7, 8 and 9, and 74% in the second survey.
- Boys perceived our dependency on Art & Design at less than 14% for the sum of rating scale 7, 8 and 9 in both surveys.

A6.03 - Concerns for the knowledge economy

In the 'Green Paper' published February 2002, the Secretary of State for Education and Skills, Estelle Morris (2002:3) wrote:

... In the 21st century, to be prosperous, the economy will depend heavily on the creativity and skills of its people. In a knowledge economy it is vital that we tap the potential of every one of our citizens.

The importance attached to 'creativity' in these two surveys has been summarised in Figures AB70/1 and AB70/2 below showing the unrounded medians and the percentage sum totals for rating scale values 7, 8 and 9 respectively.

	1995-6 survey unrounded medians Girls/Boys	1995-6 survey unrounded medians Taking/Not taking	2001-2 survey unrounded medians Girls/Boys	2001-2 survey unrounded medians Taking/Not taking
Art	8.33/8.17	8.57/8.09	8.07/8.00	8.55/7.83
D&T	7.43/7.45	7.93/6.99	7.48/7.53	7.80/7.08
English	6.66/6.02	6.68/6.11	6.26/5.62	6.55/5.59
Maths	2.51/2.53	2.62/2.48	2.59/2.57	2.62/2.58
Science	3.61/3.77	3.99/3.60	3.25/3.62	3.54/3.38

Fig. AB70/1 - Comparison of unrounded medians obtained to the question: 'How creative does the curriculum allow you to be in ...?' for various subjects

A comparison of the unrounded medians in Fig. AB70/1 above shows that the subject of Art & Design was perceived to offer the greatest possibility for creativity within the curriculum among the subjects shown. This was the case whether analysed by gender or subject studied.

Fig. AB70/2 below compares the percentage sum totals for ratings 7, 8 and 9 analysed by gender and subject studied.

	1995-6 survey total for 7, 8 and 9 Girls/Boys %	1995-6 survey total for 7, 8 and 9 Taking/Not taking %	2001-2 survey total for 7, 8 and 9 Girls/Boys %	2001-2 survey total for 7, 8 and 9 Taking/Not taking %
Art	79.10/78.30	84.60/76.90	74.60/74.80	83.80/71.70
D&T	71.50/71.50	78.40/62.80	72.00/7.53	69.00/63.30
English	54.30/42.31	54.60/44.01	45.80/35.19	51.10/34.91
Maths	6.47/5.01	5.62/5.58	4.33/5.14	5.09/4.82
Science	12.64/13.43	15.44/11.80	7.61/10.94	11.90/8.39

Fig. AB70/2 - Comparison of totals for rating scale values 7, 8 and 9 obtained to the question: 'How creative does the curriculum allow you to be in ...?' for various subjects

Once again Fig. AB70/2 above shows that the subject of Art & Design was perceived to offer the greatest possibility for creativity within the curriculum among the subjects shown. In this case, the sum totals for ratings 7, 8 and 9 were compared when analysed by gender and subject studied.

While these results recognise the creativity possible within the curriculum for Art & Design, examination of Figures AB69/1 to AB69/4 disclose a poor link with EIU. These results were interesting, since young people exercise 'appearance choice' every day, in their buying habits

and other activities.

However, these results present serious concerns since 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 visually pleasing product to build 'showroom traffic' — motor industry jargon to encourage potential buyers into the showroom.

But the results summarised in Figures AB69 and AB70 raise further serious causes for concern:

- Artistic appreciation has been highly influential in the way we now live since it helped to shape the infrastructure, but these results show little comprehension of the breadth and depth of subject influence. Here also was confirmation of an inadequate link with Economic and Industrial Understanding, as well as D&T.
- The creative possibilities perceived in Maths and Science were low, yet creativity in these subjects in the past has brought us to the way we now live through technological application.

With these stark inferences, how can the aspirations of the Green Paper for a 'prosperous ... economy' depending 'heavily on the creativity and skills of its people', ever be realised? 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 and visualised innovative processes necessary to make them.

Similarly, it was and remains the innovative imaginatively conceived products and processes that sustains the economic dynamic in any competitive world-class performance by UK companies, particularly technological companies, and which the government now seeks to promote. 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 Owers (2001:79 to 82).

In the current issue of the national curriculum (2003), 'the importance of art and design*' was described as follows:

Art and design stimulates creativity and imagination. It provides visual, tactile and sensory experiences and a unique way of understanding and responding to the world. Pupils use colour, form, texture, pattern and different materials and processes to communicate what they see, feel and think. Through art and design activities, they learn to make informed value judgements and aesthetic and practical decisions, becoming actively involved in shaping environments. They explore ideas and meanings in the work of artists, craftspeople and designers. They learn about the diverse roles and functions of art, craft and design in contemporary life, and in different times and

cultures. Understanding, appreciation and enjoyment of the visual arts have the power to enrich our personal and public lives.

*Art and design includes craft.

These results show that education faces a significant challenge, and the statement in the curriculum highlights the importance of meeting that challenge effectively. Moreover, education needs to reflect on the governments aspirations for a 'prosperous economy', a 'knowledge economy', and to consider the role of Art & Design in that context. How we earn our living in the world needs to be comprehended and this means dropping the shackles of prejudice endorsed by the hidden curriculum.

Appendix 7

Comparison of 6th Form surveys: Geography, History and a 2nd Language in 1995-6 and 2001-2

A7.01 - Introduction

Geography, History and 2nd Language 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 subjects of Geography and History?
- In your opinion, how creative does the curriculum allow you to be in a 2nd language?

*Economic and Industrial Understanding.

The parameters of analysis were limited for these subjects. For Geography and History the parameter was the importance of the subject in the context of Economic and Industrial Understanding (EIU). And for the 2nd Language the parameter was the perceived creativity allowed within the curriculum.

The same subset of questions were not used throughout the questionnaire, in order to avoid a fourth page—a possible source of deterrence for teachers contemplating participation in this research. The results are shown as graphs and presented two-to-a-page to enable direct comparison between the surveys.

All the graphs are annotated with the questionnaire references in the top left corner, and the school year of the survey in the bottom right corner.

First sight inferences appear with each pair of graphs, and an overall summary for each subject appears at the end of the appendix.

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

For the 1995-6 survey, the level of importance attributed to Geography in the context of EIU was at a median of 6 for girls and 5 boys as shown in Fig. A71 below.

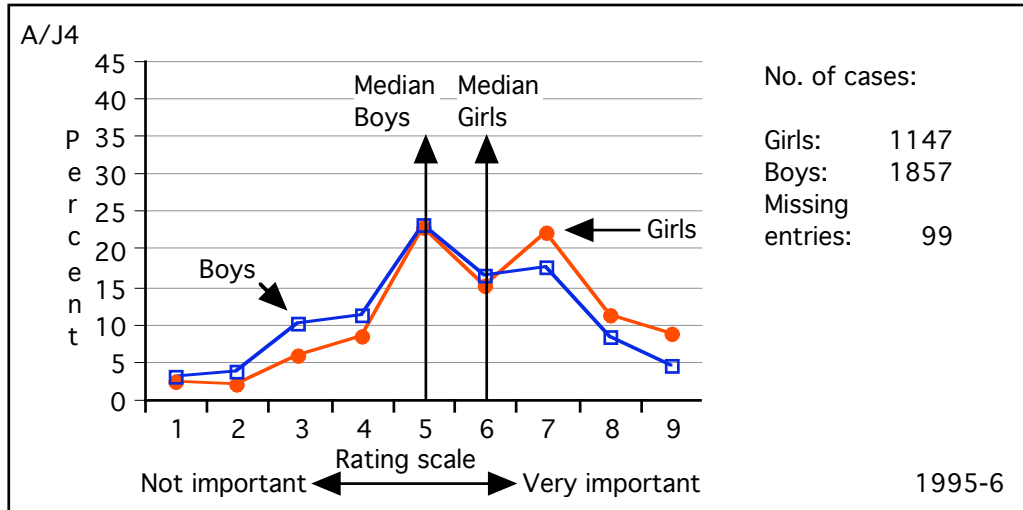


Fig. A71 - Importance of Geography in the context of EIU - Analysis by gender

A similar result was obtained in the 2001-2 survey; in the context of Economic and Industrial Understanding, girls continued to rate the importance of Geography at a median of 6 and boys at a median of 5—see Fig. B71 below.

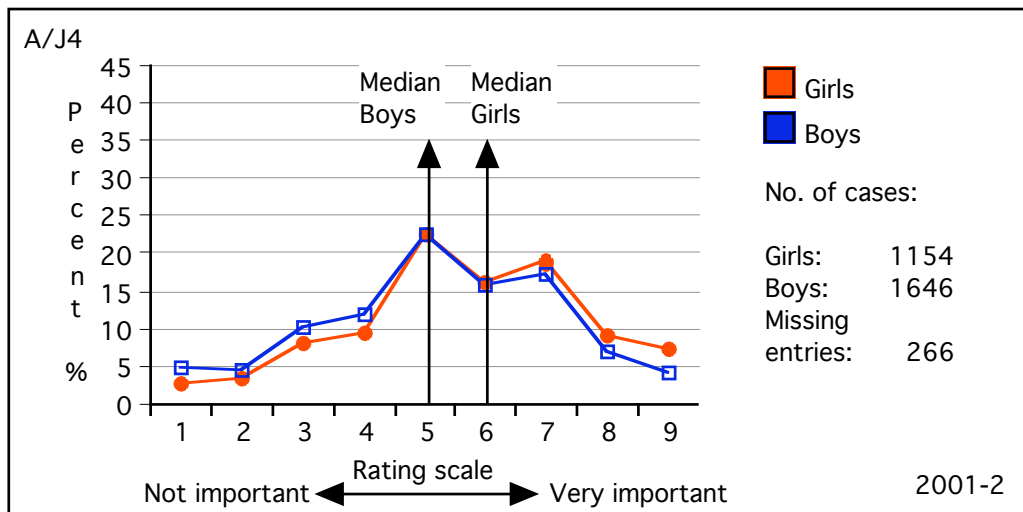


Fig. B71 - Importance of Geography in the context of EIU - Analysis by gender

Fig. A72 below shows that students who were studying Geography in the 1995-6 survey rated the importance of the subject in the context of EIU at a median of 6, while pupils who were not taking Geography recorded a median of 5.

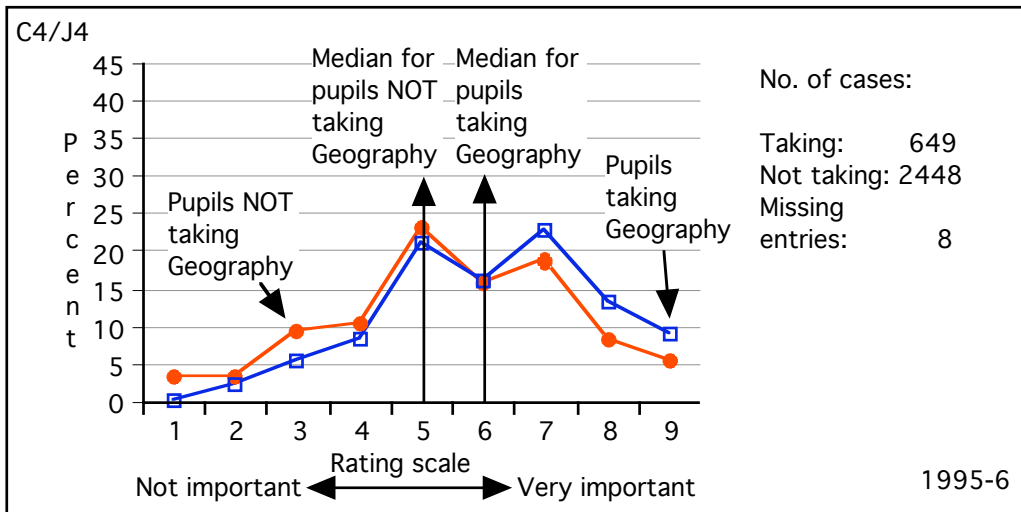


Fig. A72 - Importance of Geography in the context of EIU - Analysis by subject studied Comparison between pupils taking Geography and pupils not taking Geography

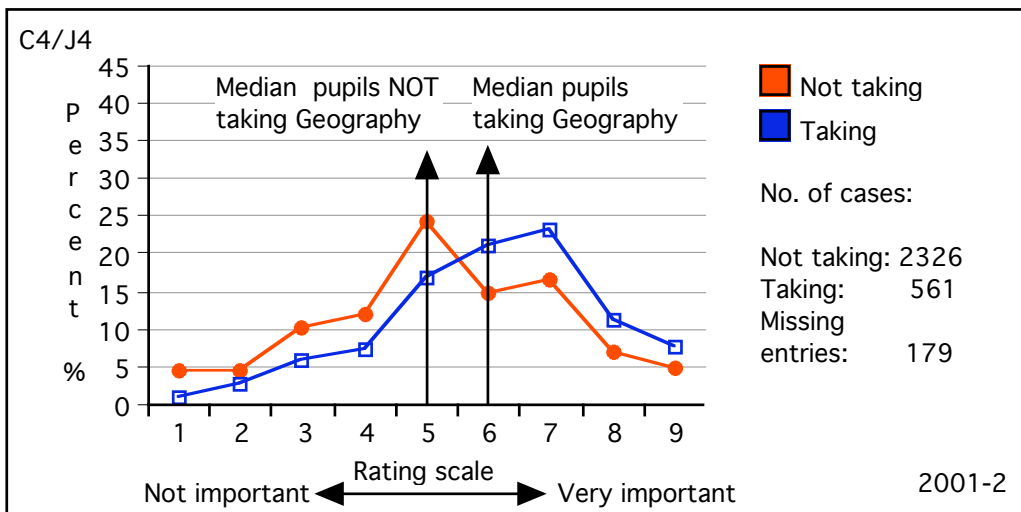


Fig. B72 - Importance of Geography in the context of EIU - Analysis by subject studied Comparison between pupils taking Geography and pupils not taking Geography

No change was recorded in the 2001-2 survey; Fig. B72 above shows that students who were studying Geography continued to rate the importance of the subject in the context of EIU at a median of 6, while pupils who were not taking Geography recorded a median of 5.

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

For the 1995-6 survey, girls rated the importance of History in the context of EIU at a median value of 5, while boys scored a rating of 4 as shown in Fig. A73 below.

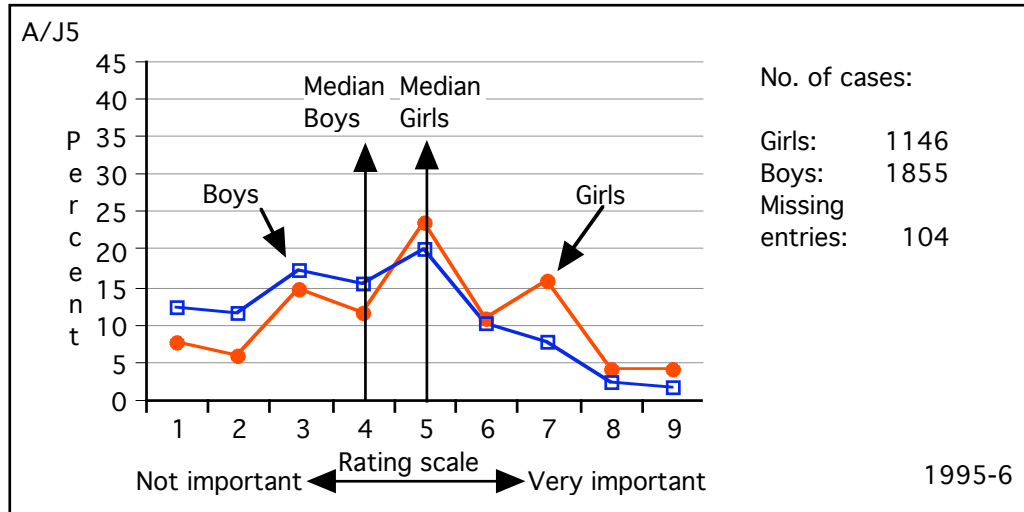


Fig. A73 - Importance of History in the context of EIU - Analysis by gender

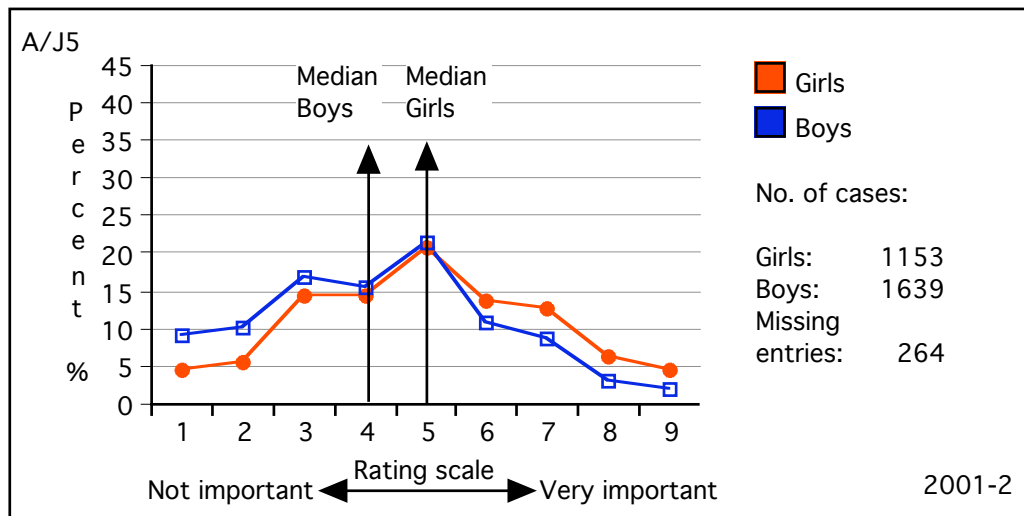


Fig. B73 - Importance of History in the context of EIU - Analysis by gender

A similar result was obtained in the 2001-2 survey; girls continued to rate the importance of History in the context of EIU at a median of 5, and boys rated a median of 4—see Fig. B73 above.

For the importance of History in context of EIU, the 1995-6 survey showed that pupils taking the subject rated a median value of 5, while pupils not studying the subject scored a rating of 4—see Fig. A74 below.

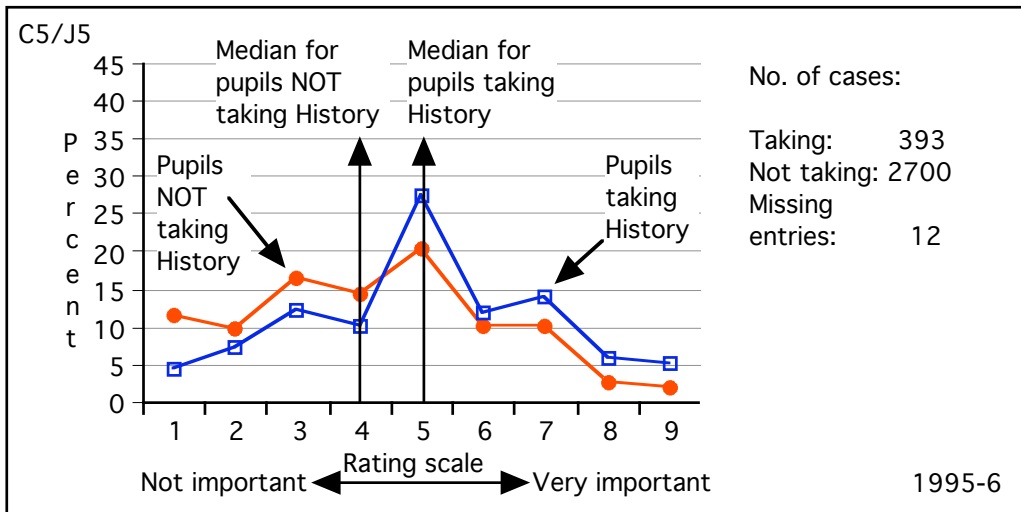


Fig. A74 - Importance of History in the context of EIU - Analysis by subject studied Comparison between pupils taking History and pupils not taking History

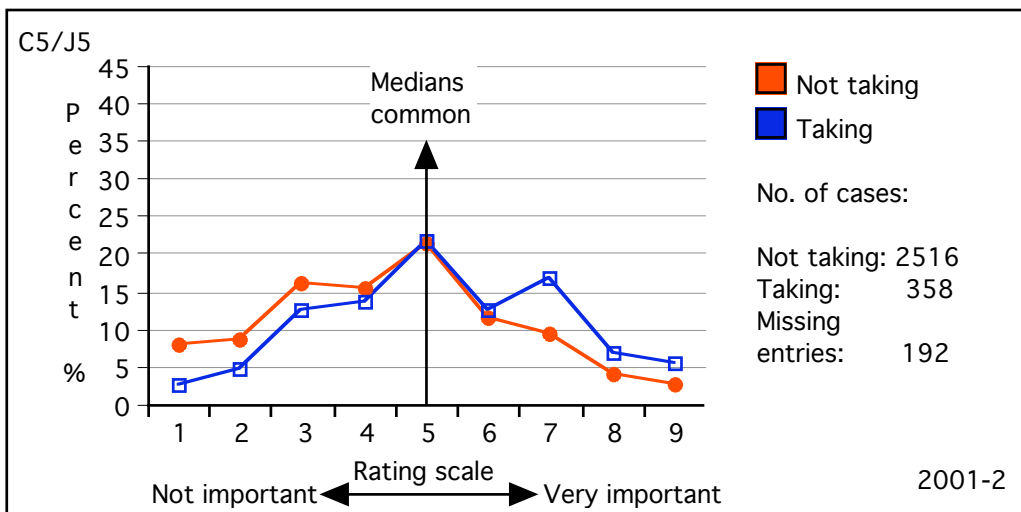


Fig. B74 - Importance of History in the context of EIU - Analysis by subject studied Comparison between pupils taking History and pupils not taking History

However, the 2001-2 study produced a change; the importance of History in the context of EIU was still rated at a median value of 5 by pupils studying the subject., and those not taking the subject also scored a median of 5—see Fig. B74 above.

How creative does the curriculum allow you to be in a 2nd Language?

The creative possibilities within the curriculum were not very highly rated for a 2nd language in the 1995-6 survey; the median value for girls was 4, and for boys it was 3—see Fig. A75.

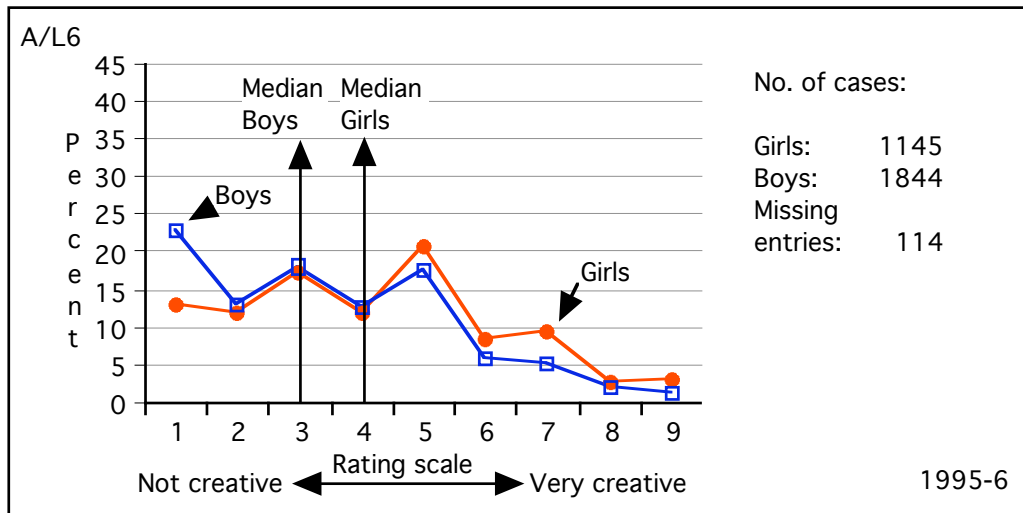


Fig. A75 - How creative does the curriculum allow you to be in a 2nd language? - Analysis by gender

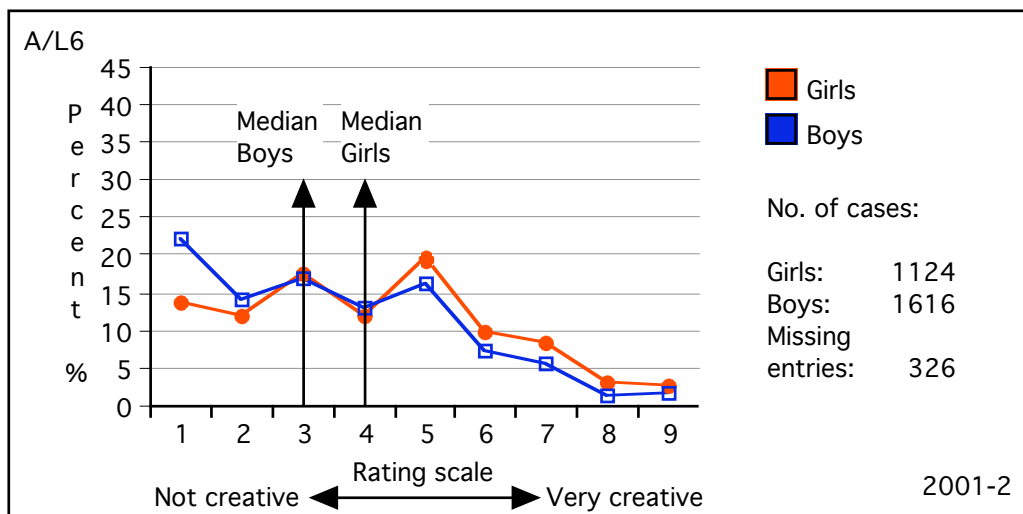


Fig. B75 - How creative does the curriculum allow you to be in a 2nd language? - Analysis by gender

The 2001-2 survey disclosed no change in these perceptions; girls continued to rate the creative possibilities within the curriculum for a 2nd language at a median of 4, and boys scored a median of 3—see Fig. B75 above.

In the survey of 1995-6, the creative possibilities in the curriculum for a 2nd language were rated at 3 by pupils not taking the subject, but students taking a 2nd language recorded a median value of 5—see Fig. A76 below.

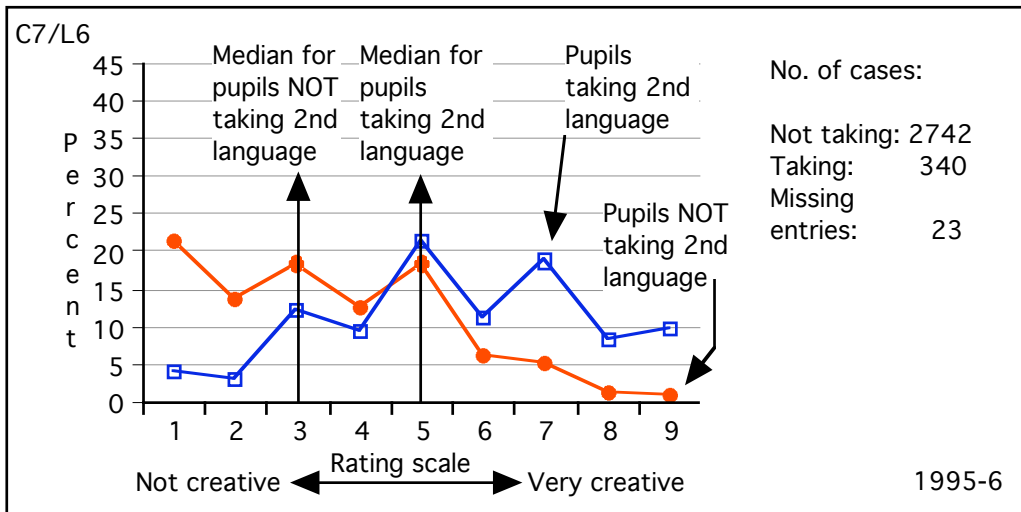


Fig. A76 - How creative does the curriculum allow you to be in a 2nd language? - Analysis by subject studied
 Comparison between pupils taking a 2nd language and pupils not taking a 2nd language

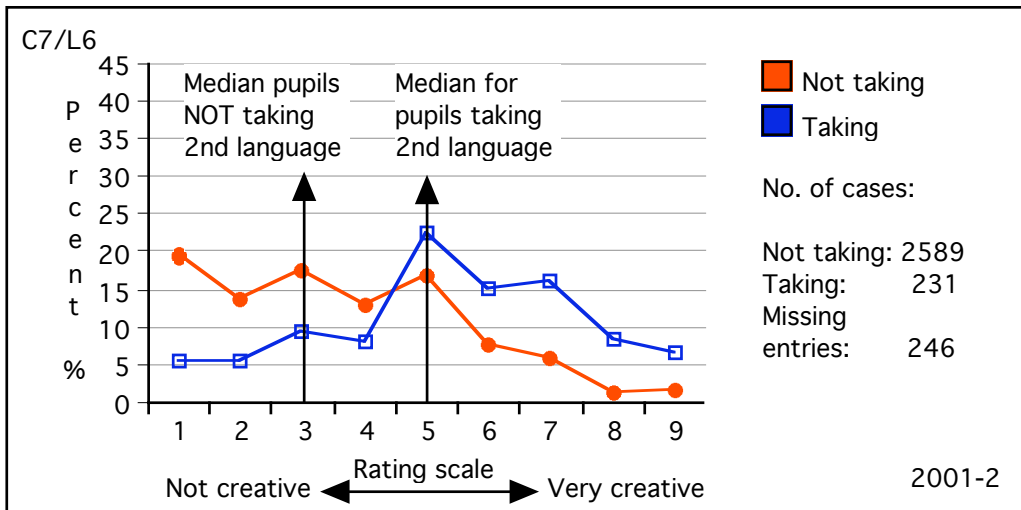


Fig. B76 - How creative does the curriculum allow you to be in a 2nd language? - Analysis by subject studied
 Comparison between pupils taking a 2nd language and pupils not taking a 2nd language

These ratings were maintained in 2001-2 survey; pupils not taking a 2nd language rated the creative possibilities at a median of 3, and once again students taking the subject scored a median value of 5—see Fig. B76 above.

A7.02 - Summary of findings for Geography, History and a 2nd Language

Although the parameters of analysis were limited for Geography, History and a 2nd Language, there were a number of results to consider. For students who took Geography or History or a 2nd Language, Fig. AB77/1 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The greatest degree of comprehension of the importance of the subject should be expected among students studying these subjects.

Parameters of analysis -see below	Comparison of unrounded medians for A-level sample taking specific subjects		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level sample taking specific subjects - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
4. Geography	6.21	6.16	45.54%	42.64%	-2.90%
4. History	5.04	5.17	25.65%	29.87%	+4.22%
6. 2nd Language	5.43	5.38	37.33%	32.09%	-5.24%

Parameters of analysis :
 4. In the context of EIU*, how important do you consider Geography? - (C4/J4)
 4. In the context of EIU*, how important do you consider History? - (C5/J5)
 6. How creative does the curriculum allow you to be in a 2nd Language? - (C7/L6)
 * Economic and Industrial Understanding

Fig. AB77/1 - Summary of changes between surveys for the parameters of analysis by students who took Geography or History or a 2nd Language

As a summary, Fig. AB77/1 presents causes for concern:

- As a trading society, a knowledge of geography in the context of EIU should be regarded as important. However the results were disappointing; there were fewer than 46% for ratings 7, 8 and 9 in the first survey, and this fell to less than 43% in the second survey.
- In the context of EIU, history was not regarded as very important although the Industrial Revolution was the source of much of the wealth of the UK. The total for rating scale 7, 8 and 9 in the first survey was less than 26%, rising to more than 29% for the second survey. Since we have progressed from before the Stone Age to the way we live now because of our tool- and technology-culture, these results remain disappointing. The impact of our tool- and technology-culture represents a vitally important part of our history that has never been taught. The pivotal place of our tool- and technology-culture can not be valued in this knowledge vacuum.
- The creativity perceived permissible within the curriculum for a 2nd Language in the first survey for rating scale 7, 8 and 9 was less than 38%, and fell by than 5% in the second survey to 32%. Given our status as a trading society, this was also a disappointing result.

Fig. AB77/2 below provides a summary of changes in the parameters of analysis for those A-level students NOT studying Geography or History or a 2nd Language.

Parameters of analysis -see below	Comparison of unrounded medians for A-level sample NOT taking specific subjects		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level sample NOT taking specific subjects - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
4. Geography	5.46	5.25	32.88%	28.86%	-4.02%
4. History	4.26	4.52	15.66%	16.65%	+0.99%
6. 2nd Language	3.29	3.39	8.16%	9.50%	+1.34%

Parameters of analysis :
 4. In the context of EIU*, how important do you consider Geography? - (C4/J4)
 4. In the context of EIU*, how important do you consider History? - (C5/J5)
 6. How creative does the curriculum allow you to be in a 2nd Language? - (C7/L6)
 * Economic and Industrial Understanding

Fig. AB77/2 - Summary of changes between surveys for the parameters of analysis by students NOT taking Geography or History or a 2nd Language

Students NOT taking Geography or History or a 2nd Language have benefited nevertheless from the outcomes of the application of knowledge of these subjects, and in many fields of human experience. Thus Geography, History and other Languages have contributed to the way we now live. Fig. AB77/2 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The main points include:

- Fewer than 33% for the total of ratings 7, 8 and 9 considered geography was important in the context of EIU in the first survey among students who did not take the subject. This fell to less than 29% in the second survey.
- In the context of EIU, history was not regarded as very important although the Industrial Revolution was the source of much of the wealth of the UK. The total for rating scale 7, 8 and 9 in the first survey was less than 16%, and less than 17% for the second survey.
- The creativity perceived permissible within the curriculum for a 2nd Language in the first survey for rating scale 7, 8 and 9 was less than 9%, and less than 10% in the second survey.

Given our status as an industrial and trading society, these were all disappointing results, and they show the enormity of the problems for our society and education.

Fig. AB77/3 below provides a summary of changes in the parameters of analysis for A-level girls including those not studying and studying Geography or History or a 2nd Language.

Parameters of analysis -see below	Comparison of unrounded medians for A-level Girls in various subjects		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for Girls in various subjects - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
	4. Geography	6.02	5.66	42.78%	35.91%
4. History	4.88	4.95	24.56%	24.17%	-0.39%
6. 2nd Language	4.09	4.01	15.81%	14.50%	-1.31%

Parameters of analysis :
 4. In the context of EIU*, how important do you consider Geography? - (A/J4)
 4. In the context of EIU*, how important do you consider History? - (A/J5)
 6. How creative does the curriculum allow you to be in a 2nd Language? - (A/L6)
 * Economic and Industrial Understanding

Fig. AB77/3 - Summary of changes between surveys for the parameters of analysis by GIRLS taking and not taking Geography or History or a 2nd Language

All girls whether studying Geography or History or a 2nd Language or not have benefited nevertheless from the outcomes of knowledge application in many fields of human experience. Thus these subjects have contributed to the way we now live. Fig. AB77/3 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The main points include:

- In the context of EIU, Geography was not considered very important by girls; the total for rating scale 7, 8 and 9 in the first survey was less than 43%, and less than 36% in the second survey.
- In the context of EIU, history was not regarded as very important although the Industrial Revolution was the source of much of the wealth of the UK. The total for rating scale 7, 8 and 9 was less than 25% in both surveys.
- The creativity perceived permissible within the curriculum for a 2nd Language for rating scale 7, 8 and 9 was less than 16% in both surveys.

Given our dependence on trade as a society in order to pay our way in the world, these results can only be described as a serious cause for concern.

Fig. AB77/4 below provides a summary of changes in the parameters of analysis for A-level girls including those not studying and studying Geography or History or a 2nd Language.

Parameters of analysis -see below	Comparison of unrounded medians for A-level Boys in various subjects		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for Boys in various subjects - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
4. Geography	5.40	5.28	30.92%	28.86%	-2.06%
4. History	4.02	4.33	12.08%	14.46%	+2.38%
6. 2nd Language	3.26	3.29	8.84%	9.04%	+0.20%

Parameters of analysis :
 4. In the context of EIU*, how important do you consider Geography? - (A/J4)
 4. In the context of EIU*, how important do you consider History? - (A/J5)
 6. How creative does the curriculum allow you to be in a 2nd Language? - (A/L6)
 * Economic and Industrial Understanding

Fig. AB77/4 - Summary of changes between surveys for the parameters of analysis by BOYS taking and not taking Geography or History or a 2nd Language

All boys whether studying Geography or History or a 2nd Language or not have benefited nevertheless from the outcomes of knowledge application in many fields of human experience. Thus these subjects have contributed to the way we now live. Fig. AB77/4 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys. The main points include:

- In the context of EIU, Geography was not considered very important by boys; the total for rating scale 7, 8 and 9 in the first survey was less than 31%, and less than 29% in the second survey.
- In the context of EIU, history was not regarded as very important although the Industrial Revolution was the source of much of the wealth of the UK. The total for rating scale 7, 8 and 9 was less than 15% in both surveys.
- The creativity perceived permissible within the curriculum for a 2nd Language for rating scale 7, 8 and 9 was less than 10% in both surveys.

This set of results for boys was even more disappointing than for girls; in combination they underline the magnitude of the problems we face as a society. Our dependence on trade as a society in order to pay our way in the world is simply not comprehended.

In the current issue of the national curriculum on line (March 2003), 'the importance of Geography and History' were described respectively as follows:

Geography provokes and answers questions about the natural and human worlds, using different scales of enquiry to view them from different perspectives. It develops

knowledge of places and environments throughout the world, an understanding of maps, and a range of investigative and problem-solving skills both inside and outside the classroom. As such, it prepares pupils for adult life and employment. Geography is a focus within the curriculum for understanding and resolving issues about the environment and sustainable development. It is also an important link between the natural and social sciences. As pupils study geography, they encounter different societies and cultures. This helps them realise how nations rely on each other. It can inspire them to think about their own place in the world, their values, and their rights and responsibilities to other people and the environment.

History fires pupils' curiosity about the past in Britain and the wider world. Pupils consider how the past influences the present, what past societies were like, how these societies organised their politics, and what beliefs and cultures influenced people's actions. As they do this, pupils develop a chronological framework for their knowledge of significant events and people. They see the diversity of human experience, and understand more about themselves as individuals and members of society. What they learn can influence their decisions about personal choices, attitudes and values.

In history, pupils find evidence, weigh it up and reach their own conclusions. To do this they need to be able to research, sift through evidence, and argue for their point of view – skills that are prized in adult life.

These results show that education has a significant challenge, and the curriculum statements help to point the way. Nevertheless these excellent curriculum statements fall short since they do not recognise how different ethnic societies have used the materials of their chosen habitats for the purposes of survival, including our own. Ethnic societies have not only developed their own tool-culture according to their chosen habitats, they have made an impact on their habitats.

In addition, those societies with access to metals, and eventually iron, found materials with the potential for new convergent syntheses which could be realised only through intellectual and imaginative activity including visualisation. Thus the history of tool-culture becomes vitally important as the base from which our modern technologies evolved. Indeed, this history provides a rich tapestry of the intellectual and imaginative capabilities of our forebears, but one which is exceptionally difficult for our culture to comprehend.

Finally, education also needs to reflect on the governments' aspirations for a 'prosperous economy', a 'knowledge economy', and to consider the role of Geography, History and a 2nd Language in that context; how we earn our living in the world needs to be understood while dropping the shackles of prejudice dominant in the hidden curriculum.

Appendix 8

Comparison of 6th Form surveys: Cross-curricular themes in 1995-6 and 2001-2

A8.01 Introduction

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.

By the time of the second survey, these themes were thought to be no longer required by the curriculum. However, while discussing the revised questionnaire in pilot trials with some schools, specific requests were made to retain the cross-curricular themes, hence their inclusion and this appendix.

Bar-charts that capture the educational provision for these themes are presented in Figures A78 to A82 for the 1995-6 survey, and B78 to B82 for the 2001-2.

All the graphs are annotated with the questionnaire references in the top left corner, and the school year of the survey in the bottom right corner.

First sight inferences appear with each pair of graphs, and an overall summary for each subject appears at the end of the appendix.

Did you have teachers for Careers Education & Guidance?

The analysis of the survey data for 1995-6 appears in Fig. A78 below, showing that more than 90.9% of girls and 85.7% of boys had teachers for Careers Education & Guidance.

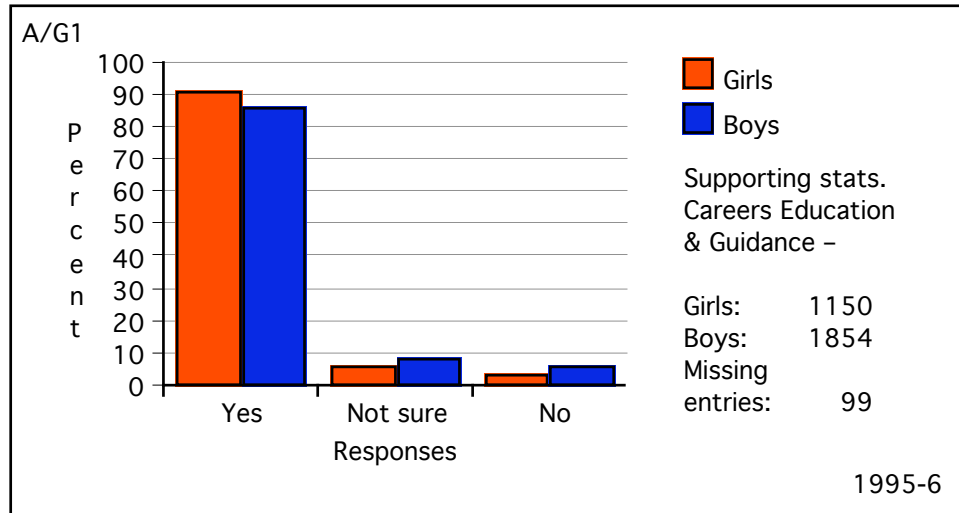


Fig. A78 - Did you have teachers for Careers Education & Guidance?

The comparable analysis for 2001-2 appears below in Fig. B78, showing that some 88.5% of girls and 84.4% of boys had teachers for Careers Education & Guidance. There were small changes over the 1995-6 survey; minus 2.4% and minus 1.3% for girls and boys respectively.

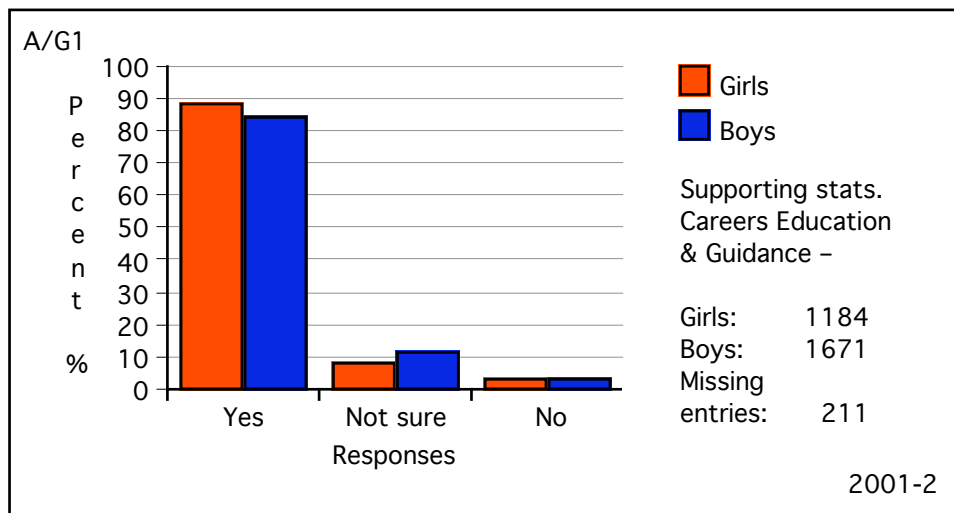


Fig. B78 - Did you have teachers for Careers Education & Guidance?

Did you have teachers for Education for Citizenship?

In the 1995-6 survey, some 10.9% of girls and 11.7% of boys had teachers for Education for Citizenship—see Fig. A79.

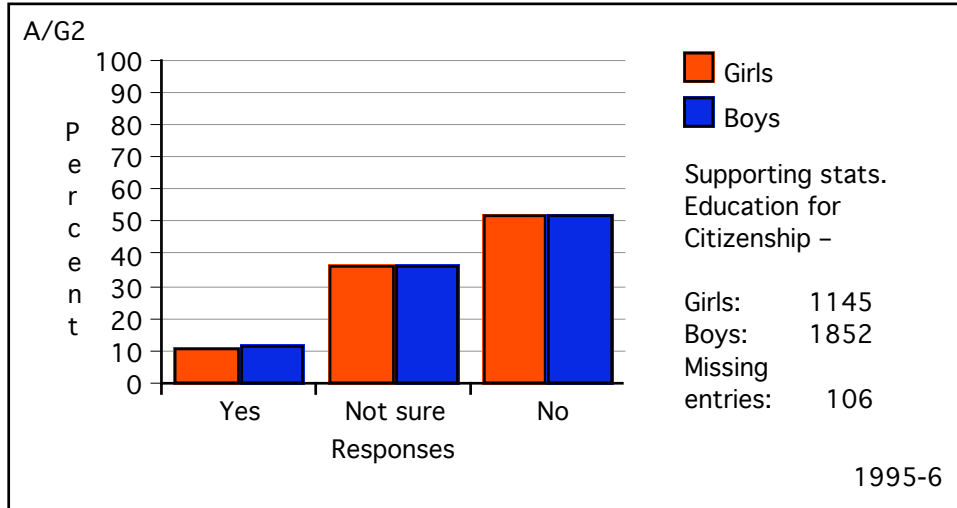


Fig. A79 - Did you have teachers for Education for Citizenship?

The 2001-2 survey disclosed a number of changes; 15.4% and 16.3% of girls and boys respectively had teachers for Education for Citizenship—see Fig. B79 below. So the 'Yes' category increased by some 4.5% and 4.6% respectively.

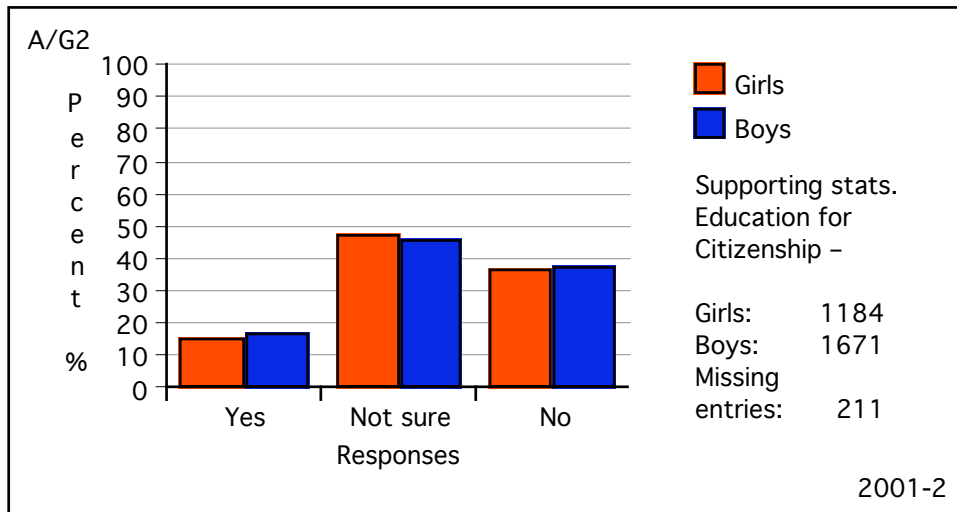


Fig. B79 - Did you have teachers for Education for Citizenship?

Did you have teachers for Education in EIU?

From the 1995-6 survey, 22.6% of the girls and 27.6% of the boys had teachers for Economic and Industrial Understanding—see Fig. A80 below.

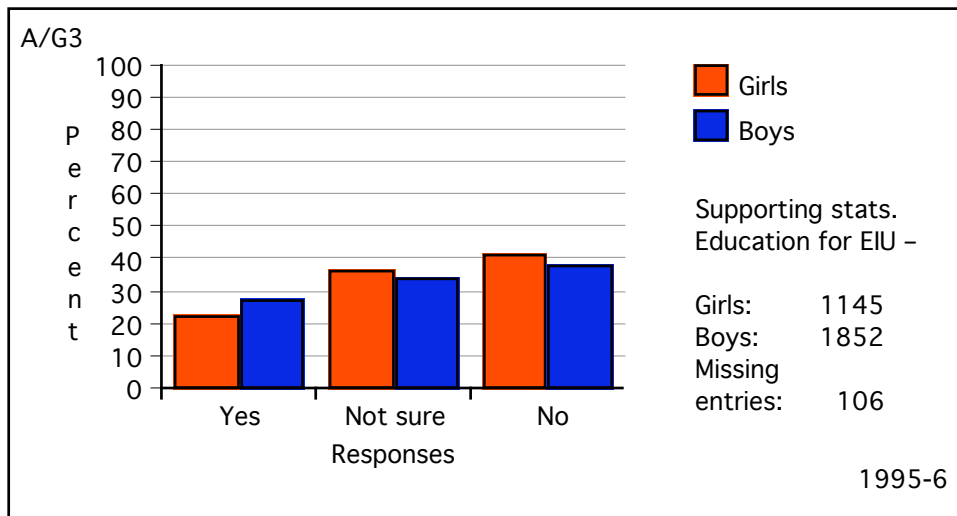


Fig. A80 - Did you have teachers for Education in EIU?

The 2001-2 survey disclosed that only 11.3% of the girls and 22.7% of the boys had teachers for EIU—see Fig. B80 below. Hence the latest survey discloses a perception that there were 11.3% and 4.9% fewer teachers for Education in Economic and Industrial Understanding by girls and boys respectively.

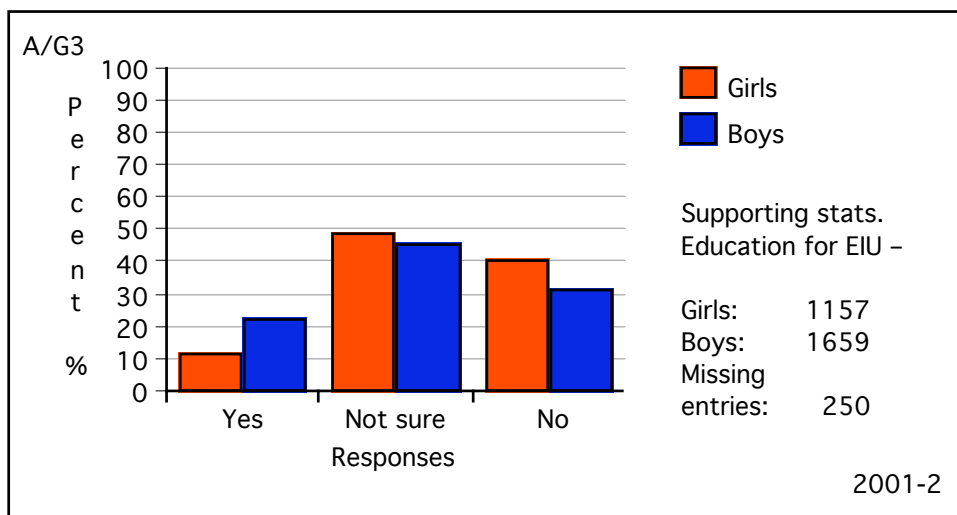


Fig. B80 - Did you have teachers for Education in EIU?

Did you have teachers for Environmental Education?

In the survey of 1995-6, it was found that 29.8% of girls and 27.5% of boys had teachers for Environmental Education—see Fig. A81 below.

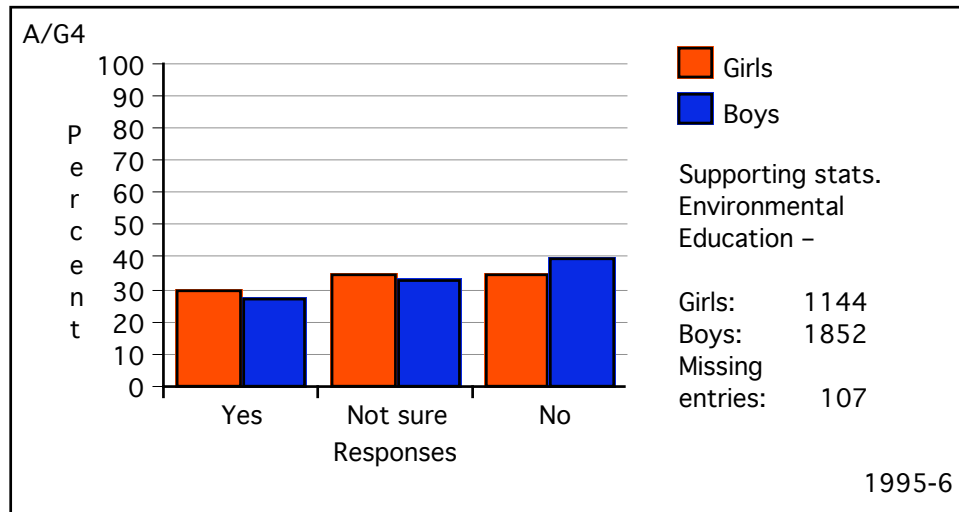


Fig. A81 - Did you have teachers for Environmental Education?

The 2001-2 survey disclosed that only 16% of girls and 20.9% of boys had teachers for Environmental Education—see Fig. B81 below. Hence the latest survey discloses a perception that there were 13.8% and 6.6% fewer teachers for Environmental Education by girls and boys respectively.

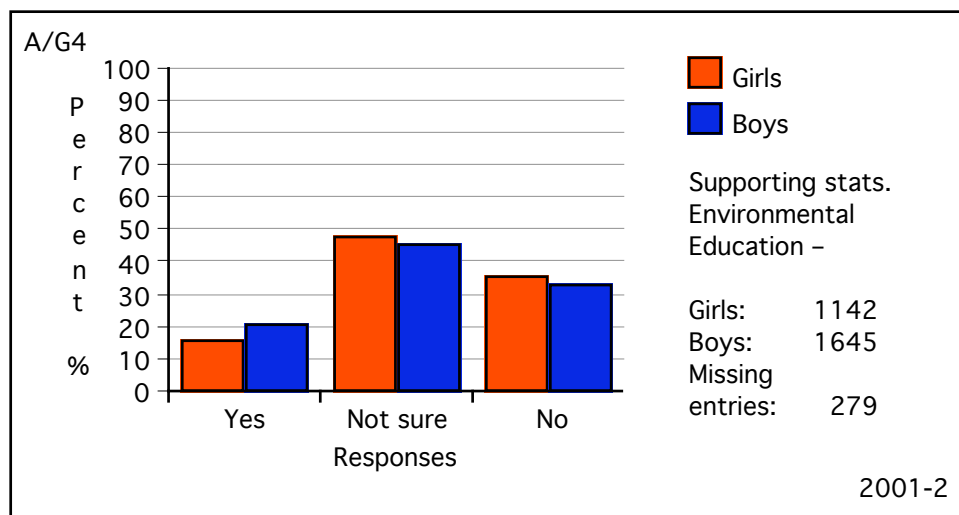


Fig. B81 - Did you have teachers for Environmental Education?

Did you have teachers for Health Education?

Some 73.1% of girls and 59.9% of boys had teachers for Health Education in the 1995-6 survey—see Fig. A82 below.

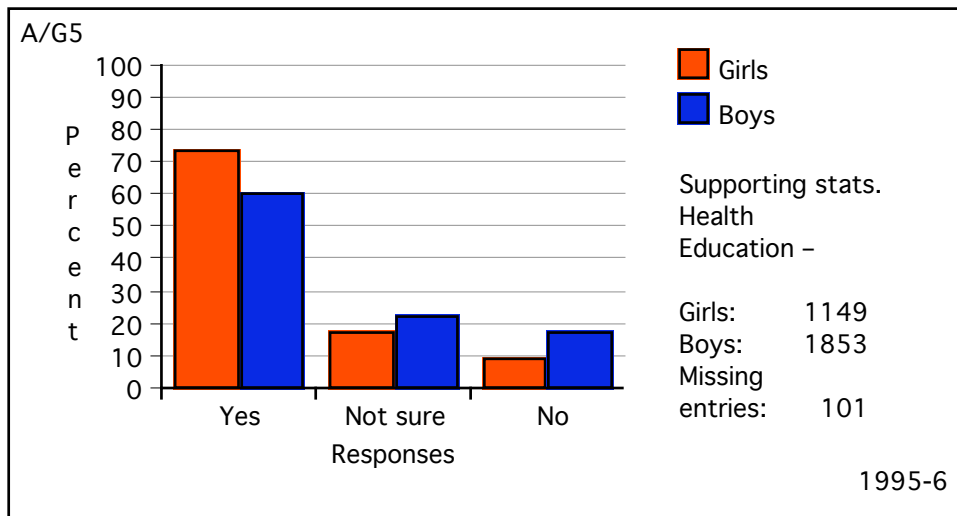


Fig. A82 - Did you have teachers for Health Education?

And for the 2001-2 survey, 65.9% of girls and 54% of boys had teachers for Health Education—see Fig. B82 below. So the latest survey discloses a perception that there were 7.2% and 5.9% fewer teachers for Health Education by girls and boys respectively.

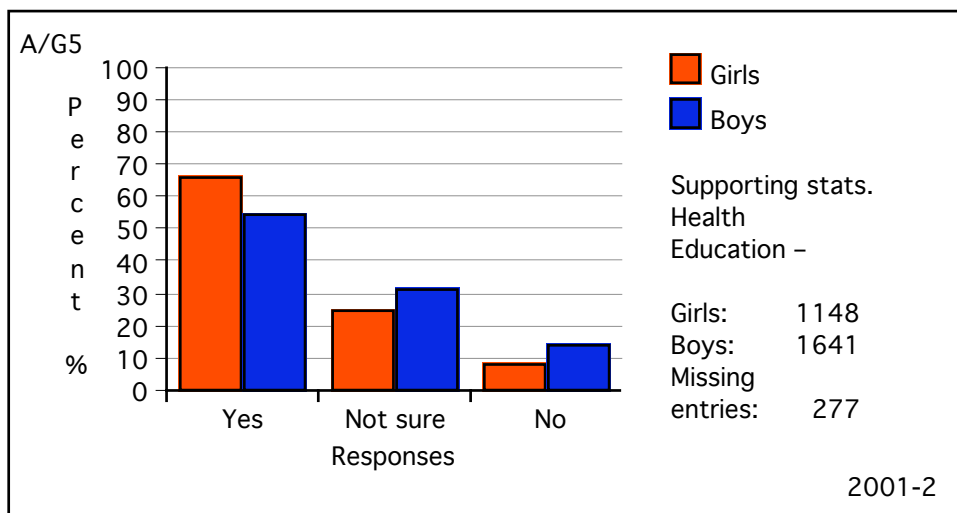


Fig. B82 - Did you have teachers for Health Education?

A8.02 - Summarising the educational provision for cross-curricular themes

Fig. AB83 below offers a tabular summary of the cross-curricular educational provision as perceived by this A-level student population.

Themes	A		B		C		D		E	
Gender	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Yes % 1995-6	90.9	85.7	10.9	11.7	22.6	27.6	29.8	27.5	73.1	59.9
Yes % 2001-2	88.5	84.4	15.4	16.3	11.3	22.7	16.0	20.9	65.9	54.0
Changes %	-2.4	-1.3	+4.5	+4.6	-11.3	-4.9	-13.8	-6.6	-7.2	-5.9

Fig. AB83 - Summary of cross-curricular educational provision - comparisons between 1995-6 and 2001-2

The legend for Fig. AB83 was as follows:

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

The main changes were:

- The changes in perceived provision for Careers Education & Guidance for girls was minus 2.4%, and for boys minus 1.3%—see Figures A78 and B78.
- An improvement in the provision for Education for Citizenship by 4.5% for girls, and 4.6% for boys—see Figures A79 and B79.
- Girls recorded a sharp reduction in educational provision for EIU from 22.6% to 11.3%, and boys from 27.6% to 22.7%—see Figures A80 and B80.
- There was a perceived reduction in the provision for Environmental Education, by 13.8% for girls, and 6.6% for boys—see Figures A81 and B81.
- There was also a perceived reduction in the provision for Health Education, by 7.2% for girls, and 5.9% for boys—see Figures A81 and B81.

These results present some causes for concern. As citizens we are without exception part of the economic fabric of society, and the overwhelming support for Careers Education & Guidance makes sense. However, in employment, do we become consumers or creators of wealth? So in this context, the result for EIU presents serious causes for concern.

A8.03 - Overloaded curriculum - cross curricular themes and student thoughts

As first implemented, the 1988 National Curriculum was overloaded. The Secretary of State

for Education ordered an enquiry 'to look into the scope for slimming'—Dearing (1993:1). The bar charts above present a picture of the provision, after the introduction of the revised National Curriculum. But what do A-level students think about cross-curricular themes? Should they be part of the National Curriculum? The data-gathering instrument offered students the opportunity to respond to these questions; their answers are presented below.

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

In the survey of 1995-6, some 89.5% of girls and 84.7% of boys thought Careers Education & Guidance should have a place in the National Curriculum—see Fig. A84 below.

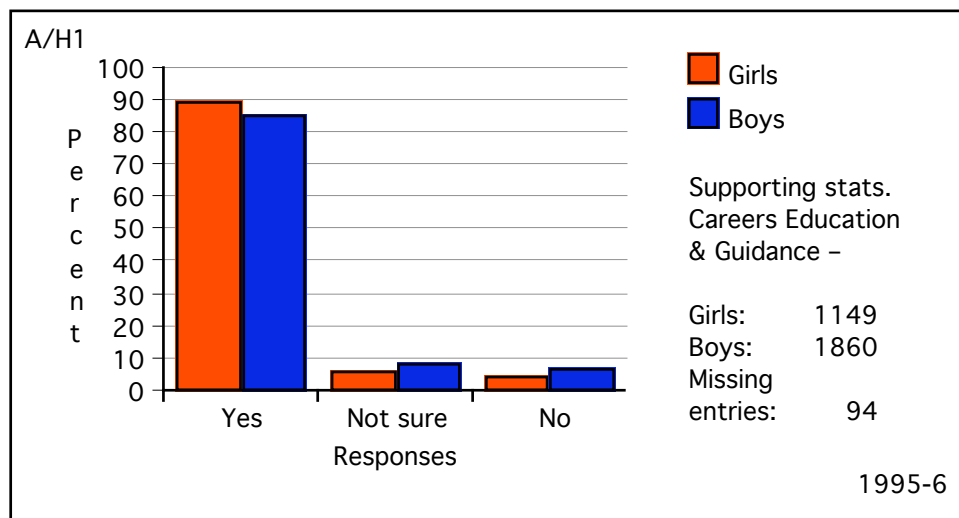


Fig. A84 - Should Careers Education & Guidance have a place in the National Curriculum?

For the survey of 2001-2, 86.6% of girls and 79.7% of boys thought Careers Education & Guidance should have a place in the National Curriculum—see Fig. B84 below. So the trends between the two surveys were negative by 2.9% and 5% respectively.

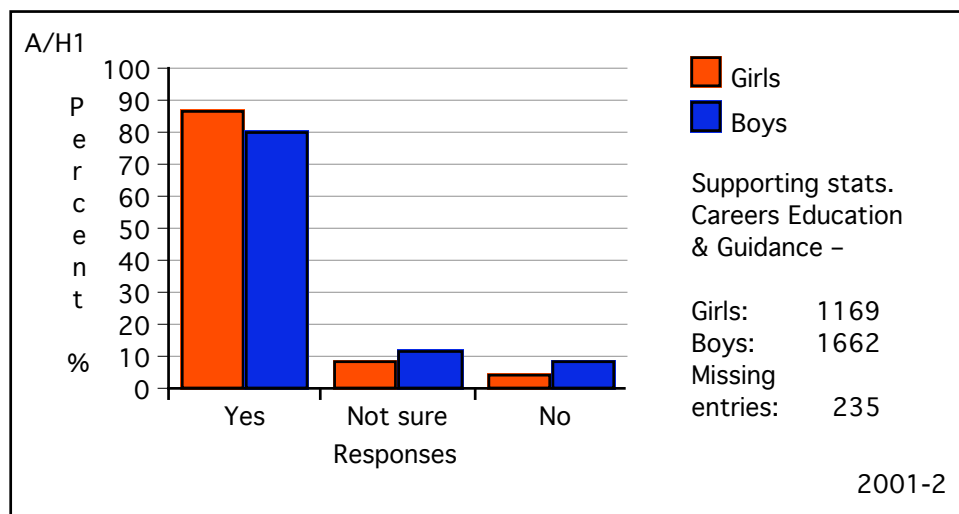


Fig. B84 - Should Careers Education & Guidance have a place in the National Curriculum?

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

From Fig. A85 below, some 29% of girls and 28.1% of boys thought that Education for Citizenship should have a place in the National Curriculum in the 1995-6 study.

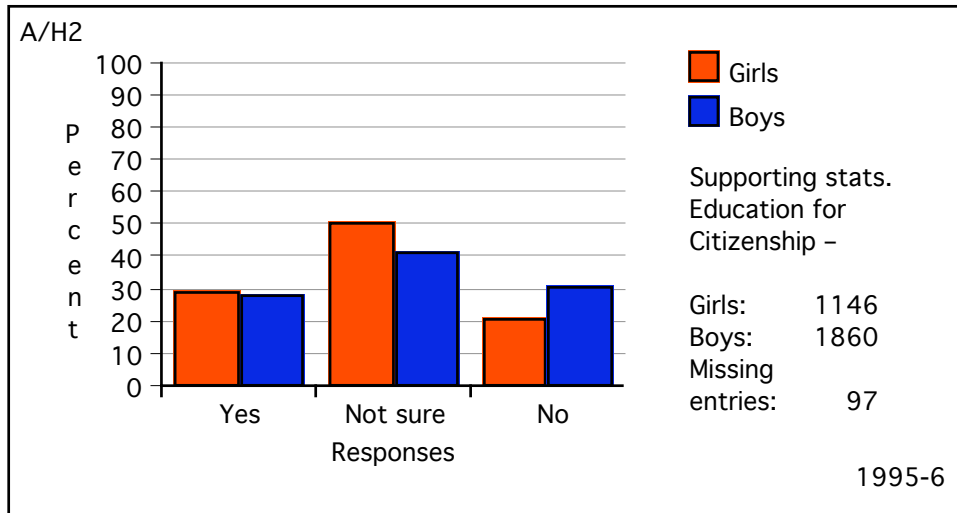


Fig. A85 - Should Education for Citizenship have a place in the National Curriculum?

From Fig. B85 below, some 30.3% of girls and 26.9% of boys thought that Education for Citizenship should have a place in the National Curriculum in the survey of 2001-2; there was no significant change.

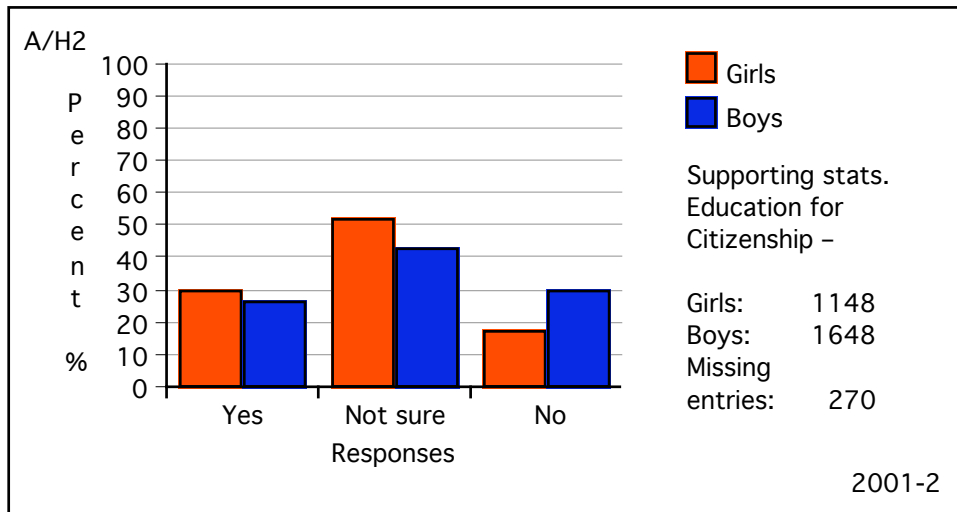


Fig. B85 - Should Education for Citizenship have a place in the National Curriculum?

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

In the 1995-6 survey, 49.7% of girls and 54.4% of boys thought that Education for Economic & Industrial Understanding should have a place in the National Curriculum—see Fig. A86 below.

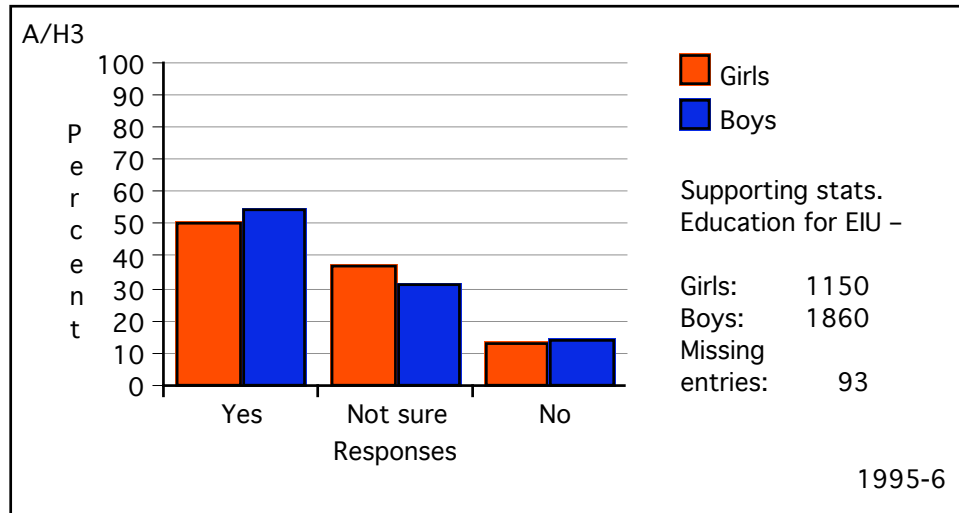


Fig. A86 - Should Education for Economic & Industrial Understanding have a place in the National Curriculum?

In the study for 2001-2, 37.1% of girls and 45.8% of boys thought that Education for Economic & Industrial Understanding should have a place in the National Curriculum—see Fig. B86 below. Hence the responses to this parameter deteriorated by some 12% and 8% respectively.

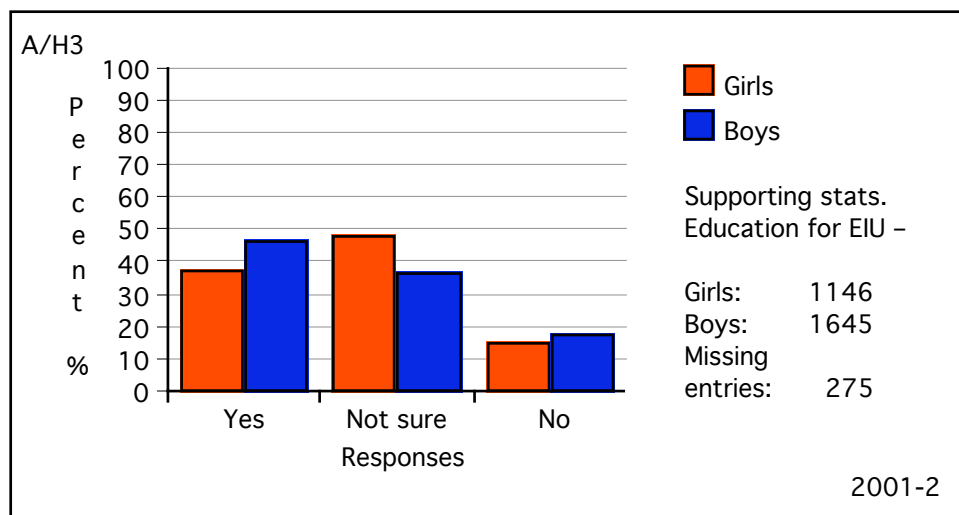


Fig. B86 - Should Education for Economic & Industrial Understanding have a place in the National Curriculum?

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

The 1995-6 survey showed that 73% of girls and 59.5% of boys considered Environmental Education should have a place in the National Curriculum—see A87 below.

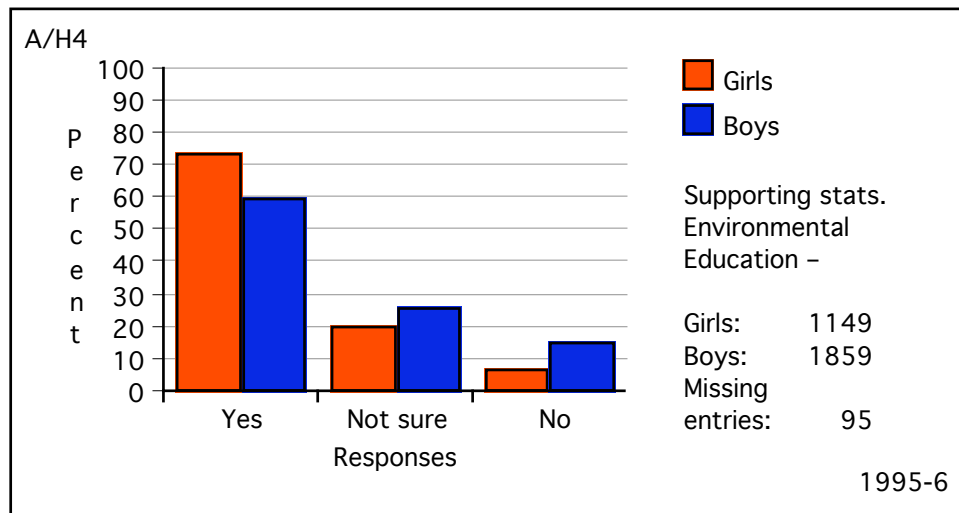


Fig. A87 - Should Environmental Education have a place in the National Curriculum?

The 2001-2 survey disclosed a significant change; only 53.4% of girls and 49.9% of boys considered Environmental Education should have a place in the National Curriculum—see Fig. B87 below. Hence the responses to this parameter deteriorated by some 19% and 9% respectively.

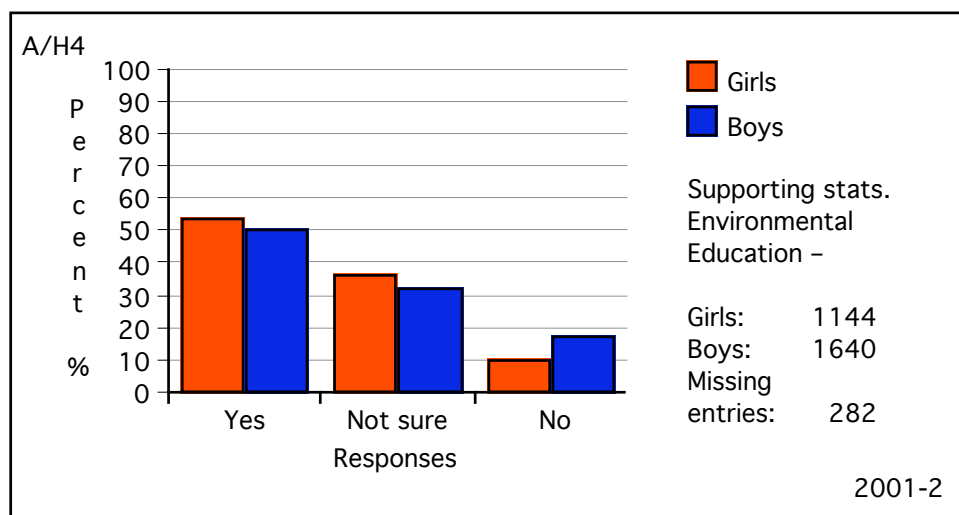


Fig. B87 - Should Environmental Education have a place in the National Curriculum?

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

From the 1995-6 survey, it may be seen that some 92.8% of the girls and 81.8% of the boys thought that Health Education should have a place in the National Curriculum—see Fig. A88 below.

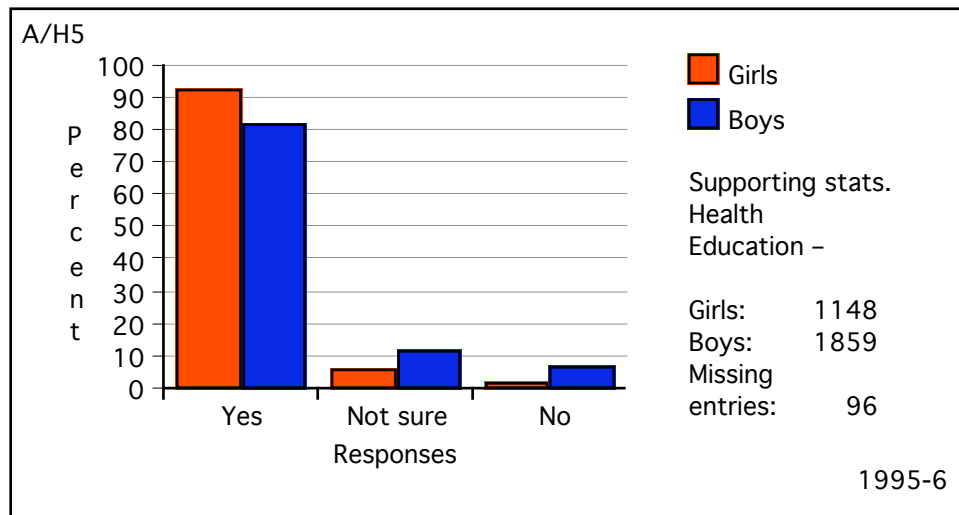


Fig. A88 - Should Health Education have a place in the National Curriculum?

In the 2001-2 survey, 89% of girls and 75.3% of boys thought that Health Education should have a place in the National Curriculum—see Fig. B88. So there was a decline of 3.8% for girls and 6.5% for boys in the numbers who thought health education should have a place in the National Curriculum, but the values were still high.

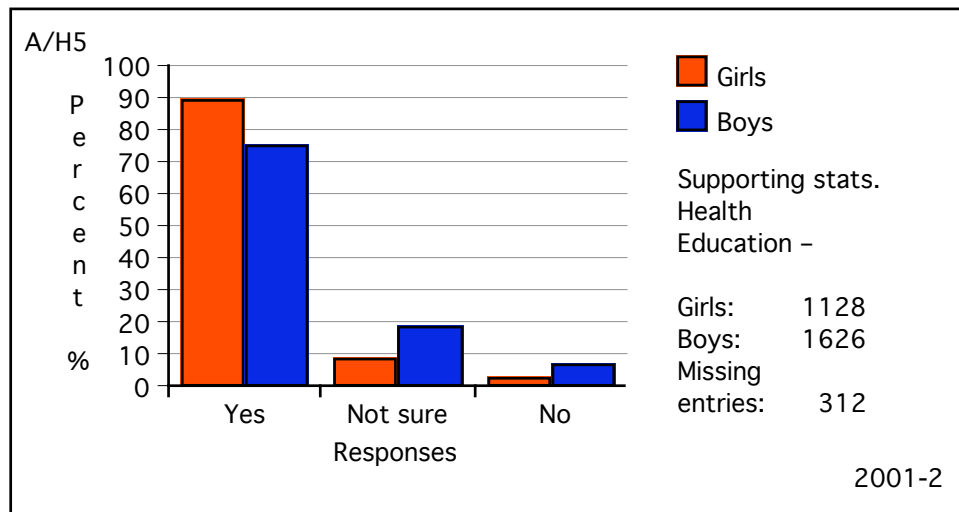


Fig. B88 - Should Health Education have a place in the National Curriculum?

A8.04 - Summarising whether Cross-curricular themes should be in the National Curriculum

Fig. AB89 below offers a tabular summary of student opinions on whether the cross-curricular themes should be in the 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. AB89 provides a tabular summary of the changes between the two surveys, and enables more direct comparison.

Themes	A		B		C		D		E	
Gender	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Yes % 1995-6	89.5	84.7	29.0	28.1	49.7	54.4	73.0	59.5	92.8	81.8
Yes % 2001-2	86.6	79.7	30.3	26.9	37.1	45.8	53.4	49.9	89.0	75.3
Changes %	-2.9	-5.0	+1.3	-1.2	-12.6	-8.6	-19.6	-9.6	-3.8	-6.5

*Fig. AB89 - 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?*

Between the first and second surveys there was little change in parameter 'B'; all other parameters produced a downward trend. The main changes over the first survey were:

- 86.6% of girls and 79.7% of boys thought that Careers Education & Guidance should be in the curriculum. Although these results were relatively high, they were lower than the earlier survey by 2.9% for girls, and 5.0% for boys—see Figures A83 and B83.
- 30.3% of girls and 26.9% of boys considered that Education for Citizenship should be in the curriculum, disclosing negligible change—see Figures A84 and B84.
- 37.1% of girls and 45.8% of boys thought EIU should be in the curriculum, representing a change of minus 12.6% for girls and minus 8.6% for boys.—see Figures A85 and B85.
- 53.4% of girls and 49.9% of boys considered Environmental Education should be in the curriculum, a decline of 19.6% for girls, and 9.6% for boys—see Figures A86 and B86.
- 89.0% of girls, and 75.3% of boys thought Health Education should be in the curriculum. Although relatively high, these figures still represent falls of 3.8% and 6.5% respectively—see Figures A87 and B87.

There are a number of aspects with these results that present causes for serious 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 very disappointing.

Appendix 9

Comparison of 6th Form surveys: dependency on Commerce, Finance and Industry in 1995-6 and 2001-2

A9.01 Introduction

Commerce, Finance and Industry in education

For both surveys the data gathering instrument sought answers to the following questions:

- As a modern society, how dependent do you think we are on commerce,
- As a modern society, how dependent do you think we are on finance,
- As a modern society, how dependent do you think we are on industry.

The results are presented as graphs in the following pages. All the graphs are annotated with the questionnaire references in the top left corner, and the school year of the survey in the bottom right corner; they are shown two to a page to enable direct comparison.

First sight inferences appear with each pair of graphs, and an overall summary for each subject appears at the end of the appendix.

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

From Fig. A90 below, it may be seen that with a median value of 7 by both girls and boys, our dependency on Commerce was fairly highly rated in the survey of 1995-6.

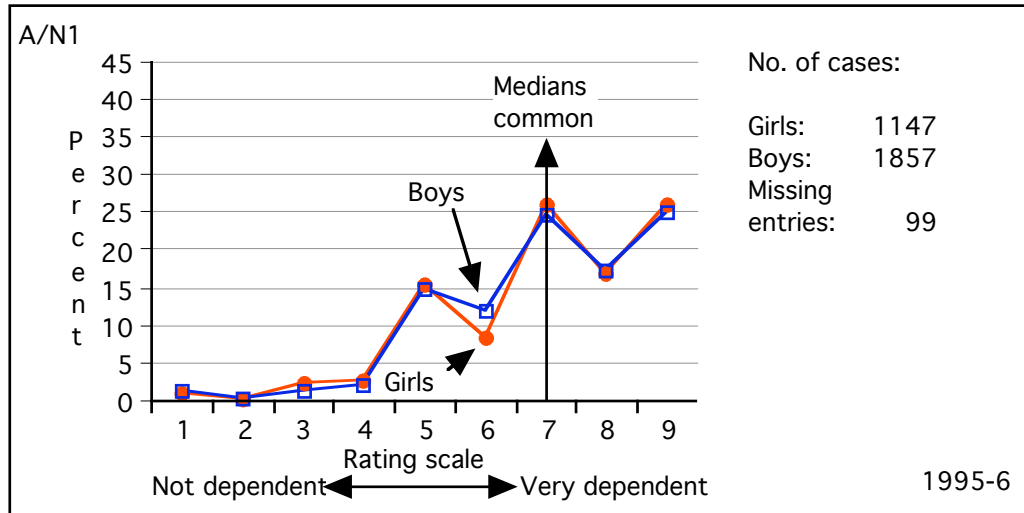


Fig. A90 - As a modern society, how dependent do you think we are on Commerce?

The study of 2001-2 showed no change as confirmed by Fig. B90 below; both girls and boys scored a median value of 7, so our dependency on Commerce was fairly well understood. However, if our role as a trading nation was properly understood, then the score for both surveys would have been at least 8.

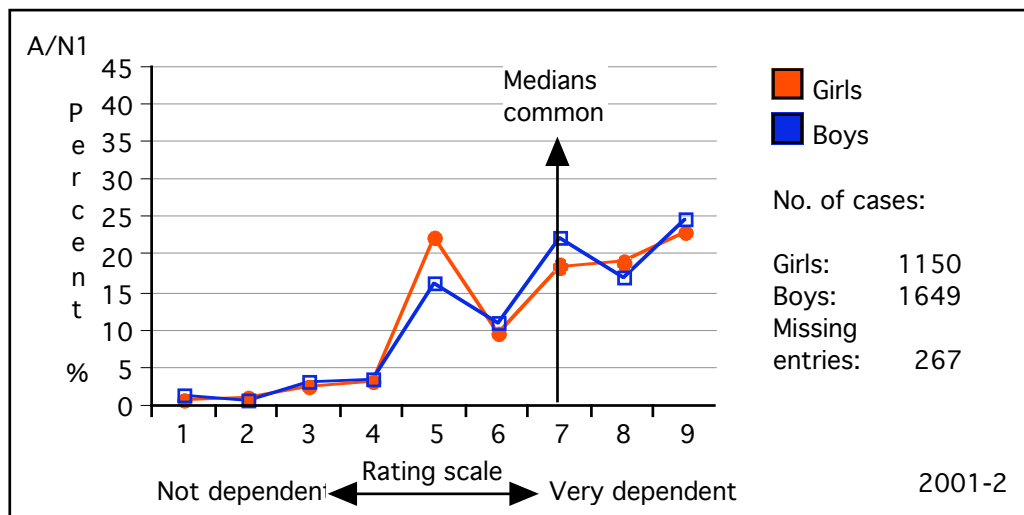


Fig. B90 - As a modern society, how dependent do you think we are on Commerce?

The median values in these graphs are rounded figures as determined by the software. For a comparative study, the unrounded medians were required to determine whether there was any real change, and these appear at the end of the appendix.

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

From Fig. A91, the 1995-6 survey showed that with 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.

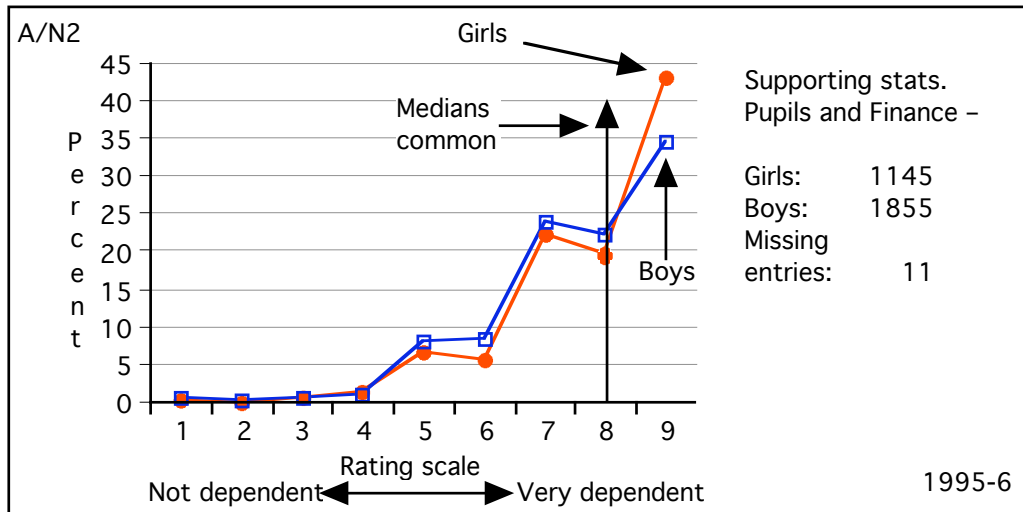


Fig. A91 - As a modern society, how dependent do you think we are on Finance?

The 2001-2 survey disclosed no change as may be seen from Fig. B91 below; the median value was common at 8 for both girls and boys.

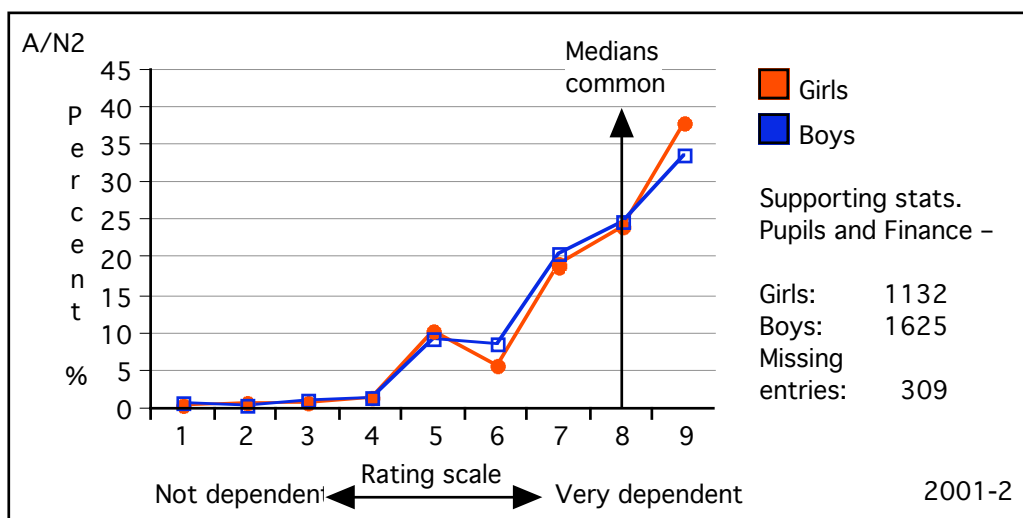


Fig. B91 - As a modern society, how dependent do you think we are on Finance?

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

From Fig. A92 below, 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 in the study of 1995-6.

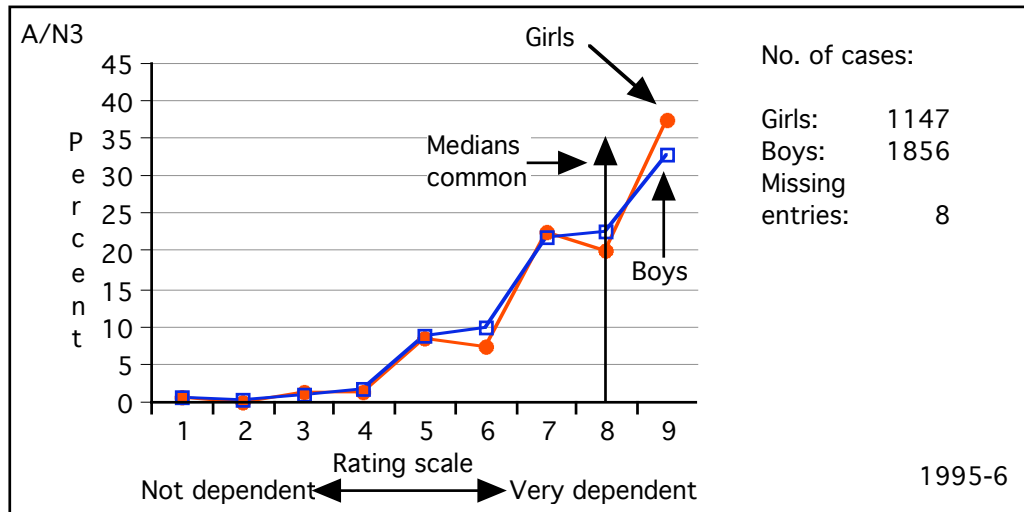


Fig. A92 - As a modern society, how dependent do you think we are on Industry?

The Fig. B92 below, shows that the survey of 2001-2 produced no change by comparison with the earlier study. Both girls and boys continued to rate our dependency on Industry at a median of 8, which should be expected as a minimum for a trading nation.

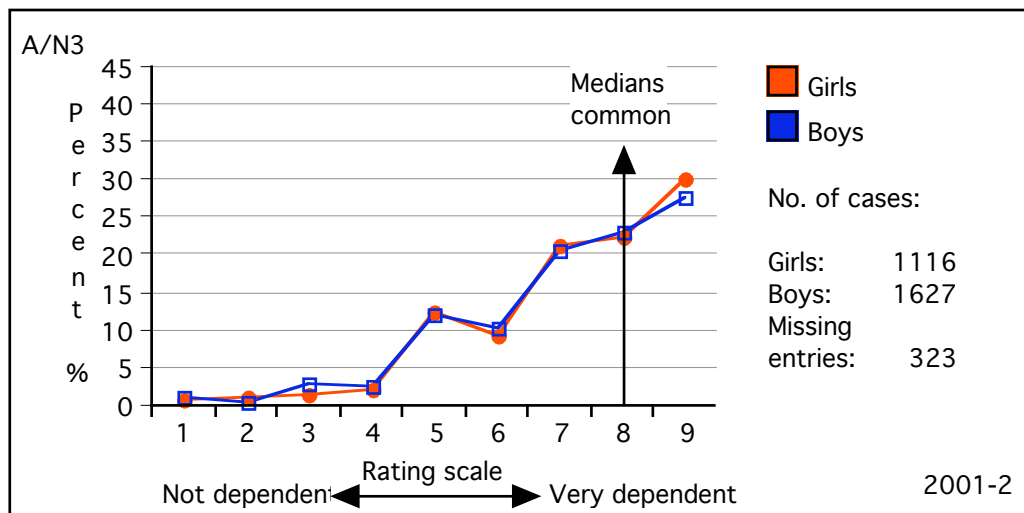


Fig. B92 - As a modern society, how dependent do you think we are on Industry?

The median values in these graphs are rounded figures as determined by the software. For a comparative study, the unrounded medians were required to determine whether there was any real change, and these appear at the end of the appendix.

A9.02 - Summary of findings for perceived dependence on commerce, finance and industry by girls

Fig. AB93/1 below provides a detailed summary of the changes between the two surveys.

Parameters of analysis - see below	Comparison of unrounded medians for A-level Girls for various parameters		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level Girls for various parameters - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
1.	7.24	7.07	69.40%	60.40%	-9.00%
2.	8.14	7.99	84.90%	80.40%	-4.50%
3.	7.86	7.59	79.90%	73.00%	-6.90%

Parameters of analysis :
 1. As a modern society, how dependent do you think we are on commerce? - (A/N1)
 2. As a modern society, how dependent do you think we are on finance? - (A/N2)
 3. As a modern society, how dependent do you think we are on industry? - (A/N3)

Fig. AB93/1 - Summary of changes between surveys for perceived dependence on commerce, finance and industry by female A-level students

Fig. AB93/1 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys, as perceived by female A-level students. The greatest degree of comprehension of the importance of these parameters should be recorded against ratings 7, 8 and 9. The main points include:

- Our perceived dependence on commerce fell by 9% from 69.4% to 60.4%.
- Our perceived dependence on finance fell by 4.5% from 84.9% to 80.4%.
- Our perceived dependence on industry fell by 6.9% from 79.9% to 73%.

Hence all the unrounded medians, and the percentage totals for ratings 7, 8 and 9 declined. As a trading and industrial society, these results for female A-level students present serious causes for concern.

A9.03 - Summary of findings for perceived dependence on commerce, finance and industry by boys

Fig. AB93/2 below provides a detailed summary of the changes between the two surveys.

Parameters of analysis - see below	Comparison of unrounded medians for A-level Boys for various parameters		Comparison of combined totals on ratings 7, 8 and 9 (and the change) for A-level Boys for various parameters - %		
	1995-6 survey	2001-2 survey	1995-6 survey	2001-2 survey	Change
	1.	7.19	7.12	67.30%	63.60%
2.	7.80	7.83	80.70%	78.40%	-2.30%
3.	7.74	7.51	77.30%	70.40%	-6.90%

Parameters of analysis :
 1. As a modern society, how dependent do you think we are on commerce? - (A/N1)
 2. As a modern society, how dependent do you think we are on finance? - (A/N2)
 3. As a modern society, how dependent do you think we are on industry? - (A/N3)

Fig. AB93/2 - Summary of changes between surveys for perceived dependence on commerce, finance and industry by male A-level students

Fig. AB93/2 compares the unrounded medians and the combined percentage totals at ratings 7, 8 and 9 for the two surveys for male A-level students. The greatest degree of comprehension of the importance of these parameters should be recorded against ratings 7, 8 and 9. The main points include:

- Our perceived dependence on commerce fell by 3.7% from 67.3% to 63.6%.
- Our perceived dependence on finance fell by 2.3% from 80.7% to 78.4%.
- Our perceived dependence on industry fell by 6.9% from 77.3% to 70.4%.

The percentage totals for ratings 7, 8 and 9 have declined. Although the loss in perceived dependence on finance at -2.3% was the lowest, these results for male A-level students nevertheless present causes for concern since the UK is a trading and industrial society. Commercial, financial and industrial activity underpins how we earn our living in the world.

Bibliography

- Argyle M, *Social Interaction*, 1976, Tavistock Publications, Methuen & Co Ltd, London.
- Baker K *Design and Technology for ages 5 to 16*, DES 1989a, HMSO, London.
- Barnes D *Practical Curriculum Study*, 1982, Routledge & Kegan Paul, London.
- Barnett C *The Audit of War: The Illusion and Reality of Britain as a Great Nation*, 1986, this ed PAPERMAC 1990, Macmillan London Limited, London.
- Boronski T *Knowledge: Sociology in Focus Series*, 1st ed 1987, this ed 1988, Longman, London.
- Bowers B *Electricity in Britain*, 1990 Understanding Electricity, Educational Service, Electricity Association Services Ltd, London.
- Bronowski J *The Ascent of Man*, 1st ed 1973, this ed 1979, The BBC, London.
- Byers A *The Willing Servants - A history of electricity in the home*, Educational Service, 1988, The Electricity Council.
- Clarendon, Earl of, 1864 *Report of Her Majesty's Commissioners appointed to inquire into the Revenues and Management of Certain Colleges and Schools, and the studies pursued and instruction given therein. [the Clarendon Report]* Published 1864.
- Cotterell B and Kamminga J *Mechanics of pre-industrial technology*, 1990, CUP, Cambridge.
- Craft A *Indoctrination or Empowerment? The Case of Economic and Industrial Understanding*, in A. Ahier and A. Ross (Eds) *The Social Subjects within the Curriculum*, 1995, The Falmer Press, London.
- Dahrendorf, R, *Europe: some are more equal*, *The Listener*, 1976, Vol 96, pp 458-460, 14th October, BBC, London.
- Dearing R *Final Report - The national curriculum and its Assessment*, SCAA, 1993, London.
- Green Paper *14-19: Extending opportunities, raising standards*, published by DfES February 2002.
- Hampden-Turner C and Trompenaars F *The Seven Cultures of Capitalism: Value systems for creating wealth in the United States, et al*, 1st ed 1993, Doubleday, NY, this ed 1995, Judy Piatkus Ltd, London.
- Handy C Professor *Schools for life and work*, in *Living Education*, Edited by Mortimore P, and Little V, 1997, Paul Chapman, London.
- Kendall, M G and Stuart A *The Advanced Theory of Statistics*, first pub 1958, this ed 1963, Charles Griffin, London.
- Landels J G *Engineering in the Ancient World*, 1st ed 1978, this ed 1997, Constable & Co Ltd, London.
- Lawton D *Class, Culture and the Curriculum*, 1975, Routledge & Kegan Paul, London and Boston.

- Margolis E
Soldatenko M
Acker S and
Gair M *The Hidden Curriculum in Higher Education*, 2001, Routledge, NY and London.
- Merrill R S *Technology: The Study of Technology*, International Encyclopaedia of the Social Sciences, v15, p 585, 1965, Macmillan, London.
- Morris E Secretary of State for Education and Skills, Foreword to Green Paper *Extending Opportunities, Raising standards*, Feb 2002, The Stationery Office.
- NACCCE report *All our futures: Creativity, Culture and Education* published by the National Advisory Committee on Creative and Cultural Education, 1999.
- Owers S Doctoral thesis: *The place and perception of technology in the curriculum: historical developments up to 1997*, 2001, Anglia Polytechnic University.
- Pacey A *The Culture of Technology*, 8th printing 1996, 1st ed 1983, MIT Press, Cambridge, Mass.
- Penfold J *Craft, design and technology: past, present and future*, 1988, Trentham Books, UK.
- Pinder R *Why don't teachers teach like they used to?*, 1987, Hilary Shipman, London.
- Pirsig R M *Zen and the Art of Motorcycle Maintenance: An Inquiry into Values*, 1st ed 1974, this ed 1999, Vintage, London.
- Poulter J D *An early history of electricity supply*, 1986, Peter Peregrinus, Ltd, London.
- Poyatos F *New Perspectives on Nonverbal Communication*, 1983, Pergamon Press, Oxford.
- Rae J *Our Obsolete Attitudes: Education & the National Malaise, Encounter*, 1977, Vol. 49 pp10-17. Headmaster of Westminster School in London, and former headmaster of Harrow public school.
- Redhead B *Thanks to Industry*, 1986, Video produced for The Royal Society for the encouragement of the Arts, Manufactures, and Commerce.
- Rolt L T C *Tools for the Job: A short history of machine tools*, 1965, B. T. Batsford Ltd, London.
- RSA Royal Society for the encouragement of Arts, Manufactures and Commerce.
- Schick K D
and Toth N *Making Silent Stones Speak*, 1st ed. 1993, this ed. 1995, Phoenix, London.
- Select
Committee,
1868 *Report from the Select Committee on the Provisions for giving Instruction in Theoretical and Applied Science to the Industrial Classes*, The House of Commons, July 1868.
- Sharon D *Technical illiteracy*, *EDUCATION*, 21 July 1989, London.

- Smiles S *Industrial Biography: Iron Workers and Toolmakers*, 1863, John Murray, London.
- Snow C P
(Lord Snow) *The Two Cultures*, Cambridge University Press, 1st ed 1959, this ed 1965.
- Spencer H *Education: Intellectual, Moral and Physical*, 1861, Williams & Norgate, London.
- Taunton *Report of the Royal Commission known as the Schools Inquiry Commission [the Taunton Report]* 1868, The House of Commons, London.
- Usher A P *A history of mechanical inventions*, 1954, Harvard University Press.
- Velleman P F *Data Desk 4: Handbook Volume 1*, 1992, Data Description, NY.
- Williams R *Keywords: A vocabulary of culture and society*, Fontana Press, 1st edition 1976, this edition 1988, London.
- Whitehead A N *The Aims of Education*, first pub 1932, this ed 1966, Ernest Benn Ltd, London.
- Wiener M J *English Culture and the decline of the Industrial Spirit 1850–1980*, first published 1981, this ed 1987, Penguin Books, London.
- Woodbury R S *History of the Gear-cutting machine: A Historical Study in Geometry and Machines*, 1972a, MIT Press, Massachusetts, and London.
- Woodbury R S *History of the Lathe to 1850, A Study in the Growth of a Technical Element of an Industrial Economy*, 1 of 4 monologues pub. 1972d, MIT Press, Massachusetts, and London.

6th Form Survey 1996	Please do not fold this form Please do not use paper clips or staples on this form
<p>Note 1: This form is designed to be completed by 6th Form Pupils Note 2: Here is some information to help you complete this form: • Please answer each question or part of a question. • You indicate your answer by making a bold line — in one of the faint brackets marked from 1 to 9. • Please use a black or blue ball-point pen or HB pencil. • The brackets and numbers are faint so that the machine will 'read' only the marks you make on this form. • Thank you for your help in this research. Here is an example of how to make your answer.</p>	
<p>1 2 3 4 5 6 7 8 9</p>	
<p>Part A. Please indicate whether you are female 1 2 or male 3 4</p>	
<p>Part B. In which year of your studies are you? First year 1 2 or Second year 3 4</p>	
<p>Part C. Please indicate which subjects you are taking at 'A' level.</p>	
C1. Art: 1 2 3 4 5	C6. Maths: 6 7 8 9
C2. Design & Technology: 1 2 3 4 5	C7. Modern Foreign Languages: 6 7 8 9
C3. English: 1 2 3 4 5	C8. Science: 6 7 8 9
C4. Geography: 1 2 3 4 5	C9. Other – please define: 6 7 8 9
C5. History: 1 2 3 4 5 6 7 8 9
<p>Part D. How much interest do you have in each one of the following subjects at the moment:</p>	
D1. D & T: low interest 1 2 3 4 5 6 7 8 9 high interest	
D2. English: low interest 1 2 3 4 5 6 7 8 9 high interest	
D3. Maths: low interest 1 2 3 4 5 6 7 8 9 high interest	
D4. Science: low interest 1 2 3 4 5 6 7 8 9 high interest	
<p>Part E. In your opinion, how difficult is each one of the following subjects: :</p>	
E1. D & T: not difficult 1 2 3 4 5 6 7 8 9 very difficult	
E2. English: not difficult 1 2 3 4 5 6 7 8 9 very difficult	
E3. Maths: not difficult 1 2 3 4 5 6 7 8 9 very difficult	
E4. Science: not difficult 1 2 3 4 5 6 7 8 9 very difficult	
<p>Part F. For most people, when it comes to getting a job, how important do you consider each of the following curriculum subjects:</p>	
F1. D & T: unimportant 1 2 3 4 5 6 7 8 9 very important	
F2. English: unimportant 1 2 3 4 5 6 7 8 9 very important	
F3. Maths: unimportant 1 2 3 4 5 6 7 8 9 very important	
F4. Science: unimportant 1 2 3 4 5 6 7 8 9 very important	
F5. 2nd language unimportant 1 2 3 4 5 6 7 8 9 very important	

*Attachment 1/1 - Questionnaire for 1995-96 school year
page 1*

The image shown above is a 75% copy of the original questionnaire, and was reduced for the purposes of presentation here.

Part L. In your opinion, how creative does the curriculum allow <u>you</u> to be in <u>each one</u> of the following subjects:											
L1. Art	not creative	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very creative
L2. D& T:	not creative	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very creative
L3. English:	not creative	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very creative
L4. Maths:	not creative	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very creative
L5. Science:	not creative	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very creative
L6. 2nd language	not creative	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very creative
Part M. As a modern society, how dependent do <u>you</u> think we are on <u>each one</u> of the following subjects:											
M1. Art	not dependent	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very dependent
M2. D& T:	not dependent	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very dependent
M3. English:	not dependent	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very dependent
M4. Maths:	not dependent	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very dependent
M5. Science:	not dependent	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very dependent
Part N. As a modern society, how dependent do you think we are on <u>each of the following</u> :											
N1. Commerce:	not dependent	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very dependent
N2. Finance:	not dependent	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very dependent
N3. Industry:	not dependent	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	very dependent
Part O. Here is a list of professional occupations. How do <u>you</u> personally see the standing of <u>each one</u> in <u>our society</u> ?											
O1. Accountant:	low standing	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	high standing
O2. Artist:	low standing	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	high standing
O3. Doctor (GP):	low standing	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	high standing
O4. Engineer:	low standing	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	high standing
O5. Lawyer:	low standing	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	high standing
O6. Pilot (Civil):	low standing	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	high standing
O7. Policeman:	low standing	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	high standing
O8. Politician:	low standing	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	high standing
O9. Teacher:	low standing	1:1:1	[2]	1:3:1	[4]	1:5:1	[6]	1:7:1	[8]	1:9:1	high standing
[Printer Offset 0.026" - 19.04.1996]										[Form 5]	

6th Form Survey 2001

**Please do not fold this form
Please do not use paper clips or staples on this form**

This form is designed to be completed by AS/A2 Students

- Please answer each question or part of a question.
- You indicate your answer by making a bold line — in one of the faint brackets marked from 1 to 9.
- Please use a black or blue ball-point pen or HB pencil.
- The brackets and numbers are faint so that the machine will 'read' only the marks you make on this form.
- Thank you for your help in this research. Here are two examples of how to make your answer.

1 2 3 4 5 6 7 8 9
1 2 3 4 5 6 7 8 9

Part A. Please indicate whether you are female or male

Part B. In which year of your studies are you? First year or Second year

Part C. Please indicate which subjects you are taking at 'A' level.

- | | | | |
|--------------------------|--------------------------|----------------------------------|--------------------------|
| C1. Art: | <input type="checkbox"/> | C6. Maths: | <input type="checkbox"/> |
| C2. Design & Technology: | <input type="checkbox"/> | C7. Modern Foreign Languages: | <input type="checkbox"/> |
| C3. English: | <input type="checkbox"/> | C8. Science: | <input type="checkbox"/> |
| C4. Geography: | <input type="checkbox"/> | C9. Other – please define: | <input type="checkbox"/> |
| C5. History: | <input type="checkbox"/> | | |

Part D. How much interest do you have in each one of the following subjects at the moment:

- | | | | | | | | | | |
|--------------|--------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------|
| D1. D& T: | low interest | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | high interest |
| D2. English: | low interest | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | high interest |
| D3. Maths: | low interest | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | high interest |
| D4. Science: | low interest | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | high interest |

Part E. In your opinion, how difficult is each one of the following subjects: :

- | | | | | | | | | | |
|--------------|---------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|----------------|
| E1. D& T: | not difficult | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | very difficult |
| E2. English: | not difficult | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | very difficult |
| E3. Maths: | not difficult | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | very difficult |
| E4. Science: | not difficult | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | very difficult |

Part F. For most people, when it comes to getting a job, how important do you consider each of the following curriculum subjects:

- | | | | | | | | | | |
|------------------|-------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|----------------|
| F1. D& T: | unimportant | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | very important |
| F2. English: | unimportant | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | very important |
| F3. Maths: | unimportant | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | very important |
| F4. Science: | unimportant | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | very important |
| F5. 2nd language | unimportant | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | very important |

Part L. In your opinion, how creative does the curriculum allow you to be in each one of the following subjects:

L1. Art	not creative	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very creative
L2. D& T:	not creative	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very creative
L3. English:	not creative	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very creative
L4. Maths:	not creative	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very creative
L5. Science:	not creative	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very creative
L6. 2nd language	not creative	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very creative

Part M. As a modern society, how dependent do you think we are on each one of the following subjects:

M1. Art	not dependent	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very dependent
M2. D& T:	not dependent	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very dependent
M3. English:	not dependent	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very dependent
M4. Maths:	not dependent	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very dependent
M5. Science:	not dependent	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very dependent

Part N. As a modern society, how dependent do you think we are on each of the following:

N1. Commerce:	not dependent	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very dependent
N2. Finance:	not dependent	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very dependent
N3. Industry:	not dependent	{:}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	very dependent

Part O. In general, how far do you consider your abilities and capabilities have been recognised by the curriculum

Low recognition {:} {2} {3} {4} {5} {6} {7} {8} {9} High recognition

Part P. To what extent do you feel your abilities and capabilities have been developed by the curriculum

Low development {:} {2} {3} {4} {5} {6} {7} {8} {9} High development

Part Q. Are there any other general comments you would like to make that would be of further benefit to this questionnaire?

.....

.....

.....

.....

[Printer Offset 0.00" - 30.11.2001] [Form 7]