

# Technology and the Hidden Curriculum

Dr Stan Owers  
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This presentation is about a conflict between two strands of our culture. On the one hand we are totally dependent on our tool- and technology-culture to function as individuals and as a society. But on the other hand the value judgments of the majority in our society disparages our tool- and technology-culture.

In the context of this conflict, what I have to show may shock, but there should be no surprises since our society has influenced education, and education has influenced society.

But what do I mean by the "hidden curriculum"?

A sub-set of learning experiences outside the statutory curriculum to which every child is exposed.

This sub-set is influenced by society, with much of the responsibility for delivery given to schools.

The list of possible learning outside the curriculum is a long one; it includes our value and belief systems.

Barnes D (1982:169) *Practical Curriculum Study*, Routledge & Kegan Paul, London.  
Boronski T (1988:47) *Knowledge: Sociology in Focus Series*, Longman, London.  
Lawton D (1975:6) *Class, Culture and the Curriculum*, Routledge & Kegan Paul, London.  
Margolis et al (2001:6) *The Hidden Curriculum in Higher Education*, Routledge, London.  
Pinder R (1987:143) *Why don't teachers teach like they used to?*, Hilary Shipman, London.

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To remain competitive, industry needs to be at the forefront of technological change. However in our society, neither industry nor technology are properly valued, thereby posing an economic threat.

Support for my assertion may be found in Dahrendorf (1976:460) who argued:

'... an effective economic strategy for Britain will probably have to begin in the cultural sphere, in attitudes, habits, expectations'.

Dahrendorf, Professor R, *Europe: some are more equal, The Listener*, 1976, Vol 96.  
[www.ultralab.ac.uk/tools/](http://www.ultralab.ac.uk/tools/)

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Much of the material I shall be drawing on in this presentation appears in my Doctoral thesis which reports on the place and perception of technology in the National Curriculum, and was printed in 2001. My thesis may be downloaded from:

[www.ultralab.ac.uk/tools/](http://www.ultralab.ac.uk/tools/)

I shall be concentrating on 'the cultural sphere, on our attitudes, our habits, and our expectations'. My account will be historical since the past is in the present.

The presentation will take about an hour, and it is structured in the following way:

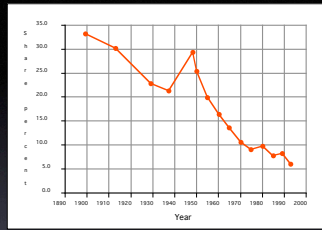
- video film evidence
- statistical data
- the place of technology within our culture
- disparagement of technology by statutory sanction
- anecdotal evidence
- action research evidence
- further video evidence
- and lastly, what can we do?

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I shall be pleased to take questions at the end of the presentation.

From the first lecture, you may recall that in the early 1970s, I began to ponder why it was we had given the world the Industrial Revolution, and had been in relative industrial decline ever since. I also showed you this graph:



Exports of manufactured goods – decline of UK world-wide share from 1899 to 1993 – %

Ref. 1 *The British Economy Key Statistics 1900-1970*, London and Cambridge Economic Service  
 Ref. 2 *Review of External Trade Statistics Annual Supplements 1980-1988*, Government Statistical Service  
 Ref. 3 The 6% figure for 1993 quoted by Michael Heseltine and reported in *The Times* November 24 1993. Heseltine compared 1913 at 33% with 1993 at 6%.

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I believe the situation represented by this graph provided much of the impetus for Industry Year 1986. The short film you are about to see was produced for Industry Year 1986, and captures many of the issues that should concern us in the cultural sphere, in our attitudes, habits, and our expectations.

This film also serves to show one of the periods in the recent history of our society when we tried to confront a philosophical direction that had always been inappropriate for an industrial and trading society, attitudes that have long been obsolete. See also 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.

## Thanks to INDUSTRY

A video film produced in support of Industry Year 1986, and initiated by The Royal Society for the encouragement of Arts, Manufactures and Commerce.

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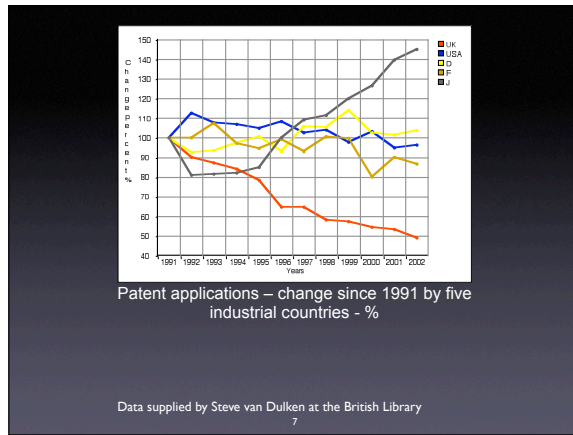
I believe that film presented a succinct summary of many of the basic problems for the UK as an industrial and trading society.

Ignoring industry can hardly be described as an intelligent course of action when we are utterly dependent on the products and services of industry to function as individuals and as a society. We need the wealth creation of industry as well as employment opportunities for a wide range of aptitudes to offer better chances to experience job satisfaction, and a measure of self-esteem. But a further need is for our socio-economic communities to thrive and be prosperous in every part of the country. How else are we going to fund what we demand from the state?

Later in this presentation I shall show you how "snobbery" was exhibited, how snobbery influenced the curriculum, and how those influences are still with us today. Finally, I shall show how those influences were given statutory sanction.

As you saw from the film, the Japanese discovered that the ideas for more than half of the 100 most successful industries started after WW11 came from the UK.

What about our more recent inventive performance?



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This slide shows the change in patent applications since 1991 as a proportion of the data for 1991. "In 1991 these five countries accounted for 77.75% of all Patent Co-operation Treaty (PCT) filings, while in 2002 they accounted for 74.14% of a much greater total" (22,247 in 1991 and 114,048 in 2002)—van Dulken.

This graph was plotted from data provided by Steve van Dulken of the British Library, which was "prepared for those with an interest in the technological strength of countries".

In my view, this slide portrays a bleak economic future for the UK!

But let me demonstrate how we have benefited from industry and technology in the past by showing you some data published by the Central Statistical Office in 1994.

	1914	1994
Population - millions	43 (GB & NI)	58 (UK)
Life expectancy - years	51.5 (M) 53.4 (F)	73.2 (M) 78.7 (F)
Food as a proportion of index	60%	15%
Motor vehicles licensed	300,000	24,851,000
Price of car	£730 (20HP 4cyl)	£6995 (1.4L)

Statistics from 1914 to 1994 published by CSO

From candles and starch to camcorders and cook-in-sauce - CSO marks 80 years of official price watching, Central Statistical Office, News Release 26 April 1994.  
Odea, W.T. Lighting 1: Early oil lamps and candles, 1966, HMSO.

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The CSO includes 'official price watching' among their responsibilities. This slide shows some of the data from a survey between 1914 and 1994.

During those 80 years, life expectancy improved for females by 47% and for males by 42%. Contributory factors included the education and training of medical staff, and a greater range of products and services from industry because of new and improving technology.

Changes in the products shown on the index list, reflected the growing affluence of society. In 1914, food as a proportion of the index was 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 from manufacturing industry.

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'.

With no change in technology, a car that cost £730 in 1914 would have cost £36,500 in 1994. How many could afford such prices? With many technological advances, a car was available in 1994 for £6995. The modern car had superior performance and economy, superior ride and handling, superior steering and braking systems, much lower cost of ownership, and was much safer. These CSO data should similarly be a cause for celebration of the achievements of industry and technology, but there were no such references. I believe this is because the functions of industry and technology are difficult to place in a societal perspective.

'Man is a tool using animal ... feeblest of bipeds! ...  
Without tools he is nothing, with tools he is all'.

If at a stroke the benefits of our tool- and technology-  
culture could be removed, not only would this  
equipment 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  
—see Owers (1993b:7)

Thomas Carlyle, essayist and historian (1795-1881).

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In trying to come to grips with the nature of technology, it is worth recalling what an essayist and historian had to say in the 19th Century.

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. Let me underpin that with this statement.

However D&T was the last subject to be introduced into the curriculum on a national basis when it was authorised by the Education Reform Act of 1988; it came in to effect at Key Stage 3 in 1989.

This late introduction was symptomatic of the inappropriate values that have dogged our society for more than two centuries.

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.

June 1989, Design and Technology for ages 5 to 16

December 1992, Technology for ages 5 to 16

January 1995, Design and Technology

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After D&T was introduced, there were a further two sets of Standing Orders and the titles of all three sets are shown here.

- June 1989, Design and Technology for ages 5 to 16
- December 1992, Technology for ages 5 to 16 (1992)
- January 1995, Design and Technology

These 3 sets of standing orders imply considerable difficulty with the introduction of D&T.

The late introduction was made more difficult because technology was not defined in any of the standing orders. If technology can't be defined how can anyone be told what it is, and this surely added to the difficulties faced by teachers.

During the course of my research, I became convinced that defining the place of technology in our lives was of paramount importance, and I would now like to share my findings with you.

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.

See also Chapters 1, 4 and 5 Owers (2001). See also Usher A P, *A history of mechanical inventions*, 1954, Harvard University Press.

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These three statements capture important concepts to do with the imaginative capability of humankind as a toolmaker, a capability possessed by some who could visualise that there was a problem, and go on to find a solution. In the early days finding solutions would sometimes take generations.

Chapter 4 of my thesis reflects on the nature of invention as a key phenomenon in the evolution of humankind since the Stone Age. Accumulation of experience and knowledge is possible in human societies because of their life span—Usher (1954:67) [see Usher A P, *A history of mechanical inventions*, 1954, Harvard University Press]. Ever since the Stone Age, this cumulative acquisition has been a social cultural achievement; the enormity of this cultural process was long overlooked—Usher (1954:68). However, this process yields successions of significant inventions as products, bringing together many specific features of novelty, and many familiar methods—Usher (*ibid*). Here are the next two statements:

4 - Knowledge builds on knowledge as social cumulation. In reality the 'hero inventor' also 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 multi-layered, and is implicit in the law of prior dependency.

See also Usher A P, *A history of mechanical inventions*, 1954, Harvard University Press.

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Typically, the process of invention encourages images of the 'hero inventor', but it should be seen also as the product of 'social cumulation'—Usher (1954:68), or knowledge building on knowledge.

I believe the study of 'cause and effect' was a key phenomenon in the evolution of our tool-culture. The study of 'cause and effect' is now a main platform of scientific research, but there is no doubt in my mind that this phenomenon arose first within our tool-culture.

So I regard Science and Maths as knowledge components of technology because it is through technological application that we realise the benefits of research. Here are next two statements:

6 - Without exception we are all tool-users and technology-users.

7 - Although we are all tool-users, relatively few of us are tool- or technology-makers.

Bowers B, *Electricity in Britain*, Understanding Electricity, Educational Service, Electricity Association Services Ltd, London, 1990.  
Byers A, *The Willing Servants - A history of electricity in the home*, Educational Service, The Electricity Council, 1988.  
Rolt L T C, *Tools for the Job: A short history of machine tools*, 1965 B T Batsford Ltd, London.  
Usher A P A, *A history of mechanical inventions*, 1954, Harvard University Press.  
Woodbury, R S, *History of the Lathe to 1850. A Study in the Growth of a Technical Element of an Industrial Economy*, 1972.

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The mobile phone provides a good example of one of our tools exhibiting multilayered technology, social cumulation, the law of prior dependency and thus a new convergent synthesis. Starting with the concept of the cutting edge from the Stone Age, our ancestors learned to cut and shape progressively harder materials until steels could be worked and shaped for plastic moulds to produce the phone cases. All this was only possible because of the more recent mastery of precision engineering or technology. Henry Maudslay lived from 1771 to 1831—Rolt (1965:83); he made the breakthrough in precision in his engineering workshops, and in particular for surface plates. Precision surface-plates must be neither convex or concave.

Precision engineering made possible replaceable parts, so providing the foundation for mass-production with huge economies of scale. So Maudslay's contribution can not be too highly regarded, and for me he was the man of the last millennium.

Another crucial concept for the mobile phone was the work of Faraday. In 1821, Michael Faraday (1791-1867) showed that 'a wire connected to a battery would rotate around a fixed magnet'—Byers (1988:10).

The mobile phone uses microelectronic components, made possible by the precision concepts introduced by Maudslay. And of course the mobile phone uses wireless technology, and battery technology.

This is but a small insight into our tools and technological inventory which by any standard is vast beyond our comprehension.

Here are the next two statements.

8 - We use tools and technologies as tools as extensions of ourselves in order to enhance our productivity and capability.

9 - As a society, our collective productivity and capability underpins our standard of living relative to other countries.

See also Chapters 1 and 4, Owers (2001)

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The mobile phone extends our productivity and our capability; we can make a phone call any time we choose without recourse to a fixed installation in the home or the office. Mobile phones have proven their capability also in lifesaving situations for people capsized at sea, or who are stuck in bad weather in a dangerous situation on a mountain.

See also Chapters 1 and 4, Owers (2001). Here are the last two statements:

10 - In order to function as individuals and as a society, we are totally 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.

See also Chapters 8 and 9, Owers (2001).

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The process of socialisation into using tools starts in the family, but how much is this understood? Although we are totally dependent on our tool- and technology-culture, our society has never learnt to value the essential creative nature of our tool- and technology-culture for us to remain competitive as an industrial and trading society.

In fact the language of our opinion leaders has too often provided statutory sanction for disparagement, and I shall now show you some examples.

In 1816, Parliament commissioned an inquiry into the 'Education of the Lower Orders in the Metropolis', subsequently extended to the whole country.

Maclure J S, *Educational Documents England and Wales: 1816 to the present day*, 1986, Methuan, London  
See also Chapter 7 - *Technology in Education: statutory considerations*, Owers (2001).

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This provides an example of the snobbery prevailing in those times. Further examples follow as a small selection from a huge field that helps us to understand the value judgments endemic in our society. But it also helps us to understand how the past is in the present. Here is the next example:

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).

*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, [Clarendon Report] 1864.*

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More snobbery!

Here is the next example:

In England, 'natural science ... is practically excluded from the education of the higher classes' .... 'Education' was 'narrower than it was three centuries ago'; the 'exclusion' of science was 'a plain defect and a great practical evil'—Clarendon (1864:32).

*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, [Clarendon Report] 1864.*

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So this select committee were expressing serious concern about the courses of study offered by the public schools, and their report went on:

This exclusion damages the 'mental training of the young'; while many 'men ... have little aptitude or taste for literature', there are many with 'an aptitude for science', particularly with the 'science [of] external and sensible objects'—Clarendon (1864:32).

*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, [Clarendon Report] 1864.*

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As you can see the select committee identified specific concerns, recognising that young people had different aptitudes which education needed to take into account.

Recently, there was yet another attempt to confront this problem. In the Green Paper published February 2002, Estelle Morris the former Secretary of State for Education and Skills, wrote (see next slide):

'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'.

'... For too long, vocational studies and qualifications have been undervalued. This must change ...'—(2002:3)

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

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'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. ...'—(2002:3)

But of course changes have yet to be implemented, and in particular our obsolete value judgments have to be recognised for the damage they are doing to our economic prospects. Back to the Clarendon Report.

There was strong opposition to the inclusion of natural science in the courses of study; as counter arguments, claims were made for the benefits of training the mind, enhancing the powers of observation, while learning about 'cause and effect'—Clarendon (1864:32).

*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, [Clarendon Report] 1864.*

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As may be seen, there was serious opposition to modernising the curriculum.

Contrary to 'the eminent Schoolmasters', the Commissioners were 'convinced that the introduction of natural science' was 'desirable, and ... practicable'—Clarendon (1864:32).

Nevertheless, the Commissioners recommended that the 'classical languages and literature should continue to hold the principal place in the course of study'—Clarendon (1864:53).

*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, [Clarendon Report] 1864.*

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So the Commissioners capitulated!

Let us now examine another select committee publication, namely the Taunton report.

The time that parents were prepared to 'keep their children under instruction' defined the groups of educational provision—Taunton (1868:15)

There were three groups—up to 'about 14', up to 'about 16', and up 'to ... 18 or 19'; these were classified as 'Third', 'Second' and 'First-grade of Education respectively'—Taunton (*ibid*).

Schools Inquiry Commission, [The Taunton Report], The House of Commons, 1868.  
See also Chapter 7 - Technology in Education: statutory considerations, Owers (2001).

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Note the gradings.

Schools that provided the First-grade of education were patronised by 'two very distinct classes' of parent. 'One class' were similar to those parents who favoured the public schools covered by the Clarendon report—Taunton (1868:16).

Schools Inquiry Commission, [The Taunton Report], The House of Commons, 1868.  
See also Chapter 7 - Technology in Education: statutory considerations, Owers (2001).

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So the gradings were based on class distinctions.

This class were wealthy, and had no wish to 'displace classics' from the 'forefront of English education'. But ... considered that English education should be widened 'to cultivate mathematics ... to add modern languages and natural science'—Taunton (1868:16).

Schools Inquiry Commission, [The Taunton Report], The House of Commons, 1868.  
See also Chapter 7 - Technology in Education: statutory considerations, Owers (2001).

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The wealthy parents wanted education to be modernised but without displacing the classics.

Parents took a keen interest in the attempts to modernise English education, but they were unwilling 'to put their own boys into it'; their boys were not to be 'marked off as peculiar'—Taunton (1868:16).

Often, 'modern departments' were 'a refuge for boys' of 'inferior ability or diligence [that] prevented their success in classical studies'—Taunton (1868:17).

Schools Inquiry Commission, [The Taunton Report], The House of Commons, 1868.  
See also Chapter 7 - Technology in Education: statutory considerations, Owers (2001).

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In summary, parents were interested in attempts to modernise education, but they were not willing to be part of the change process. Furthermore, those with little or no aptitude for the classical languages were regarded as having 'inferior ability'. This of course was seriously prejudicial, ignorant and technological illiterate.

The second class (in the First-grade) who wished to keep their children at school to 18 or 19, were the 'majority of professional men' and 'poorer gentry'; having had a 'cultivated education', these men did not wish 'their sons' to 'fall below them'—Taunton (1868:17).

Schools Inquiry Commission, [The Taunton Report], The House of Commons, 1868.  
See also Chapter 7 - Technology in Education: statutory considerations, Owers (2001).

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Another example of snobbery.

Although parents would appreciate 'more than classics and mathematics', they nonetheless valued them 'highly for their own sake', and the 'value ... assigned to them in English society'—Taunton (1868:17).

These parents thought that education was the only way 'to keep their sons on a high social level'—Taunton (1868:18).

Schools Inquiry Commission, [The Taunton Report], The House of Commons, 1868.  
See also Chapter 7 - Technology in Education: statutory considerations, Owers (2001).

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What the sons of those times learnt was only important for reasons of social snobbery, and had nothing to do with earning a living or sustaining ourselves as a society.

For boys up to 16 years in the Second-grade, parents required a different education... These parents comprised 'two classes': (1) those who accepted Latin as useful for certain 'professions' as well as its 'social value', and (2) 'the mercantile classes' who 'barely ... tolerate Latin'—Taunton (1868:18).

Schools Inquiry Commission, [The Taunton Report], The House of Commons, 1868.  
See also Chapter 7 - Technology in Education: statutory considerations, Owers (2001).

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This is the conflict that still dogs us today 'social value' versus an education with a practical use although we live in a technological age.

This second group thought 'mathematics, modern languages, chemistry ... physical science' were 'essential' ... 'Classical culture' was an acceptable 'instrument of education', provided the modern subjects 'considered indispensable' were not excluded—Taunton (1868:20).

Schools Inquiry Commission, [The Taunton Report], The House of Commons, 1868.  
See also Chapter 7 - Technology in Education: statutory considerations, Owers (2001).

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So parents had very different requirements from education, and as was said earlier this was recognised only recently by Estelle Morris in 2002, ie 134 years later! But to continue with the Taunton Report.

For the second group education in subjects with a 'practical use in business' was thought 'absolutely essential', and parents would 'not allow any culture'.

'Some' parents were 'not insensible to the value of culture' and the advantages of 'sharing the education of the cultivated classes'—Taunton (1868:20).

Schools Inquiry Commission, [The Taunton Report], The House of Commons, 1868.  
See also Chapter 7 - Technology in Education: statutory considerations, Owers (2001).

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So snobbery was always evident.

The Commissioners concluded 'many ... parents' had no access to 'suitable schools' for their children—Taunton (1868:660).

'Middle-class ... youth', were thus unprepared for life's 'duties' or the 'intelligent acquisition of ... technical instruction' allegedly so necessary for 'our great industrial interests'—Taunton (1868:661).

Schools Inquiry Commission, [The Taunton Report], The House of Commons, 1868.  
See also Chapter 7 - Technology in Education: statutory considerations, Owers (2001).

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Remember Estelle Morris in 2002?

As you can see, our great industrial interests were of little consequence to the upper classes, and this was reinforced by the next select committee report.

In 1868, a Select Committee was appointed 'to inquire into the provisions for giving instruction in theoretical and applied Science to the Industrial Classes'.

Note the link between Science and the 'Industrial Classes'.

Parliamentary Papers 24th March 1868.

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Note the link between Science and the 'Industrial Classes'! Confirmation yet again that the collective economic well-being of our country and our society came second, and I believe it still does!

Now for examples of anecdotal evidence disclosing the value judgments of our society against trade, industry, business, and professional engineers; failing also to comprehend the role of technology in our society. In effect, the values of the upper-classes not only influenced our education system, but many other institutions as well. Much of the anecdotal evidence is founded on prejudice and alarming levels of ignorance.

'There is, believe it or not, still prejudice against success in trade and business. We are light years away from being a true meritocracy'.

Rt Hon Tony Blair, Leader of the Opposition, *The Times* July 17, 1995.

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Anecdotal evidence.

'When I told my mother-in-law I had been appointed Secretary of State for Trade and Industry, she said - "but you are going to become associated with trade." I told her I was proud to be associated with trade and industry'.

Rt Hon Peter Lilley, CBI Conference, Southampton, Autumn 1991.

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Anecdotal evidence.

From my thesis for reference as back-up if required: Before 1760 there was no concerted hostility towards industry and business in the UK, but that changed in the period up to 1790. This change was driven by forces outside education, but the cultural context and associated value judgments have significance here.

The origins of hostility towards business in modern Britain have been studied by Raven (1985). His dissertation, entitled *English Popular Literature and The Image of Business 1760–1790*, considers two aspects—Raven (1985:1). Firstly 'the commercial growth of the book trade and the social impact of popular literature', and secondly, the 'attitudes' and 'prejudices' in the literature 'promoted' by the 'writers' and 'booksellers'—Raven (*ibid*).

Popular literature in the 16th Century showed no disapproval of 'merchants and tradesmen' although they 'certainly indulged in fashionable conspicuous consumption'—Raven (1985:134). Until the early 17th Century, the portrayal was usually 'generous' depicting 'mercantile pride and self-esteem'—Raven (*ibid*).

Here is the next anecdote:

'A new supplement to the Dictionary of National Biography acknowledges the sins of earlier omissions. ...'

'The original DNB neglected business men, and there was also a lack of engineers'.

The Times Tuesday January 26, 1993.

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Anecdotal evidence.

The prejudicial influence spread to those responsible for producing the DNB. Ignorance of this kind threatens our ability to sustain ourselves economically in a fiercely competitive world.

Here is the next anecdote:

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

*The Times* March 18, 1994.

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Anecdotal evidence.

Here is the next anecdote:

'... my father disinherited me because I became an engineer, an occupation totally unfitting for a gentleman. I do not regret my choice, although I had to leave England to follow it in peace'.

Paul D Hobson, *Professional Engineering*, 3 September 1997.

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Anecdotal evidence.

How tragic for father and son!

Here is the next anecdote:

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

Chandler, Sir G, *The forgotten campaign: Industry Year 1986*, RSA Journal 2/4 1998, The Royal Society for the encouragement of Arts, Manufactures and Commerce, London.

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Anecdotal evidence.

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

The headteacher had a degree in Science.

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Anecdotal evidence.

The head teacher had a degree in Science, and a frightening level of economic and technological illiteracy.

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

'We are not in the business of producing fodder for factories'—said by both primary and secondary school teachers.

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

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A selection of three anecdotes.

'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.

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Anecdotal evidence.

Referring to the Interim Report on D&T, the Rt Hon Kenneth Baker, Secretary of State for Education, wrote:

'The report sets out a coherent and persuasive view of design and technology as an essentially practical activity ...'

Does this not show an appalling level of technological and economic illiteracy for an influential opinion leader?

Interim Report on D&T, dated 23.11.1988 - see letter from Kenneth Baker, Secretary of State for Education to Lady Margaret Parkes Chairman, page 99 of the 1989a Standing Orders

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Anecdotal evidence.

This shows an appalling level of technological and economic illiteracy for an influential opinion leader.

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

'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.

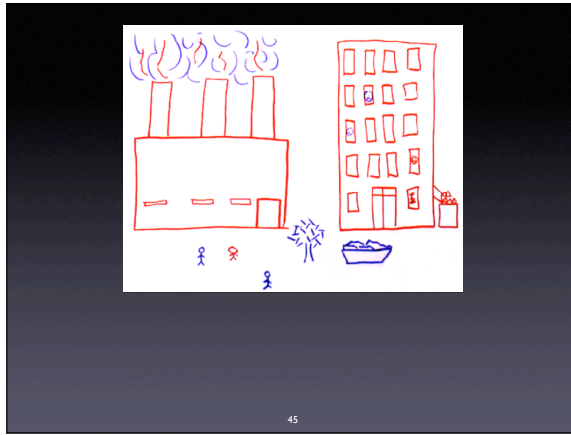
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These are two dreadful examples of technological illiteracy! All the anecdotes you have seen come from appendix 5 of my thesis, which lists some 65 in total.

I would now like to show you a number of slides from action research evidence. They come from an exercise I used as an "ice breaker" when lecturing student teachers in training on economic and industrial understanding.

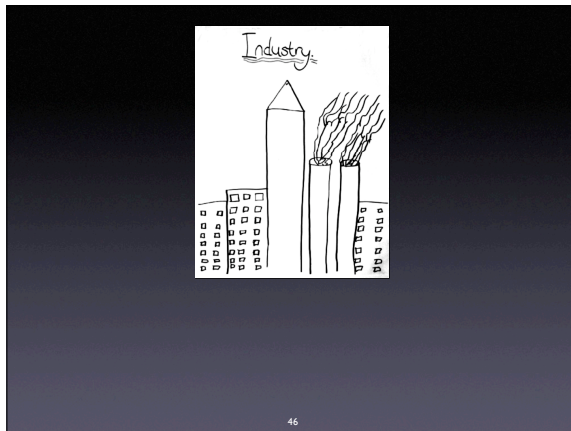
The class of student-teachers were asked to form subgroups of 4 or 5, and to spend 5 minutes reflecting on their perceptions of industry. Then come to some consensus, and commit their shared point of view to a piece of flip-over chart paper. The next four slides provide actual examples.



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Evidence from action research. These data were gathered from an exercise used as an "ice breaker" when lecturing student teachers in training on economic and industrial understanding.

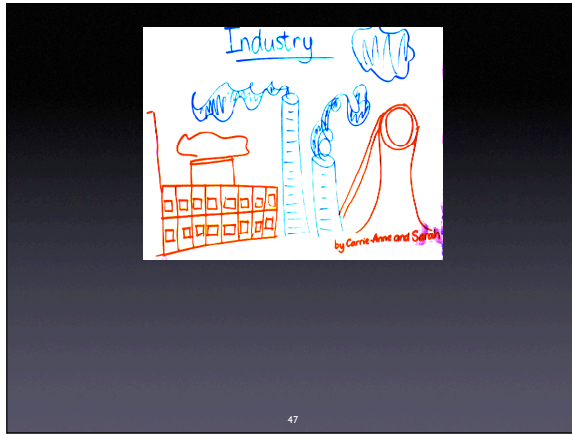
The class of student-teachers were asked to form subgroups of 4 or 5, and to spend 5 minutes reflecting on their perceptions of industry. Then come to some consensus, and commit their shared point of view to a piece of flip-over chart paper. This slide comes from one of those sub-groups.



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Evidence from action research. These data were gathered from an exercise used as an "ice breaker" when lecturing student teachers in training on economic and industrial understanding.

The class of student-teachers were asked to form subgroups of 4 or 5, and to spend 5 minutes reflecting on their perceptions of industry. Then come to some consensus, and commit their shared point of view to a piece of flip-over chart paper. This slide comes from one of those sub-groups.



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Evidence from action research. These data were gathered from an exercise used as an "ice breaker" when lecturing student teachers in training on economic and industrial understanding.

The class of student-teachers were asked to form subgroups of 4 or 5, and to spend 5 minutes reflecting on their perceptions of industry. Then come to some consensus, and commit their shared point of view to a piece of flip-over chart paper. This slide comes from one of those sub-groups.



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These four flip-over chart pages show no comprehension of the products and services of industry upon which our society is totally dependent. As you can see they showed a preoccupation with smoking chimney stacks at a time when great technological strides had been made to reduce pollution from stacks. So the impressions were essentially negative.

The next two slides provide evidence from further action research.

- 1) Assumptions that work in factory is demeaning and doesn't need any education/brains.
- 2) Mentor hasn't realized that there are many other different types of jobs in factory.
- 3) Children's parents could work there.

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What was concerning the student teacher in training?

In 1966, 17 student teachers on a Four Year BEd course chose an option entitled *The Contribution of Industry to the School Curriculum*.

Action research was conducted with this group recounting a personal experience that related to the testing of a questionnaire with a group of licensed teachers in 1993.

After completing the test, one student had a serious concern. Her Mentor had taken a class of primary school children on an outside trip. As they passed a factory, the Mentor paused, gathered the pupils around and said: "Now if you don't do well in your studies that is where you will finish up". The Mentor had no idea that prototype cars costing more than £100,000 each were made in the factory.

The licensed student teacher was horrified, but chose to say nothing because she wanted to qualify. This experience troubled the licensed student teacher because children could be learning to disparage the occupations of their parents, and hence the parents. The student teacher was told that what she had witnessed was a commonplace event, and symptomatic of the anti-industry culture that prevails in our society.

This experience was used as the basis for action research with the students on the Four Year BEd, and at a point about 25% into their course. The 17 students were asked to split into subgroups of four or five, and without being told about the traditional anti-industry culture, they were asked to reflect on 'what was concerning the student licensed teacher in training' and to commit their shared point of view to a flip-over chart.

1. Class teacher giving very negative messages to pupils who are impressionable
2. Insensitive - children may have family working there
3. Ignorant assumption that you don't need to be educated to work there.
4. Teacher has no knowledge of real situation - therefore should say nothing or encourage the children to discuss what goes on inside
5. How will the children respond? What might they say at home? Will they presume that it's not good to work in a factory?

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What was concerning the student teacher in training?

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2. Insensitive - children may have family working there.
3. Ignorant assumption that you don't need to be educated to work there.
4. Teacher has no knowledge of real situation - therefore should say nothing or encourage the children to discuss what goes on inside.
5. How will the children respond? What might they say at home? Will they presume that it's not good to work in a factory?

As I said earlier, we should not be surprised by anything shown here in this presentation. The culture and the values of the critical mass in our society have disparaged industry and technology for more than 200 years.

However, I believe that understanding the "cultural sphere" helps us to confront our damaging value and belief systems.

Now another video produced for Industry Year 1986 that asks the question "What is education for?" and covers many of the issues in the "cultural sphere".

# The Writing's on the Wall

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What can we do?

'Challenge for Britain is to transform performance.'  
'BRITONS must achieve a cultural adjustment embracing every aspect of society if industry is to be truly competitive ....Although companies must improve their performance, science, education and government must also change attitudes to prevent Britain's slide down the world competitiveness league... . It is in truth about culture'.

Rt Hon Michael Heseltine MP, President of the Board of Trade - *The Times* November 16 1993.

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What can we do? I believe this Minister hit the nail on the head!

You may recall Dahrendorf (1976:460) argued '... an effective economic strategy for Britain will probably have to begin in the cultural sphere, in attitudes, habits, expectations', and now I trust you can see why.

In the context of sustaining ourselves economically, we have had more than 200 years of cultural failure in the philosophical direction. The value judgments responsible are now deeply embedded in our psyche, and therefore not only hard to see but even harder to change. So trying to make change happen will be difficult; the difficulties arise also because:

'Cultures "see" what they are predisposed to see, and ignore the rest'—Hampden-Turner and Trompenaars (1995:60).

People use their intelligence to defend the *status quo*.

Those who 'succeed' in education are probably among the most reluctant to change.

Hampden-Turner C and Trompenaars F, *The Seven Cultures of Capitalism: Value systems for creating wealth in the United States, Britain, Japan, Germany, France, Sweden, and the Netherlands*, 1995, Judy Piatkus Ltd, London.

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Some of the reasons why trying to make change happen is always difficult.

Summarising the issues:

- UK dependent on products and services of industry
- UK has an anti-industry culture
- UK can't function without tool and technology-culture
- D&T not valued by majority in education or society

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At the beginning of this lecture, I set out to show a conflict between two strands of our culture, and here we see the dilemma in two ways. We are dependent on the products and services of industry, but we have an anti-industry culture. Furthermore, we can't function without our tool- and technology-culture, but D&T is not valued by the majority in education or society.

## Recommendations (1)

National action plan for society and education to:

- Raise the importance of industry
- Confront the anti-industry culture
- Expose dependence on tool and technology-culture
- Value the subject of D&T

Current method of D&T project assessment  
is flawed - see next slide

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We don't pretend that our recommendations are complete, but you will appreciate that the task is exceptionally difficult. The recommendations are in two parts; this shows the first part.

There is a serious problem with the current method of assessing D&T projects in education, and that is identified on the next slide

Current system is mechanistic, encouraging rote activity  
and stifling creativity

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But there is a serious problem with the current method of assessment adopted in education, and it is addressed in the second part of the recommendations.

## Recommendations (2)

Ultralab regard following as key for the 14-19 curriculum:

- adopt an holistic approach to D&T project assessment
- sever link to specific crafts
- nurture ability to identify research opportunities
- foster ingenuity
- work with real world clients on real world problems
- identify the critical functions necessary to:  
focus knowledge acquisition on what student needs to know and how to access it

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Here is the second and final part of the recommendations.

That concludes my presentation.

## Further reading:

Ashby, Sir E, *Technology and the Academics: An Essay on Universities and the Scientific Revolution*, 1958, Macmillan & Co Ltd, New York.

Barnett C, *The Audit of War: The Illusion and Reality of Britain as a Great Nation*, 1986, this ed PAPERMAC 1990, Macmillan Limited, London.

NACCCE *All our futures: Creativity, Culture and Education* published by the National Advisory Committee on Creative and Cultural Education, 1999.

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Further reading.

Rae J, *Our Obsolete Attitudes: Education & the National Malaise, Encounter*, 1977, Vol. 49 pp10-17. Headmaster of Westminster School, and former headmaster of Harrow public school.

Sharon D, *Technical illiteracy*, *EDUCATION*, 21 July 1989, London.

Snow C P, *The Two Cultures*, Cambridge University Press, 1959, (Lord Snow).

Wiener M J, *English Culture and the decline of the Industrial Spirit 1850–1980*, 1981, Penguin Books, London.

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More reading.

*Dr Stan Owers*  
Industrialist in Residence and Researcher  
Ultralab  
Anglia Polytechnic University  
Chelmsford  
Essex

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The author.