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Examinations? What a Bore

At Secondary School level the need to examine is a phenomenon which is more important, to a large sector of our community, than it ever has been since compulsory schooling became the 'in thing'.

Why? Is it that we no longer have the capacity to assess our fellow men – or women, because we are not too strong on the subject of human relationships; or is it that the sheer weight of numbers gives us the golden opportunity to de-personalise to a point where a written response will allow us to kid ourselves that we can assess meaningfully? I suspect that it could be a bit of both.

This presupposes that we have a set of aims upon which we base our assessments. A part of the statutory duty of local education authorities as laid down in the Education Act 1944 is to 'include practical instruction and training appropriate to their (the pupils) respective needs'. I think it reasonable that we should be able to interpret words like 'instruction' and 'training' in a more modern context. Indeed, the Department of Education and Science do just that in 'A Framework for the School Curriculum' 1980. Amongst the aims which are set out in that document are two which are opposite to my philosophy of education through Craft, Design and Technology.

1. To help pupils develop lively, enquiring minds, the ability to question and argue rationally and to apply themselves to tasks, and physical skills.
2. To help pupils acquire knowledge and skills relevant to adult life and employment in a fast changing world.

The document also makes mention of eight areas of experience, two of which are 'the aesthetic and creative'.

If Craft, Design and Technology teachers accept that these aims are amongst those formulated by themselves, as forward thinking, professional educationalists, then I don't believe that subjects such as Woodwork, Metalwork, Technical Drawing, Engineering Drawing, etc.; subjects which are predominantly skills training, and recall, are sufficient for the pupils needs. These subjects have served us well in the past, but in the last decade or so we have seen the birth of a new series of subjects, some dealing with the design element and craft, whilst others couple design with technology. The majority of these subjects have a 'Design-Make-Test element, though regretfully we have a few of the 'old faithfuls' masquerading under revamped titles – but, with nothing else changed. It is my strongly held view that these 'cuckoos in the nest' can do more harm than the original sterile subjects in achieving a worthwhile position in the curriculum for C.D. & T.

In the forthcoming trauma, or enlightenment, depending upon your viewpoint, of the change to G.C.S.E. (General Certificate of Secondary Education) we have an ideal opportunity to rationalise the plethora of subjects under the umbrella of Craft, Design and Technology. At present, a glance through a number of syllabuses will demonstrate the vast variety available. This is confusing for Heads, Heads of Departments and staff, and must be utterly bewildering to parents and prospective employers. In the rarified air of universities it has allowed many faculties to brush aside anything to do with Design and Technology, as an 'odd ball' in a minefield of courses with vastly differing academic standards. It is easy to have some sympathy with this attitude since teachers have been their own worst enemies in allowing examination boards to 'float' anything and everything. The Boards are commercial organisations and must, of necessity, make a profit from their

ANALYSIS OF 'A' LEVEL CRAFT, DESIGN AND TECHNOLOGY COURSES

	A.E.B. ENG. SC.	LONDON ENG. SC.	J.M.B. ENG. SC.	OXFORD ENG.	O. & C. APP. MECH.	CAMB. EL. OF ENG. D	OXFORD DESIGN	LONDON D. & T.
Materials								
Metals – Structure	/	/	/	/				/
Composition	/		/	/		/		
Heat Treatment	/		/		/			
Corrosion and Prevention								/
Properties	/		/	/		/	/	/
Mechanical Testing	/	/	/	/	/	/	/	
Plastics			/	/		/	/	/
Timber							/	/
Mechanics								
Forces and Frame Structures	/	/	/	/	/	/		
Moments and Levers	/	/	/	/	/	/		
Work, Energy, Power		/	/	/	/			
Mechanical Advantage		/	/	/	/			
Simple Machines		/	/	/	/			
Velocity, Momentum	/	/	/	/	/	/		
Hydraulics		/	/	/	/			
	optics							
Heat and Heat Engines								
Engines and Motors	/	/	/	/				
Energy Conservation	/	/	/	/	/			
Friction		/	/	/	/			
Efficiency		/	/	/				
Transmission	/	/	/	/		/		
Latent Heat	/	/	/					
Refrigeration		/	/					
Electricity and Electronics								
Conductors and Insulators	/	/	/	/				
OHM's Law, etc.	/	/	/	/				
Simple a.c. Theory	/	/	/	/				
Transformer	/	/	/	/				
Electromagnet	/	/	/	/				
a.c. & d.c. Motors	/	/	/	/				
Transducers	/	/	/	/				
Electricity Supply								
Semi-Conductors	/	/	/	/				
Simple Circuitry				/				/

examination entries. I suggest that this may not always be conducive with our task of providing for a pupils educational needs.

It would be wrong of me to leave you with the impression that universities are ignoring the more substantial Design and Technology courses. An increasing number concerned with engineering in its many forms are realising that the divergent thinking required of pupils engaged on such pursuits is actually an asset. Whilst I have always advocated that at 'A' level an Engineering or Design and Technology syllabus should be taken with Maths and Physics, as service subjects, it is the problem solving approach, the inquisitiveness, or 'noseyness' coupled with imagination, which is the quantity most required of our future engineers. It is an essential part of any syllabus worthy of our consideration in C.D. & T.

The National Association of Head Teachers in considering Design and Technology and Engineering Science as a worthy contender in the academic stakes, agreed with Her Majesty's Inspectorate that many of the new courses were very demanding. The Association voiced its concern that some Admissions Tutors were treating the courses as lightweight and not worthy of university consideration. If that is the case, it is sad to think that they are probably depriving this nation of some excellent, open minded, engineers in years to come.

'What is all this G.C.S.E. nonsense', said one teacher, 'it won't affect us. We shall continue to take 'O' levels!' It is a disturbing reflection upon our profession to find that many teachers know more about the draw for the next round of the league cup than they do about something which is going to affect the destiny of themselves and the pupils in their charge for many years to come. It is imperative that colleagues realise the importance of the opportunity before them to 'get it right' once and for all. Our subject area has suffered more upheaval than most in the past decade. Subjects have come and gone; we now have an opportunity to rationalise.

I have said little about syllabuses levels below that of 'O' level up to now. There are a number of questions which I believe teachers should be applying themselves to. What syllabuses should be developed in a differentiated fashion to cater for G.C.E. and C.S.E. candidates? What syllabuses do not lend themselves to this approach? What provision is to be made for those below the 40th percentile?

In a wider context we have to contend with the implications of falling rolls and, in some cases, survival as a subject specialist. In the 1944 Education Act secondary education is defined as applying to pupils up to 19 years. It, therefore, can be said that there is dual provision for the 16-19 year olds. What are the educational criteria for the provision of some C.D. & T. courses at secondary level rather than Further Education level, or vice versa? What implications does an intermediate level examination have for departments able to cater for the needs of young men and women intending to stay on at secondary level? How far should we go towards the training needs of industry, when we are concerned to give a broad education? What do we know about industry so that we may assess the educational criteria most compatible with our industrial and commercial environment?

There are a vast number of questions that we could and should be asking ourselves; every single teacher of Craft, Design and Technology, not just the few who are highly motivated. Many of us in the past have agreed that integration is a wonderful thing, but then found excuses why it would not

ANALYSIS OF 'A' LEVEL CRAFT, DESIGN AND TECHNOLOGY COURSES

	A.E.B. ENG. SC.	LONDON ENG. SC.	J.M.B. ENG. SC.	OXFORD ENG.	O. & C. APP. MECH.	CAMB. EL. OF ENG. D	OXFORD DESIGN	LONDON D. & T.
Design and Drawing								
Sketches				/	/		/	/
Assembly Drawing			/	/	/		/	/
Simple Jigs and Fixtures				/		/		/
Mech. and Elect. Devices			/	/				
Analysis of Function			/	/			/	/
Shaping, Forming, Fabricating				/			/	/
Perspective					/			/
Exploded Views					/			/
Orthographic				/	/		/	/
Isometric				/	/			/
Development					/			/
Loci.					/			
Historical Development							/	/
Social Implications			/				/	
Project and Practical								
Functional Project	/	/	/	/		/	/	/
Project Drawings			/	/			/	/
Test Data			/	/		/	/	/
Enamelling								/
Moulding and Casting				/		/	/	/
Heat Treatment				/				/
Hand Tool Processes							/	/
S. & H. Soldering & Brazing							/	/
Machine Tool Practice				/		/	/	/
Materials Testing				/		/	/	/
Plastics – Manipulation				/			/	/
Timber Technology							/	/
Examinations								
Written Paper	/	/	/	/	/	/	/	/
Design			/	/		/	/	/
Engineering Analysis	/	/	/	/			/	
Project Assessment					/		/	
– Moderated Internal	/	/	/	/		/		/
Practical Exercise								
Written Report	/	/	/	/		/		/
Safety								
Care of Tools and Machines								/
Personal Safety								/
Use of Chemicals								/
Skin Protection								/

work in our own schools. Here we have a situation where knowledge and expertise can be fed in from Art, Maths and Physics as service subjects to the design, and the realisation of that design. Colleagues who have influence on Boards and Consortia have a golden opportunity, whilst the G.C.S.E. discussions are taking place, to take a major step towards stabilising and rationalising the syllabus minefield. It will do us all a favour; pupils, parents, teachers, industry and eventually the country.

ANALYSIS OF 'O' LEVEL CRAFT, DESIGN AND TECHNOLOGY COURSES

	S.U.J.B. TECH.	A.E.B. E.W.T. & P.	J.M.B. E.W.T. & P.	OXFORD E.W.T. & P.	O. & C. D. & T.	LONDON D. & T.	CAMBS. EL. OF E.D.	A.E.B. D.C. & A.	OXFORD C.D. & T.	LONDON ENG. SC.	OXFORD APP. SC. & T.	CAMBS. ENG. SC.	CAMBS. TECH.
Design and Drawing													
Sketches	/	/	/	/	/	/	/	/	/		/		/
Assembly Drawings	/	/	/	/	/	/	/	/	/		/		
Simple Jigs and Fixtures	/	/		/		/		/			/		/
Mech. and Elect. Devices		/						/			/		/
Analysis of Function		/				/		/			/		/
Shaping, Forming, Fabricating		/		/		/	/	/			/		/
Perspective								/			/		
Exploded Views				/			/				/		
Orthographic		/		/	/	/	/	/	/		/		
Isometric				/	/	/	/	/			/		
Development							/	/			/		
Loci.							/	/			/		
Historical Development		/	/		/								
Social Implications	/												/
Project and Practical													
Functional Project	/		/				/	/	/		/		/
Test Data	/						/				/		/
Enamelling						/							
Moulding and Casting	/	/		/	/	/	/				/		/
Forcework		/	/	/	/	/					/		
Heat Treatment	/	/		/			/				/		/
Hand Tool Processes		/	/	/	/	/		/			/		
S. & H. Soldering & Brazing		/		/	/	/					/		
Gas Welding		/									/		
Arc Welding													
Machine Tool Practice		/	/	/	/	/	/	/			/		/
Materials Testing		/				/	/				/		/
Plastics – Manipulation	/	/			/	/	/		/		/		/
Timber Technology	/				/	/	/		/		/		/
Examinations													
Written Paper	/	/	/	/	/	/	/	/	/	/	/	/	/
Design Paper			/	/	/	/	/	/	/		/		/
Engineering Analysis							/				/		/
Project Assess. – External							/				/		
– Moderated Internal	/	/	/					/	/				/
Practical Exercise		/	/	/	/	/			/				
Written Report	/		/				/		/		/		/
Safety													
Care of Tools and Machines	/	/	/	/	/	/		/					
Personal Safety	/	/				/		/					/
Use of Chemicals	/	/				/							/
Skin Protection	/	/				/							/

There are two important messages for teachers preparing pupils for examinations:

1. Do not take the Examination Boards or the universities to be 'sacred cows'. They are there to be used for the benefit of your pupils. Go to great lengths to build relationships with both and don't be afraid to question what they are at. The 'old boy network operates in all walks of life. Make sure that you are one of the 'old boys'.
2. Apply the fundamental design criterion to your own syllabuses, i.e., 'FITNESS FOR PURPOSE' – What purpose? – That of fitting pupils to think for themselves – to be able to apply design and technology to their particular career paths.

I think that some of you will find that the syllabuses which feature such aspects as lap dovetails, secret mitre dovetails, fox wedged tenons, French polishing, intricate wrought iron work, upsetting, forge welding or the ability to draw a plummer block with some precision – when the pupils has never seen one or knows what it is for – do NOT actually fit him or her for life in our modern society. All the skills mentioned are well and good in their own right, but I would remind colleagues that we are not in the game of TRAINING pupils for a specific task. Our role as educationalists is one of providing a broad education which hopefully will stimulate divergent thought.

We should by now have moved away from the level of INSTRUCTORS doing everything by numbers – to a point where, as professional educators, we have minds of our own, and are prepared to use them in stimulating children – or teaching them to learn.

I firmly believe that the way forward is to use the motivation of designing and making – or problem solving as some would call it, NOT in a subservient way to Maths and Physics, but using those subjects as service subjects to draw upon. Maths and Physics do not build a society, it is the application of them that does – you have that ability in your hands.

The National Association of Head Teachers carried out a survey of new 'A' levels for Design and Technology, and also Engineering Science, in September 1978.

They commented:– 'We share the concern already voiced by the SCSST, the STF, SCUE and more recently the Equal Opportunities Commission, that Admissions Tutors still viewed those courses as lightweight and leading only to lightweight examinations. We believe many of the new courses to be very demanding – a view supported by H.M. Inspectorate'.

Out of the 36 universities there were 79% replies whereas only 48% of all polytechnics responded.

54% of those universities accept 'A' level passes in Design, Technology and Engineering Science for matriculation purposes, whilst a further 32% give full recognition to Engineering Science but not necessarily to Design and Technology. Only 27% of

the polytechnics recognise any of these subjects for admission. 14% of the universities and 28% of the polytechnics do not recognise passes in any of the three subjects.

Examinations
G.C.E. 'A' LEVELS

A.E.B.
644 – ENGINEERING SCIENCE –
My view is that any work that we do at 'A' level involving Applied Sciences, should be in conjunction with Maths and Physics. This course can be taken in lieu of Physics, so we must ask ourselves if it is a watered down Physics course so that some Applied Science work may be added? The course can be conducted entirely in a lab. – is that how we produce our divergent thinking engineers. There is no DESIGN element and lab. experiments and project work only amount in total to 16% of total marks.

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Materials													
Metals – Structure	/	/			/	/	/				/		/
Composition	/	/	/	/	/		/		/		/		/
Heat Treatment	/	/	/	/		/	/				/		/
Corrosion and Prevention	/					/	/				/		/
Properties	/	/	/	/		/	/		/		/		/
Mechanical Testing	/	/	/			/	/			/	/		/
Plastics	/	/			/	/	/	/	/		/		/
Timber	/				/	/	/	/	/		/		/
Mechanics													
Forces and Frame Structures	/									/	/	/	/
Moments and Levers	/	/								/	/	/	/
Work, Energy, Power	/									/	/	/	/
Mechanical Advantage	/	/								/	/	/	/
Simple Machines	/	/								/	/	/	/
Velocity, Momentum										/	/	/	/
Hydraulics										/	/	/	Pnu.
Heat and Heat Engines													
Engines and Motors										/	/	/	
Energy Conservation	/										/	/	
Friction	/	/								/	/	/	/
Efficiency	/										/	/	/
Latent Heat										/	/	/	
Refrigeration										/	/		
Electricity and Electronics													
Conductors and Insulators	/									/	/	/	/
OHM's Law, etc.	/									/	/	/	/
Simple a.c. Theory							/			/	/	/	/
Transformer							/			/	/	/	/
Electromagnet	/									/	/	/	/
a.c. & d.c. Motors							/			/	/	/	/
Transducers	/									/	/		/
Electricity Supply	/						/				/	/	/
Semi-Conductors	/									/	/	/	/
Simple Circuitry	/					/	/				/	/	/

656 – GRAPHIC COMMUNICATION –
I do not feel that this is an appropriate 'A' level subject, bearing in mind potential for careers.

LONDON
150 – ENGINEERING SCIENCE –
There are, obviously, many similarities between this course and the A.E.B. one. There is little syllabus work on materials and no recognition for the needs of Graphic Communication and Design. So I would regard it as an enhanced Physics course.
110 – DESIGN AND TECHNOLOGY –
This syllabus has recently undergone major surgery. You will find that the new version is much more akin to the modular courses and has taken heed of the universities comments in the past about a lack of 'academic rigour'. In my view it is a well balanced course.

J.M.B.
ENGINEERING SCIENCE –
It is significant that this subject does not appear under the heading of Technical Subjects. It is basically an enriched Physics Course and my earlier comments hold true. You should bear in mind that to do the subject justice you have rolled two subjects – Physics and Applied Science into one – and that is a heavy load.
DESIGN –
The aim of this course is to provide a broad, balanced approach to two and three dimensional design. Although J.M.B. have taken some time to come out with a design based course I think they have got it right. It is a demanding course both academically and practically.

OXFORD LOCAL
9882 – ENGINEERING –
The important thing to remember about this syllabus is that it is intended to run alongside Maths and Physics.
In addition to the Principles of Engineering it has a Design problem which the candidate has 3 weeks to complete. The project work is assessed by a visiting examiner.
This is a very well thought out course which covers the needs of the potential professional engineer extremely well.
9883 – DESIGN –
This is an extremely enlightened course which deals with Design in a broad fashion. It has some currency at tertiary level, though I must say that we have not yet managed to convince some of the more entrenched professors. If pupils take it with two 'safe' subjects then it would be an excellent start for them.

CAMBRIDGE
9358 – ELEMENTS OF ENGINEERING DESIGN
My impression is that the principles are dealt with somewhat superficially and that the process of Design

is given but a passing nod. It is an improvement on the practical Physics course but not much.
TECHNOLOGY –
I understand that there should be an 'A' level out shortly to complement the existing 'O' level. There is every possibility that it will become a market leader.

Examinations
G.C.E. 'O' LEVELS

A.E.B.
079 – CRAFTWORK – DESIGN, COMMUNICATION AND APPLICATION –
Many areas of skills are dealt with by inference only, e.g. 'methods of forming materials! I guess that staff would prefer the syllabus to be more specific. There is a great deal of emphasis placed upon the Design Process, however the Moderator will only put in an appearance once every three years.
If I were God for a day I would change the title so that tertiary education or prospective employers were not confused.
059 – SCIENCE (BUILDING AND ENGINEERING) –
This is a nasty mixture of an incomplete Physics syllabus coupled with some materials, including the Blast Furnace and the L-D process. I would guess that it is certain that some Headmasters would go for it as 'Science for the less able'.
I hope that this is not intended as the preparation for 'A' level Engineering Science. No practical examination is envisaged at all.
140 – GRAPHIC COMMUNICATION –
I regret, that I would want to rename this as 'Geometrical Drawing with some Graphics'. It is masquerading under its present title. A quote from the syllabus information – 'The communication of problems of a three dimensional nature requires more than verbal and literary intercourse can provide'.

CAMBRIDGE
7000 – ENGINEERING SCIENCE –
This subject may not be taken with Physics – so in view of the accepted status of Physics do we once again end up with a place to put the also rans.
Quote 'Examiners will attach importance to an understanding of scientific principles and will look for evidence that these have been studied practically'.
YET – there is a glaring lack of content in the areas of DESIGN, GRAPHICS AND MATERIALS.
7060 – ELECTRICITY AND ELECTRONICS –
I feel that although this appears to be a most thorough course it is far too narrow in my view to qualify for inclusion in a broad curriculum – particularly if it is at the expense of a broader C.D. & T. course.
7052 – TECHNOLOGY –
This is a well rounded syllabus with a great deal of emphasis on investigation, selection and evaluation. Craftsmanship in the project work is rewarded.
The syllabus is based around a modular system with the following areas of study:– STRUCTURES, PNEUMATICS, MECHANICS, ELECTRONICS OR ELECTROMAGNETS, MATERIALS OR POLYMER TECHNOLOGY. 3 areas of study have to be chosen. I would be inclined to make MATERIALS a compulsory section since it is central to everything we do.
The new Schools Council 'Modular Courses in Technology' series of books and work cards are particularly relevant to this type of course.
WARNING
I think that we, as professionals, in using a particularly well documented syllabus as the one I have just described, do not in due course, drop into the pitfall of teaching by *vote*. Since it is all provided, it would be so easy to do if all in numbers – which is precisely what we have been trying to get away from all these years.
6039 – CRAFT, DESIGN & TECHNOLOGY –
Once again I feel that the title is misleading. To me this course is an enriched CRAFT and DESIGN Course without the technology. It may suit some of you to have a multi-media Craft and Design Course, in which case this would fit the bill quite well, BUT what a pity it had to usurp the title.
7050 – ELEMENTS OF ENGINEERING DESIGN –
This is for schools requiring an integrated syllabus in Applied Science. If you take the broad curriculum view this course is rather specialised, but forms a good introduction for pupils with a bias towards engineering. I like the layout of the syllabus showing the depth that each subject should be taken to.

J.M.B.
DESIGN –
This course could be looked upon as an enlightened course which puts DESIGN well to the fore. However, it is worrying to some extent that it *may* be possible to continue to teach a conventional wood or metal course within its syllabus and add a sprinkle or two of Design here and there.
Whilst the course gives the flexibility the designer likes, when it comes to so called 'academic rigour' which tertiary education claims is necessary, you may feel it is lacking.

CONTROL TECHNOLOGY –
This syllabus falls into the category of being over-specialist, in my view, and should be the subject of courses at college or university – NOT school.

O. & C.
ELECTRONICS –
I will not labour the point. This syllabus falls into the over-specialist category.
DESIGN AND TECHNOLOGY –
This I find to be a vague syllabus which, of course, could work to the advantage of those teachers who

want to go their own way – BUT it could be very confusing for those starting up a new course. The prescribed study for 1981 is Gropius and the Banhaus experiment.

OXFORD LOCAL
7878 – TECHNOLOGY –
This is a revamped version of the old Applied Science and Technology course. It is in fact the Cambridge syllabus 7052. Oxford Board are not so generous in giving notes on assessment of the project.
7879 – CRAFT, DESIGN AND TECHNOLOGY
Once again there is little technology in the 'applied science' sense in this course. It is principally a 'design and realisation' exercise with a strong flavour of Art. Whilst the links with Art and the aesthetic side of our work should be encouraged, this is another syllabus where one could teach conventional wood or metal within it.

LONDON
DESIGN AND TECHNOLOGY –
This is a fairly well balanced syllabus which still allows the teacher or pupil to develop his own particular talents. Some simple mechanics and electrics have been omitted – which could aid project work if they were included. This syllabus, I understand, is due for a facelift shortly.
ENGINEERING SCIENCE –
We have another course which may not be taken with Physics. If we are to embark upon the applied sciences I regard Maths and Physics as essential tools to complement, rather than discount.

S.U.J.B.
TECHNOLOGY –
This, in my view, is an excellent course much on the lines of the Cambridge syllabus. Once again the Schools Council Modular Courses will assist in background.
As a general comment it appears that we are starting to see the Mark II versions of Technology, or Applied Science courses, settling down to a worthwhile future, gaining respect within the curriculum and providing a substantial base to go on to 'A' level. However, with the Design and Craft courses we still have an amount of difficulty with identity. Some are masquerading under a Technology banner while they are patently the same recipe as before.