

# Teacher Opinion on Technology

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If the introduction of technology into the curriculum is to be 'wholesome' then we must pay heed to the position of the teacher. We do not really know (I have yet to find evidence of investigation into this area) how they perceive their position or what reservations they have on this issue. I do however feel, through casual discussion and acquaintance, that there still exists a mood, amongst those not obviously involved with high profile initiatives, of concern that many educational values are undermined by such initiatives.

Our picture cannot be complete until their position is ascertained. To this end I undertook to simply ask as near to a typical cross section of teachers as possible how they viewed the matter.

I approached three schools in the local consortium (including my own) with a possible maximum sample of 150-200 full and part-time teaching staff.

I sought to ask questions that allowed an open interpretation of technology yet gave some indication of the individual's perspective. These opinions were to be held against Status, Responsibility, Age, Gender, Subject Specialisms and Years in Teaching. By categorising my findings in this way I felt that not only could opinion be sorted but the conclusions could identify areas such as age groups, subjects and managerial status where initiatives could be best aimed for optimum effect.

The questions asked were . . .

How would you define technology as applies to school?  
Do you experience any pressure to accommodate some/more aspects of technology?  
Would you like to know more about technology?  
Which areas?  
Which subjects are particularly suited to the teaching of technology?  
Which are not?  
What additional resources (if any) do you feel you would require to further your Technology teaching capacity?  
List sources of any useful information you have encountered concerning technology.

Any other thoughts?

It proved very difficult to decide upon the terminology especially the use of the word 'Technology'. I endeavoured not to predetermine any particular technological activity and so, although contentious, I referred to the activity of 'teaching' technology. I felt that this could be interpreted as dealing with CONCEPTUAL, SYNTHETIC and OPERATIONAL technology. However such a decision did arouse some concern amongst some who completed the survey.

The use of the word 'applies' rather than 'applied' in the first question was also intentional as I sought to gain an idealistic viewpoint rather than an observational one.

I had not anticipated the response to the survey (or lack of it). Out of a total of 200 survey forms handed to head teachers I received less than 30 returns. I still receive a dwindling trickle of returns from my own school but generally the sample is nowhere near as comprehensive as I would have liked. In fact the Head teacher of one school failed to distribute the forms to his staff.

Nevertheless the returns I did receive were revealing in many aspects.

The following data only acknowledges 19 returns. Although more were received they were not in time to be analysed for the purposes of this investigation.

## Returns by subject

English	5
Humanities	3
Languages	2
Science	2
Home Economics	2
Computing	2
Craft Design and Technology	1
Drama	1
Mathematics	1

The sample is composed of 9 female and 10 male staff between the ages of 31 to 58 who had taught in schools between 5 and 33 years. Every status currently observed in schools was represented.

I felt that the size of the sample did not lend itself to analysis against the

above categories as any conclusions concerning age or status, for example, would not necessarily be representative. However I did feel that the sample did represent a good cross section of staff in fairly typical schools and so the response to the set questions would serve as a reasonable basis for conclusions concerning a general interpretation of technology.

The following pages look at the responses to each question in turn and their implications.

## How would you define technology as applies to school?

There seemed to be no hesitation in answering this question and most seemed to display a fairly catholic interpretation. Fifteen of the nineteen analysed referred to the use of hardware of one kind or another. Where specific equipment such as computers and videos were mentioned these were qualified as being examples. Of the fifteen all used more general terminology such as resources, equipment, machines or tools. Perhaps surprisingly only three teachers actually made a direct reference to either videos, electronics, computers or tape-recorders. The computer, it seems, is not synonymous with technology although as we will see later, it is seen to be a useful asset.

The activity of problem solving was mentioned by six of the nineteen and two teachers referred to the concept of enhancement. However by far the most popular interpretation seemed to involve the simple application of hardware and the learning of related skills and knowledge.

Of those who made no reference to hardware one simply referred to the 'terminology used within a specific subject area' which although facilitates a subject interpretation offers little guidance to the uninitiated. Another defined technology as 'the application of knowledge to solve problems' which again would need qualification to be useful (are managerial or psycho-analytical techniques technology?)

Only two made reference to the

\* The three part Conceptual, Synthetical, Operational model used here I first found in Maurice Barrett's book 'Art Education' whilst undertaking my PGCE. I used it then to formulate projects in Art as it usefully identified three necessary components of any Art or Design activity. This was Maurice Barrett's intended application and I understand that he went on to develop an aid to project composition based on this model.

I have suggested that the model could just as usefully describe component activities of a complete 'Technology' experience and provide a tool for teachers to address these integral elements when considering Technology's introduction into the curriculum.

demands of a changing society (both teachers of English).

'Modern ways of doing things, finding out and presenting one's findings'

and more noble . . .

'The knowledge and skills necessary to live with dignity and competence in a fast changing technological society'.

These two statements, in my view, qualify the others. The tools, machines and resources referred to are of a certain category, being those currently used in our 'technological society'. It is hard to imagine that a teacher may consider 'adzing skills' or the application of the steam-hammer as suitable topics without linking them in some way with contemporary practice.

We might assume that a high proportion of teachers do have a useful interpretation of technology and that that definition involves addressing the imbalance of education's Form relating to contemporary technological achievement and activity.

Although many may consider that technology cannot be defined without referring to problem solving activity we cannot assume that such activity is a pre-requisite of technological experience. Much of our understanding and awareness of technology is developed on a much more casual basis. Driving a car, tuning a TV and dialing a telephone number are activities that contribute to our overall understanding and technological capability.

#### **What technology do you already teach?**

At least five teachers (some verbally) felt that they ought to make the distinction between teaching and using technology. One quite forcefully made it known that they objected quite strongly to the teaching of technology for technology sake. I think that many of us can sympathise with this viewpoint but must realise that a subject that has feels unable to offer Synthetic Technology activity but uses Operational Technology activity ought to recognise that the former has a place in the curriculum.

The summary of technology taught by a cross-section of nineteen secondary school teachers is . . . wordprocessing, stage lighting, set design, car mechanics, computer awareness, programming,

databases, spreadsheets, microwave cookers, food preparation, tools, materials, electronics, structures, fluidics, control, digital logic, mechanics, textiles. Use of a variety of subject specific software, video, language laboratory and various applications in Science. Technological developments in the home, historical context, problem solving and the 'moral dimension'.

It seems to me that this is a formidable list. We could haggle over missing elements but generally this represents quite a comprehensive blend of understanding and activity. However it is doubtful whether there is any underlying strategy behind this 'shadow syllabus'.

#### **Do you experience any pressure to accommodate some/more aspects of technology?**

We could, if we were feeling charitable towards High level initiators attribute the development of the 'technologically infiltrated' curriculum to them. But we have seen that this is unlikely to be appropriate as their 'message' would be reflected in the definitions gathered from the first question. In fact, these definitions do not use the rhetoric used by High level initiators for innovation has come from another source. Looking at the pressures felt by teachers to accommodate technology would give an insight as to the class of initiative that teachers are most likely to respond to.

Of the nineteen returns analysed only six made reference to anything that could be interpreted as acknowledging a High level initiative. Three specified TVEI, one specified Industrial Liaison, one referred to 'infrequent courses' and the media in general and the last made a vague reference to Prestel and computer Networking.

Seven of the remaining thirteen bluntly did not acknowledge any form of pressure whatsoever while the remaining six referred to self pressure through the perceived motivating virtues of technology or the need to make more relevant use of what is or could be available or were dissatisfied with their own inexpertise.

To bring our picture up to date, we have a body of teachers with very definite ideas as to what Technology in

education means to them. This definition does not seem to reflect the contemporary thought of High level initiators. However technology does seem to have been established without overt guidance by teachers who have established a 'hidden syllabus' which covers a broad spectrum of technological activity.

It would be wrong to deduce that this situation has not been influenced in part by High level initiators. The demand for increased expertise in the use of computers, for instance, would not have occurred without the computer being provided by a High level initiative in the first instance. Nevertheless we can, I think, safely assume that many of these teachers are taking admirable steps to address a need that they have identified. These teachers happen to live in the same 'fast changing technological society' that their pupils need to adapt to. The need to develop technology in this respect is for the most part, intuitive in that the rationale for such development is not in a rationalised form.

Although we can trust teachers to provide their best and to filter change with pragmatism, the whole affect lacks cohesion. Initiating change is of little use without real guidance if that change is to reach it's full potential. There are very basic misconceptions that can be arrived at, which will, if not corrected, inhibit good practice and demotivate staff and pupils alike.

#### **Would you like to know more about technology? Which areas?**

Of the nineteen, four declined the invitation to specify where they thought they needed help. Of the four only one had previously stated that they do already contribute to technology.

Twelve teachers were able to be more or less specific as to where they thought their weaknesses were. Of the nine who identified the use of computers five stipulated wordprocessing. However if we hold this against the fact that four teachers entered answers that carried the same sentiment as 'Yes please, but what?' we might assume that a proportion of those who specified computers also were not sure as to what was expected of them.

This is another indication of the

ineffectual nature of current High level initiatives. There are not many teachers who could not use a word processor to enhance their teaching capability in some way, but for many this is as far as their perceived need goes. The question is rather like saying to a child, 'Do you want what's in this bag?' How could the child or the teacher know whether they want the bag's contents? This sentiment was more clearly identified by the teacher who asked to see in the bag or have a wider perspective of the curriculum. This is perhaps quite an optimistic request as it assumes that there does exist a body that is able to offer a workable overview. It could be that those who declined have no expectations of any body having a complete perspective of the matter.

Two teachers were more categorical in asking for a cross curricular view, both asked for links with CDT or Science which is a commendable request but may indicate that they do not imagine connections with other curricular areas as being possible.

#### **Which subjects do you feel are particularly suited to the teaching of technology and which are not?**

Ten of the nineteen stated that they thought technology could be taught across the curriculum and were unable to identify subjects where technology could not be 'taught'.

From the nine who were able to identify subject areas the following list illustrates their opinion.

<i>Can support Technology</i>	<i>Cannot support technology</i>
Science	Religious Studies
Maths	PE
CDT	Music
Home Economics	Art
Computer Studies	Modern Languages
Humanities	Art History
Modern Languages	English
Business Studies	Humanities
English	

Obviously this listing illustrates a muddled understanding which would be best sorted by dealing directly with those subjects where teachers have difficulty in appreciating their role in technology education.

RELIGIOUS STUDIES can use

technology in an Operational sense through interactive software and word processing. They may also consider themselves as having a part to play in the Conceptual sense as the moral dimension will definitely brush against religious belief. The changing role of religion in a technological society is, I imagine, an ongoing and vital topic for discussion in most religious organisations.

PHYSICAL EDUCATION can use technology in an Operational sense in that probably all sports have benefitted from advancements in technology over recent years. Although it may be difficult to schedule academic sessions to discuss directly these changes pupils cannot help through attending the PE lesson but have their understanding of technology broadened. PE departments in my experience make great use of videos, whether to fill in background or to facilitate a higher level of appreciation at any level. Concepts such as timing (to 1/1000 of a second!) and recording and broadcasting of sport events are real examples of 'technology in action'.

MUSIC today is generally not a viable activity without the utilisation of some technological device. All musical instruments are the result of technology and contemporary music always reflects contemporary instrument technology.

Purists may say that this viewpoint does little to foster an appreciation of music but then teachers of music have had always to choose what technologies they want to specialise in. I suggest that this choice always follows contemporary instrument technology. Very few, if any departments use a Hurdie-Gurdie or a lute or a hollowed out log and a bone. Even if they did is it possible to foster a useful appreciation of music without requiring pupils to understand something of recording and broadcasting technologies?

ART probably has one of the greatest cases for denying technology a place. Many artists do survive through exercising techniques that have been available for centuries. The art teacher would be quite right in saying that the more basic aims of an art education do not need technological trimmings as they are to do with expression and an exploration of inner self. If need be this

can be done in a stimulating way with nothing more than a pencil and a sheet of paper.

However technologies related to image processing have undoubtedly an important role to play in the arts of the future and any teacher who does not acknowledge this will be inhibiting the potential capability of his or her pupils. Generally speaking though most good art teachers recognise the motivating qualities of making such technologies available.

MODERN LANGUAGES when deciding to use the Language Laboratory recognised the usefulness of operational technology. Although, without a good software the use of computers is limited I think that most can appreciate the potential of using such hardware.

ART HISTORY. I am not sure as to the relevance of this subject area as applies to this survey. I am fairly sure that it is not a 'running subject' in most schools. However, I imagine that the person who stipulated Art History thought long and hard to find a subject area that could not incorporate technology. Nevertheless use of videos and word processors at least would undoubtedly enhance the teaching of this subject.

ENGLISH could quite easily avoid using technology if it saw fit. But I cannot help but think, as I sit before my word processor, how much more capable a writer I am for learning how to use it.

I took under my wing a twelve year old low ability truant who's main reason for absconding was his lack of ability in writing, he was too embarrassed to 'perform' amongst his peers. I taught him how to wordprocess and so provided him with the facility to produce smart and reasonably neat compositions which were, with the aid of a spell-checker, perfect.

HUMANITIES in some schools deals with little else for the history of mankind is one and the same as the history of technology. Nowhere else can technology be put into a historical context more comprehensively as in the History lesson. The Humanities has a vital role to play if we are to offer pupils a complete technology experience as their expertise in considering man's relationship with technology is

unparalleled within the curriculum.

Most teachers intuitively accept that technology has an important role to play in contemporary education and that role touches every part of a modern education. Without an initiative or outside pressure to accommodate technology, technology cannot help but be absorbed into the curriculum as it is, and always was, an integral part of human activity. One might go so far as to say that it is this activity or form of progress that sets us apart from other species.

It is not all technology that concerns us here, only that which has not as yet been absorbed into education. But like the child offered the bag, we can only guess as to the extent of this failing. It is unreasonable to expect teachers to establish this alone without some form of usable guidance.

A CDT teacher friend of mine was asked to investigate the use of opto-electronics in schools, as this was seen to be a vital area of technological advancement in the near future and that schools involvement should be anticipated as far as possible.

I do not know of his conclusions but I doubt whether they will surface again as a package that will identify curricular areas that would be ideally suited to take on opto-electronics or recommend what areas of learning they will replace if necessary. Without such a package how can teachers be expected to address such a need?

#### **What additional resources do you feel that you would require to further your technology teaching capability?**

Eleven of the nineteen specified either more time with computers or more computers. Computers are, from whatever perspective you view it, central to the teaching of technology. A computer illiterate education system has no hope of providing pupils with a wholesome appreciation of modern society. Today computers are the fundamental basis upon which our technological society rests.

How demotivating it must be for these teachers to feel that they do not receive the support necessary for them to take the first steps into technology. We have passed the point where we have to sell the need for computers to schools.

Now convinced of their place teachers, as a fundamental resource need computer availability and literacy, and they know it.

#### **List sources of any useful information you have encountered concerning technology**

Only three teachers referred specifically to published material. The remainder either referred to another teacher at the same school or declined to answer.

We can only assume that most teachers feel entirely alone with the introduction of technology.

I provided space on the questionnaire for teachers to write any other thoughts they had on the matter, here they are . . .

'Technology was once described as all things that have moving and or electrical parts and which can be used to enhance the learning process. Then along came TVEI and its friend the National Curriculum and all of a sudden poor simplistic technology became a whole new teaching method of problem solving as defined by "those in the know".

I reckon that technology (machines, labour savers etc) should be our servants and not be allowed to dictate our teaching methods. Don't get me wrong, I ain't knocking technology — just what we're being asked to do with it!

'This is all very exciting but particularly inappropriate that pupils know more than I do. Just once in my teaching life could I have some training *before* my department is equipped?'

'I welcome technology if it enhances my teaching or the quality of life but not if it gets in the way of either of the above. People are more important to me than machines and inter personal relationships are very important to me. I have yet to have a meaningful relationship with a machine but have had particularly frustrating experiences (with machines).'

'Technology should be integral with all subjects — not taught as a stand alone topic.'

'Although far from a Luddite I do feel that an awful lot of our heritage is rapidly disappearing due to the encroachment of IT into all areas. This is sad in a romantic sense but fatalistically inevitable. In order to keep

up or even achieve basic skills a vast amount of time is essential'.

'My language laboratory is out of service because I am unable to get it repaired. I have contacted engineers several times but they have not come'.

'This is reminiscent of GCSE and TVEI (etc) — "over to you", what do you think ought to be done? I begin to long for real guidance, real instruction'.

#### **The role of the teacher**

Now I think that I am probably naive in some respects. Perhaps I have not been teaching long enough to accept that the process of educational change is a long one and that most initiatives rely upon interpretation. I can see that such scope for interpretation could stimulate innovation and that the imposition of a rigid interpretation would do little to encourage vitality within schools. But on the other hand, if it is vital that we address the need for technology within schools and believe that it is important that we do so . . . then why is it so difficult to define?

I suppose the scenario goes some thing like this . . . Someone up high decides that we should concern ourselves with technology. This may be in response to research or general observations or pressure from interested parties. Sections of the teaching community agree and devise their own interpretations which they in turn hand down to LEAs or schools. These definitions are then further refined as they head towards the classroom and are finally interpreted and applied by the teacher.

Different initiatives will display different degrees of interpretation according to their complexity. Stipulating that all pupils will learn a particular mathematical formula will result in a narrower response than the more general instruction to ask for pupils to be taught how to multiply one number by another. The mechanism is such that the most innovative, the most wide-reaching, the most *important* initiatives are less likely to manifest in a form that resembles the initial intent. Fundamental change in our educational system is indeed slow.

Perhaps the most important initiatives we have had to come to terms with over recent years are TVEI and

GCSE. These have quite specific aims and are broad enough to touch every aspect of the curriculum. They have required or will require all of those involved in secondary schooling to interpret some aspects. Yet ask those who actually teach within TVEI what it means to them and the response is more likely to refer to developing courses that acknowledges a child centred approach than addressing a need in the employment market. To most teachers GCSE provides the stimulus and the framework to developing pupils initiated learning rather than a consolidated public examination.

The 'pale' of technology has now been emptied into the top of the educational system. Interpretations, as is to be expected, are many fold but have not, generally speaking, filtered down to teacher level. When they do the real business of interpretation will commence. At the last level the work of forming cross curricular links will begin and the concept of technology will need to be formulated and applied. It is here in the classrooms and staffrooms, and only here, that the philosophical options can be explored with pragmatism and true meaning be put to the ideals of the initiators.

I see an heirarchical system for development where thought at each level influences the levels above and below. We are all aware of such a system and realise that although a head of department in a secondary school may directly influence the staff under him or her and the headteacher above, he or she can only influence the school governors through discussion with the head and the pupils that he or she does not teach directly through department staff.

Of course there are parallel heirarchies, for instance, LEA Chief Advisor-Subject Advisor-Head of Department-Departmental Staff-Pupils which may provide the opportunity for more or less influence. But, the general opportunity to change things on anything but an immediate level will always be limited by this structure. It could follow that another rule we might acknowledge is that the structure of ascending status makes influencing those 'below' us easier than influencing those 'above'.

In practise these interactions between

the levels of influence within the structure of education limit our perception of our work. Our thoughts are channelled into the areas where we can have the most effect. For instance, a teacher of science after trial and error in the classroom may have half an idea for formulating an innovative scheme for the introduction of an Integrated Science approach. That teacher may seek the support and advice of his or her Head of Department and may or may not receive it. However it is unlikely that the scheme will be adopted in its brightest hue as the Head of Department would then formulate his or her own interpretation with which to 'test' the head teacher who would in turn add is or her own tint. One may argue that if that scheme was worth it's salt then it would surely be adopted and so become more instrumental in influencing others. But we all know that this isn't so. I think that we can all accept that it may not be beneficial for THAT department to adopt THAT scheme in its purest form but we would never know whether it may have suited another department somewhere else. Perhaps that teacher would sometime in the future earn the opportunity to adopt the scheme in his or her own department, and one would hope that someone with such foresight would eventually achieve such status.

Maybe 'survival of the fittest' does offer an effective vetting procedure. But at its best it is slow and I suspect that many valuable ideas and innovations are lost along the way.

This, however, only concerns the thoughts that an involved individual may have on the elements of education that he or she is directly involved with. To continue with the above situation, what if the scheme for integrated science required some amendment to the national curriculum criteria for assessment or required that all teachers of it should have a skill that beforehand was unrequired? However wonderful that scheme may be it is unlikely that those who control the national curriculum or the training of teachers would ever get to hear of it let alone consider it. The only real possibility would be for that teacher to publish the scheme and offer it up for peer assessment, which given the pressures

on the classroom teacher and the commercialism of the publishing press, is for the most part an unlikely event.

The innovative science teacher returns to the classroom and his or her schemes of work without ever knowing whether the scheme was valuable or not.

We have seen that teachers are willing to consider and develop technological areas in education and that there is a good deal of sympathy for such an initiative. But without proof, in the form of training, hardware, real guidance or hard cash, of some form of commitment or understanding from a higher level of administration we cannot expect teachers to display the kind of enthusiasm that is required to vitalise this initiative.

To the teacher with just enough time to prepare lessons, handle administration, mark books etc, the request to absorb technology more fully only means hard work. In the present climate of change and initiatives the teacher is forced to take the route of least resistance, and if technology does not offer such a route then the initiating seed will fall upon what appears to be waste ground.

The above constraints, lack of time, money and guidance, are the only ones that are preventing what may prove to be a great restructuring of educational practice. The teacher sees the rest of the world benefitting from the technology boon but sadly education has been passed by. One can appreciate the bitter irony of then being asked to teach technology.

Initiators at all levels must bear this circumstance in mind. Teachers will accept an honest 'we cannot resource this initiative but given the position you can still do . . .' For High level initiators to ignore the fact that classroom practice is severely inhibited by such constraints and to continue developing a completely unrealistic philosophical standpoint serves only to further alienate the teacher. If higher levels of administration really want to take control of the curriculum then they ought to realise that they are rendering such an aim impossible by what amounts to bad practice.

#### **Teachers defining technology**

The task of defining technology is an

awesome one without help. Yet teachers are forced to do it every day in an effort to make their teaching relevant to the outside world. I have yet to experience a useful forum in school where ideas can be discussed with concrete interpretation in mind.

The task is made even more awesome by technology's insistence for a cross curricular approach. In practice teachers know precious little of other subject areas and syllabus content is generally not known outside of any given department. It is hard to imagine how any cross curricular links could ever be formulated.

In practice such development usually occurs at middle/senior management level but even then the forum is such that departments vie for time, space and money. Even though departmental heads may be keen to establish such links the process contains too many variable factors that may prevent working relationships to formulate.

In a Head of Department meeting it takes only one member suggesting that they may encroach upon another's budget, time or content to render the discussion futile. That is assuming that such a meeting would ever be called to discuss such possibilities. Heads of Department like most involved in teaching fight to maintain the status quo.

What follows is an example of the casual dialogue one might encounter in any staffroom where teachers, not necessarily Heads of Departments, are concerned enough about understanding technology to actually start defining it.

Hopefully this dialogue could be typical and is meant only to demonstrate the difficulty experienced by teachers who lack guidance and support. Hopefully the discussion will also stimulate your own thoughts.

Mr Roberts a teacher of CDT dropped into a comfortable staffroom chair at the end of school. In his hands he shuffled sheets of A4 paper. 'You know this questionnaire that I've asked the staff to complete?'

'Yes?' answered Mr Wells a teacher of English who sat staring into a mug of tea.

'Well, I composed it, but I don't know what I'm going to do with it.'

'That doesn't sound particularly

clever.'

'Well the answers aren't anything like I had expected them to be.'

Mr Wells moved his mug to his lips, 'If you knew what the replies were going to be you wouldn't have handed it round would you?'

'I know that but I can't sort the replies, they're not comparable.'

'How can that be true? They all answered the same questions didn't they?'

'Yes, but I didn't anticipate the diversity of interpretation.'

'Do you mean that people read the same question differently?'

'That's exactly it.'

'Bad grammar I expect.'

'I thought that the grammar was OK. In fact I was sure that it was when I read it.'

'Then it should make sense to others then.'

'It doesn't. Most people seem to either have a totally different interpretation or don't understand the question at all.'

'What question?'

'What aspects of technology do you teach? I can answer that question quite easily.'

'OK answer it.'

'Alright, I teach the use and understanding of structures, mechanics, hydraulics, energy, analogue electronics and digital electronics within a problem solving format as part of the design process.'

'And you expected answers in a similar vein?'

'Well yes. I thought that they would be able to be specific about the elements they teach.'

'Or do not teach.'

'Exactly. But even the science teachers seem unable to be explicit. This science teacher here says, "Very limited. Some computer applications". Now couldn't everything that science teaches be construed as being something to do with technology? Couldn't or mightn't science cover everything we cover in CDT but without the design base?'

'What you are saying is that both science and CDT could teach say Electronics for example. The only difference being that you suspend your teaching within a problem solving format.'

'Yes.'

'That seems quite proper to me or you would be both teaching exactly the same thing wouldn't you?'

'Yes'

'So you both teach the technology of Electronics. Your coverage has a practical bias and science covers the theoretical. What's wrong with that?'

'Nothing, I think, if we take a transistor as an electronic device we would teach the pupils when such a device could be used in order that they could consider its use in design.'

'That seems right, but I have no idea as to what a transistor does.'

'Oh. It's a switching or amplifying device that allows a small current to control, or switch a larger current.'

'And that's what science teaches then?'

'What?'

'That it controls current.'

'Yes, but it also covers the P and N type materials that are used within a transistor.'

'You've lost me now. What are they?'

'Oh, they handle electrons in different ways.'

'I suppose that I ought to talk to a scientist if I want to know how?'

'Yes but you have to go a long way to find someone who truly understands what happens. Usually it is described as the movement of electrons and holes, but I think that that is a device.'

'So science offers model and you show what happens when that model is applied?'

'Yes.'

'How do they do that?'

'Do what?'

'Teach their model.'

'Chalk and talk and circuits with transistors I expect.'

'Hang on, that's unfair. That doesn't sound like practical science to me. I'm sure that science teachers can cover the topic in a more active way. Don't they use problem solving?'

'Not all of them, but it is a preferred method of encouraging learning isn't it?'

'And all CDT teachers use problem solving when they cover the use of the transistor?'

'Probably not.'

'And how do *you* teach the use of transistors?'

'I explain what happens when a base current is applied and then ask the

pupils to use or consider its use in a design.

'Use or consider? Do they have to use one? Consider seems to imply that they may choose to not to use one.'

'That's right. They may find another means of doing the job, but they need to understand what a transistor does before they can make that choice.'

'What's the difference between "What it does" and "How it works"?''

'What it *does* is use a small base current to "turn on" a larger current. It *works* by, well, manipulating electrons and protons in P and N type materials. I don't really understand *how* it works'.

'Nor do many scientists you say'.

'No'.

'But science teaches how a transistor works?'

'In principal, through a model'.

'Those pupils that choose not to use a transistor in their designs? They could use it in another design later on?'

'Yes of course. They record what it does for future reference. They draw its symbol and write down an explanation of what it does'.

'Not how it works?'

'No. We say when a current arrives at the base a larger current can flow between the collector and the emitter which can be used to amplify current in sensing situations where there is a need to detect small changes in temperature, humidity, light or current'.

'And that summarises your involvement with a transistor?'

'Well, yes and no. Our aim is for pupils to have control over its use in order to be able to consider using it in the future to their own ends'.

'And might they do that after leaving school?'

'Not many I suspect. But then we want them to have an appreciation of its place in the world around them'.

'As an outsider it seems to me as if there is a very thin line between your aims and those of science. I can't imagine what science teaches that you do not'.

'We think that "hands-on" experience in applying the transistor is the best way of appreciating them'.

'And Science doesn't care that pupils may not "appreciate" the transistor?'

'Of course it does, but then there are other components that science covers in

greater detail'.

'And you don't cover them?'

'Yes, but only incidentally. We don't deal with the calculations involved in any depth'.

'But you can cover the use of electronics without such calculations?'

'Er . . .?'

'I've got to go home!'

Morning staffroom. Cups of coffee and frantic use of photocopier. Mr Roberts empties his pigeon hole.

'I thought that I had better have a look at your questionnaire last night'. Mr Wells hands Mr Roberts a completed form. He unfolds it and reads.

'None?'

'None what?'

'What aspects of technology do you teach?'

'That's right, none. What did you expect from an English teacher?'

Morning break and Mr Roberts confronts Mr Wells who is engaged with the Drama teacher, Ms Ash.

'What about word processing?'

'What about it?'

'It's technology, shouldn't you be teaching it?'

'Word processing isn't English it's computer studies!'

'But you teach them how to write with a pen?'

'I suppose so'.

'Then why don't you teach them how to write with a keyboard?'

'Look, getting them to write is hard enough. I'm not getting into typing'.

'It's not typing, it's writing. Pens are technology, so are word processors. They help us to write. They're in the same league as chalk and slate, biros, fountain pens and cuniform stamps'.

'But we don't teach them how to use cuniform stamps, we teach them how to write'.

'But they can't write unless you give them a tool to do it with'.

'We don't give them a tool, they arrive with one that they know how to use. I could teach what I want to teach using a chisel and mallet if they knew how to use them'.

'Not all of them'.

'Don't be daft, they all know how to use a pen!'

'But they can't all write with a pen'.

'Of course they can, what are you getting at?'

'I've got a very low ability writer in my tutor group. He can't write with a pen at all. If you asked him to write a report on an experiment in science you would get back a page of mis-spelt words, ill-formed letters and crossing out. If you gave him long enough in front of a good wordprocessor with a spell checker he would offer his science teacher a perfectly laid out and accurately spelt report'.

'That's not writing is it?'

'What is then? Pressing a key with an "A" on it is just as valid as forming an "A" with a pen'.

'Oh come on now. He can't carry a wordprocessor around with him for the rest of his life, but he can carry a biro'.

'So what you want is for pupils to be able to write what they want when they want'.

'And being able to use a biro lets them do that'.

'Does it matter what they write?'

'Of course it does'.

'But the process of writing is more important than them communicating?'

'It's the same thing'.

'But a low ability child may find it easier to communicate using a wordprocessor than using a biro'.

'Heck, I can't get involved in this now, I've got a lesson to prepare for. All I can say is that I can teach most kids what I want using a biro'.

Mr Wells leaves the staffroom.

Ms Ash hasn't gone anywhere and has listened to the discussion. 'You rubbed him up the wrong way', she observes.

This technology is difficult, there's a lot of stuff to sort out'.

'The only technology that I teach is lighting . . . I think'.

'That's enough isn't it?'

'Well not really. The lighting system we use is very out of date and hard to use. It's not very reliable. I'd like something that offered more control. I don't want my classes dabbling in the electronics of it, I want the lighting laid on a plate. But that's not what I wanted to ask you. It hadn't occurred to me, but if my groups knew how to wordprocess we could write scripts'.

'Can't they write scripts anyway?'

'Yes they do, well sort of. They compose scripts but they're not particularly easy to read for most of the cast. I'd like them to publish their

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scripts. I think that a wordprocessor would make it easier to produce copies for different roles as well as for direction and stage management'.

'You mean a script for each part, one for the director, one for the lighting crew etc?'

'That's right. Isn't it possible to compose a core script and then add specific prompts and directions to suit different needs?'

'Oh yes! Exactly so'.

'It would make it a lot easier to make alterations. At the moment I photocopy a master script and they have to scribble on changes. It's very messy'.

'Well buy a wordprocessor then'.

'I really would like to but I don't have the time to teach them how to use one. That's assuming that I can learn how to use one myself'.

'If I were you I'd get the head to buy you one and go from there. At least you would have taken the first step'.

'I suppose that you're right. I just don't want to end up with an expensive white elephant'.

'Go on, do it!'

'You've got this technology business upside down'. Mr Wells approaches Mr Roberts poised for a counter attack.

'What do you mean?'

'Your form asks what technology do you teach?'

'Yes?'

'Well, if I did use wordprocessors in my classroom I wouldn't be teaching technology, I'd be teaching them how to use a technology'.

'Yes, so?'

'One can't teach technology. You can't teach transistors but you can teach the use of them'.

'I see your point'.

'In fact, and I've given it a lot of thought, I can't imagine any other technology that may be appropriate within English'.

'Hang on now! What do you teach?'

'English you fool!'

'Yes I know that! I mean what "English" do you teach?'

'The English language, spoken, written, read and heard'.

'Why?'

'So that the pupils can appreciate and use it'.

'Like they use technology? Isn't language a technology? It's a tool isn't

it?'

'Hold on, that's a bit fast for me. You're proposing that any technology is a tool?'

'Yes'.

'And that all tools are technology?'

'I think so, I'm not sure'.

Mr Wells calls over to the Art teacher 'Miss Stevens, could we have a word?'

Miss Stevens joins them. 'What's wrong?'

'Do you teach technology?'

'No, of course not'.

'Well Mr Roberts here says that you do. He says that you cover at least two technologies. You teach brush and paint technology AND painting as a tool for expression'.

'Painting is not technology'.

'It's a tool for expression isn't it?'

'I suppose that you could say that, but it's a rather cold way of putting it'.

'Then Mr Roberts says that tools are technology, so painting is technology'.

'I think that you are just playing with words Mr Wells. I mean where will it all end? Do we call eating a technology or sleeping maybe?'

'There's no technique involved in that'.

'Who said anything about technique? Eating is a tool for sustenance. If technology is tools then eating is a technology'.

'Hold on there. Eating on its own is not technology, but as soon as you use a knife and fork, or prepare the food with instruments or cook it you are using technology aren't you? If sometime in the future all that you had to do to eat was select a few buttons on a robotic device, sit back in your chair and open your mouth, that robot would be technology wouldn't it?'

'Yes(?)'

'Then by the same token aren't knives and forks technology?'

'But that doesn't make EATING technology does it? No more than painting is. You can paint using mud on a cave wall'.

'But as soon as you use a stick or brush or processed pigment you are using technology'.

'I'll agree with that, but as an art teacher I'm not going to teach the kids how paint is produced or how brushes are made!'

'But you do don't you? You say this

brush has a finer bristle or hair, or, look at the way brushes can be shaped to achieve different effects. Don't you say that poster paint can be in powder or block form and that pigments can be mixed in a variety of mediums?'

'Yes you need to if they are to choose the method they need'.

'Isn't that teaching technology?'

'OK, you've won me over'.

'But then you must say to yourself, then perhaps I ought to offer silk screen printing or colour photocopying or computer graphics?'

### A working definition of technology

High level initiators generally describe tertiary technological activity, being that which displays CONCEPTUAL, SYNTHETIC and OPERATIONAL activities and areas of knowledge, as this is seen to offer the most complete (and attractive) technological experience.

This experience is difficult to describe as it may manifest in different forms and activities but we can expect that through such experience pupils will have exercised a great many of the skills that underpin general educational philosophy.

If we removed the 'Technology' title how then would we describe this activity or experience? Pupils will have displayed and developed linguistic, mathematical, creative, analytical, moral, practical, scientific, sociological, social and historical skills and understanding through an investigation into contemporary human awareness and its relationship with the world, societies and individuals past and present.

Such a perspective places technology as the vehicle through which we realise the educational aims that we have always held dear. Contrary to contemporary belief this need not outlaw traditional modes of learning, but as the content of the experience is broad, so then must be the activity.

The popular problem solving or design base is a vital part of technological activity, but we would be foolish to not accept that if we are (still) endeavouring to broaden the awareness and capabilities of the pupil then sometimes the more traditional prescriptive approach is the most effective way of preparing them for investigative or expressive activities.

The whole of the above could be undertaken without acknowledging the current state of human achievement to produce capable and well balanced individuals. But I suggest that those individuals would not be best prepared for a life after school. They certainly would have inhibited their potential for 'success' in vocational terms as well as in terms of 'living with some dignity and competence in a rapidly changing technological society'.

The idea that we are the first society to experience a technology boon is misguided. I recall listening to my grandmother as she described the 'changes' she had witnessed in her lifetime. The Victorians certainly lived through a technology boon and we can imagine that the Romans, Grecians, Egyptians and Iron Age man benefitted from great advancements in human achievement. Man has never lived without 'technology', it is the proof of his existence.

The argument that our cultural heritage is in danger of being eradicated is also misguided. The arts would not exist without technology. The cultural development of literature would have been severely inhibited without some form of transcribing instrument. The invention of the printing press enhanced our 'cultural capabilities' beyond recognition, and perhaps more importantly, ensured that it would *never* be eradicated. We must look upon our current achievements in the same way.

We cannot expect to take with us all of a society's culture and aspirations as we move through time, mankind has never managed to achieve this. Ironically a major reason has been the lack of technology with which to do so.

What makes 'our' technology boon different is its pace. On the one hand we see the creation of new technologies that are expected to be absorbed into educational awareness at a rate that renders the task impossible without massive support. Without such support that which is still 'outside' education will seem to form a major threat to established content and instead of enhancing it, will seem to be new content and remove established content from the curriculum at an astonishing pace when it does arrive. This hasty evolution will have a detrimental effect upon education's Form. The links

between other areas of educational awareness will not be allowed to develop and so distort the Form with a technology bias. This failure, through no fault of its own, of education to develop a balanced approach to technology will ultimately affect society's Form.

The task then of the teacher is to only 'take on' as much technology as can be fully absorbed. I think that many instinctively realise this but the teacher must also be aware that his or her undertakings do not as yet reflect society's Form and that a total absorption of society's Form would enhance the capability of both teacher and pupil. But that Form does also include links with awareness in other areas. Before new 'technology' is adopted all 'old' technological elements must be seen to have a direct and harmonious bearing upon the fundamental aims of education which still remain and have not altered *because* of technology.

Pupil centred learning, design and problem solving are not to be confused with the introduction of technology.

Although a complete technological experience will include these activities these must be seen as desirable vehicles for learning in any case.

Recognition of the Primary educational elements of technology, CONCEPTUAL, SYNTHETIC and OPERATIONAL would provide the teacher with a much less cluttered perspective and the facility to develop strategies in a more measured way. The establishment of Primary elements will naturally lead to Secondary then Tertiary activities.

We must bear in mind that technology is not an alien or isolated element of human activity and awareness. It is, and always was, a natural consequence of human existence. Although the recent pace of technological achievement has been so fast as to render the task of absorbing it into education seemingly impossible, we cannot help but do so. Whatever the pressure, resources, support (or lack of them), technology in education cannot exist without the educational aims that we already value.



*Pewter Design Awards Competition organised by The Worshipful Company of Pewterers. Winning entries from Sheffield City Polytechnic: First prize: Mariki Arai (front row). Second prize: Ian Cobane (back row, left). Joint Third prize winners (second row): Kath Riley (left), Tracey Robinson (centre) and Lindsey Grayson (right). Commended: Tony Holland (back row, right).*