

Establishing technology through assessment

Technology is a newcomer in the curriculum – emerging into its present form only in the last 30 years. By contrast, the vast majority of the British curriculum is deeply rooted in the mists of our educational past, as Williams somewhat acidly observes;

The fact about our present curriculum is that it was essentially created by the 19th C, following some 18th C models and retaining elements of the mediaeval curriculum near its centre. (Williams 1965)

And technology in the school curriculum has been shaped by the priorities of assessment.

- a) Starting in the 1960s, disenchantment with the limited formal strictures of GCE 'O' level examinations¹ led to the emergence of more flexible school-centred CSE² examinations, including those in technology.
- b) Dissatisfaction with the resulting two tiered structure then led, in the late 1970s, to pressure for their amalgamation into a single system of examining for all pupils.
- c) In preparation for this development, the Secondary Examinations Council³ launched a major consolidation exercise in which all 'subjects' in the secondary curriculum were required (in 1985) to define themselves in 'National Criteria'. This exercise in definition led to some of the most ferocious debates I have ever experienced. There was blood on the walls in Notting Hill Gate.
- d) Having fought our way through the National Criteria exercise, we then embarked on the enormously complex process of establishing the GCSE examination itself⁴ with all the attendant arguments about course content, examination procedures and educational standards. By 1988 the first cohort of pupils was just completing its GCSE courses and taking the first round of examinations set by the newly merged Examination Groups⁵. It was clearly time for another upheaval, only this time the upheaval was absolute. We embarked on the National Curriculum.
- e) Once again we were stuck in the thicket trying to define technology – not just in terms of existing practice but in terms laid down by the Education Reform Act of 1988; to accommodate the model of assessment dreamed up by the Task Group on Assessment and Testing (DES 1987); and being leaned on at regular intervals by functionaries from the DES and SEAC⁶. The process of definition took place initially through the 1988 Interim Report and the subsequent Final Report of the Design and Technology Working Group; thereafter the NCC Consultation Report and ultimately the Statutory Order for Technology (DES 1990). Again the exercise was controversial, with numerous players competing for ownership of this half-formed entity: technology.
- f) Within weeks of the publication of the Order teachers were struggling to assess pupil performance in technology against 150 'can-do' statements of attainment: a process that ran completely counter to the whole of teachers' experience of assessment in schools.
- g) On top of the teachers school-based assessments came the official testing in the form of Standard Assessment Tasks. Initially for pupils at age 14, then also for age 7, these new assessment instruments made yet further demands on teachers – testing their understanding of the new definition of technology. For many primary schools this was their first encounter with technology.
- h) Within months of trying to teach and assess technology as defined in the 1990 version of the National Curriculum teachers were told they were getting it all wrong. HMI wrote critical reports and all the special interest groups that felt they had been ignored or marginalised by the 1990 formulation of technology

This is an edited version of the Maurice Brown Memorial Lecture given by Professor Richard Kimbell at the NEC, Birmingham, 14th Nov 1996

were out sharpening their knives and grinding their axes. It was a period of generally ill-informed and very public blood-letting.

- i) In the end it was the teachers who put a stop to the assessment madness by their astonishingly solid refusal to have anything to do with the 1992 and 1993 SATs. But by that time, the problems of technology were being blamed *not* on the assessment system but on the definition of the subject in the Statutory Order. It was time for yet another rewrite. Over the following two years another three versions of technology were written and debated before we finally ended up with a new Statutory Order (DES 1995).

This potted history of the last 30 years is far from comprehensive, but I trust it is sufficient to demonstrate the environment within which technology was created as a school subject. At every turn those of us working within the field of technology were forced to define, and redefine, and re-define what we were doing. And in most cases this pursuit of ever tighter definition was motivated by the needs of assessment: For GCE, for CSE, for National Criteria, for GCSE, for A level, and ultimately for National Curriculum.

Hargreaves' (1989) observation must be the understatement of the decade:

...it would be no exaggeration to say that the 1980s has been the era of assessment-led educational reform (Hargreaves 1989)

Significantly for us however, the 1970s and 1980s was also the period in which technology emerged as a national force in the curriculum, and this explains the complete interdependence of the two stories. Unfortunately this interrelationship made us subject to all the evolving conventions of assessment – some of which (as I shall attempt to show) were completely flawed.

Norms and criteria – a false dichotomy

The conventional wisdom in the history of our examination systems is that GCE, CSE and many other examinations were norm-referenced. Norm-referencing is *bad* because

- it does not identify what pupils can do
- it measures pupils against their peers

By contrast – and in more recent years (since we saw the light) GCSE and latterly National Curriculum and GNVQ examinations are criterion-referenced. Criterion-referencing is *good* because

- it identifies what pupils should be able to do
- it measures pupils against these identified qualities (not against each other)

There was just sufficient truth in this to make it believable. I believed it. Indeed in 1985 I wrote the orange 'Guide' for the introduction of the GCSE examinations in CDT:

...this form is criterion-referenced, and the performance required to achieve a particular mark is therefore specified in advance in the list of criteria on the form... (Kimbell for SEC 1986)

But it was only ever a half-truth for the reality of educational assessment is that it is impossible to set and monitor standards in technology (or anything else) without understanding the respective contributions made by criteria and norms.

Defining criteria

There was a great deal of time and energy spent on defining excellence criteria for technology by the National Curriculum Working Groups – who (in each subject) sought to define Statements of Attainment (assessment criteria) for 10 levels of performance. The following story comes

from a very reliable source and recalls the process undertaken in the (1988) Design and Technology (Parkes) group.

It was agreed that a good starting point for defining these criteria (SoA) would be to refine a clear statement for level 10 – the ultimate descriptor of what we might expect the most able design and technologist to achieve. The argument ran that if we had such a clear starting point it might then be possible to work up towards it incrementally; moving step by careful step towards this Holy Grail.

So it was drafted, and debated, and redrafted and debated, and edited, and debated and finally it was honed with infinite precision. The group were happy with it as a statement describing the excellence that should be characterised as level 10. And then they showed it to teachers. And the *primary* teachers said – “Yes that's what my children do”!!

There are countless other examples of the same problem – indeed the technology Order (DES 1990) had 150 of them; and we all grew extremely sick of them.

Does the pupil use specialist modelling techniques to develop a design proposal

This is one of the 1990 SoA. It was again carefully drafted – but who can tell me the level it came from? Or to put it another way – who can tell me what it means? I could make it fit in almost any level of difficulty: If 'Lego' is the *modelling technique* it might be level 3. If we are talking about a sophisticated CAD package for modelling then it might be post-graduate designer level. And what is meant by the expression develop a design proposal? At one level I could quite coherently argue that my 10 year old son does it constantly – or I could equally well argue that our postgraduate students at college are unable to do it. Because the 'it' is not defined in those words. The words indicate a target area – they provide some bearing to follow – but they do not define a clear condition.

The metaphor of the battlefield might be helpful. The criterion acts as a target bearing – but it does not say anything about range. Without the information about range I will never hit the target. Do I drop the shot at 400m or 800m or 2 miles or 20 miles? They might all be bearing 340 degrees.

So here is *Kimbell's 1st law of assessment*:

qualitative assessment criteria exist on a sliding scale of excellence

I can make any criterion mean something simple – or something difficult. I can interpret it to fit any level of complexity that I choose. It is slippery and imprecise. And it follows therefore, that criteria on their own are useless for assessment purposes. To be useful for assessment, any criterion (target bearing) therefore needs to be supplemented by *other* information that can tell us the range to be shooting at. What I need to do is to find some way of calibrating the 'difficulty' of any criterion so that the same judgments of quality can reliably be made.

Calibration through the performance of real pupils

If the criterion says “Is able to use modelling skills” and the age group is Year 7, what level of excellence should be expected? Teachers – at the outset of the national curriculum – should have been drawn into the business of helping to calibrate each criterion for themselves; using their own experience of their own pupils. Using the example of *modelling design ideas*, the **best** pupils in a group can be kept in mind and the **least good** modellers can also be kept in mind. These standards create a frame of reference within which the teacher can understand the criterion. But this is only a first step and the challenge is to move from these teacher-centred idiosyncratic standards towards nationally agreed standards – a national norm that is understood and valued by all teachers.

This is a professional, judgmental matter that required the expertise and experience of all our teachers. It also of course required investment in collaborative moderation activities both within and across schools in

order to share, generalise, and ultimately universalise the *meanings* of the criteria: the *standards* to apply.

But this did not happen. Teachers were given the crude, uncalibrated instrument as if it were a gift from the Gods. The ultimate truth. Rather they should have been told that they were being given a crude, uncalibrated device that needed their professional expertise to render it usable. Not only would this have been more likely to draw teachers into the process, but it would also have generated a helpful debate about appropriate standards. Because the standards *did not exist* in the SoA criteria. They needed to be created.

Instead, the assumption was that the SoA *were* the standard.⁷ The arrogant procedures of implementation of National Curriculum assessment frustrated and de-skilled teachers. And yet for the process to work it required the empowering of teachers – because without the calibration that only the teachers could provide – it was nothing. So it fell apart. Or rather it was torn apart by a profession in revolt. And with it went the hapless (and hopeless) Secretary of State who had inherited a sorry mess and managed to make it worse.

So here we have *Kimbell's 2nd law of assessment*:

criterion scales need to be calibrated to the performance norms of the pupils involved

Let me make myself plain. I am **not** saying that in developing National Curriculum standards *one of the options* that we had was that teachers should be allowed to create these standards for themselves. It is **not** a matter of choosing *that particular option* against another one – such as the imposition (by SEAC/SCAA) of a *national* standard. What I am saying is that **it will happen come what may**. Teachers *will* construct a standard from their own experience of their own pupils – because they have no alternative. The points of judgment on the sliding scale criteria need to be fixed – and the only way for teachers

to get a concrete fix on those points is from their experience of pupils' work.

The challenge of a national standard

My point is that *initially* these fixes on the sliding scale needed to be based on individual teacher norms; the standards that each individual teacher thought appropriate in the light of their experience of their pupils. The challenge thereafter was gradually to transform these idiosyncratic individualised standards into something more generalisable. And this was a formidable task. We should have built and resourced a strategy that required individual judgments to be compared and contrasted within schools so as to arrive at school norms of performance. And then we should have required schools to compare and contrast their standards with those of other local schools so as gradually to arrive at local norms. And finally we should have required local areas to collaborate into regional groups to generate regional and ultimately national norms of performance.

If one or two people in my class (the 'best' one or two) are deemed to have met the standard required in 'modelling ideas' – this provides the target for those that are working towards it. A concrete achievable target. Alternatively if no-one in my group can achieve it – but a few are judged to have done so in the next-door class, then again I and my pupils can see what needs to be done to achieve success. But there is no point in defining a criterion in such a way that no-one in the target group can achieve it. Unattainable targets are dispiriting and pointless because you cannot learn from them. And equally there is little point in defining a criterion in such a way that everyone in the target group can achieve it. It loses its significance.

I am reminded of the far off days of CSE Mode 3 moderation meetings – when we took samples of our work to neighbouring schools to agree marks. At the time we might have scoffed at all the horse trading that went on; *but we learned from that process*. We came away from those meetings saying I now know what my kids have to do to get As and Bs. And because of this we developed a clear grip on the

standards being used, and we progressively drove it upwards.

The teachers I observed in 1990, 91, 92 and 93 did not understand that they had a critical role to play in defining national standards. We had moved so far down the road of criterion-referenced assessment that we had come to believe that all you need for assessment is good criteria. Teachers thought (as did the Secretary of State) that the standards were already defined in the words of the SoA. They were not. The SoA provided the bearings, but they did not – could not – define the range. They therefore did not amount to anything that could be called a 'standard'.

The received wisdom – it was even a mantra – from SCAA; inherited from GCSE days and bolstered by the arrogance of National Curriculum policy – was that we had determined and defined "...what pupils should know understand and do". This arrogant certainty recognised no role for teachers to act as agents in defining the national standard. Accordingly, instead of empowering teachers to do the job, they were intimidated by it and had no idea that **they** held the key to defining the standard. If only we had presented it to teachers in that way, the sad story of National Curriculum assessment might have been very different.

International comparisons

The USA

In case you think I am exaggerating the role of norms – by which I mean the performance of real pupils – it might help if I outline some of the assessment procedures in the USA. Because there they believe they have standards firmly bolted down. They have testing ad nauseam. Pencil and paper, right-answer, multiple-choice testing, for all subjects that are deemed significant (which does not include technology). All you have to do in multiple choice tests is identify the right answer from four options. The law of averages says you can get 25% on this system of examining without knowing anything at all.

Using this kind of test, standards in the USA have stayed remarkably stable over the years. Or rather the **percentage of students passing** has stayed consistent. I

decided to interrogate some of their assessment experts and ask them whether **standards** had also stayed consistent. This is an important difference. Keeping pass-rates consistent over time is not the same as keeping standards consistent. So my question was "Do the students that passed in this year's cohort know as much about (subject x) as those that passed in 1970?" They looked at me as if I had dropped in from Mars. What kind of question is that!!? How would we know!!?

The important point here is about their test development process. They have 'item writers' who write test items (that's questions to you and me). These items are then **pre-tested** and the resulting data produces an 'item facility index' i.e. a scale of numbers that describes how easy or difficult each question is. If lots of children in the pre-test get a question wrong – then it gets a low 'item facility' score; and if lots got it right – then it gets a high 'item facility' score. They pre-test far more questions than they need, and to get into the final test, an item has to have a facility index that is within pre-defined tolerances – not too high (we don't want too many kids passing) and not too low (we do want enough to pass).

The whole test is pre-normed to the cohort of students. These tests provide wonderfully consistent statistics year after year – and they tell you absolutely nothing about standards year by year. In the USA they test anything that will stand still long enough to fill in a multiple choice paper – and yet they can say nothing about the maintenance of standards.

Federal Republic of Germany

In Thuringia – one of the 16 'länder' or counties of Germany – they have no direct counterpart to technology, but in their primary schools, they have a subject called 'material-handling'. They use a six point scale of assessment for pupil performance, and this scale is fleshed out in a series of criteria. The following example is from level 2 (ie near the top of the scale).

The pupil made the piece to scale. He utilised all the necessary techniques correctly and effectively. In making the piece he was able to meet the demands

made. His workspace was neatly organised. Auxiliary materials were made use of efficiently and appropriately. A high level of personal interest in the project was evident in the planning and preparation. At the completion of the project the pupil was able to evaluate his own work fully. (Thuringia Ministry of Education [Arbeit und Technik in der Schule] 1992)

The six point scale (of which this is point 2) is used for their years 6-10 inclusive. And throughout that five year period the criteria for excellence stay the same. How can this be? Surely the pupils improve over that time. Surely all the really young ones get the low grades and the older ones get the high grades. Surely this is not fair.

But I have cheated you because there is another sentence at the end of the criterion/descriptor, and it reads...

The level of performance, commitment and effort was appropriate to the potential of a pupil of his age. (Thuringia Ministry of Education [Arbeit und Technik in der Schule] 1992)

The six point scale means one thing for year 6; and something progressively more sophisticated for years 7, 8, 9 and 10. The criterion sits on a sliding scale and the teachers calibrate it to their pupils. At one level this is very sensible. But it does require serious investment in moderation and dissemination procedures to develop and ensure the standards. And in that domain the German system is surprisingly lax with the result that awards in one Länder may not be accepted by another.

The value of sliding scales

This all goes to confirm the importance for teachers of sliding scales of assessment. As many of you will know, I have – since its inception – been completely opposed to the absolutist (yes/no) principle that is (or rather I should say was) embedded in National Curriculum assessment. It was extremely unhelpful to be forced into the position of having to say ‘yes’ or ‘no’ about pupils. Because for most of the time, the majority of them are in categories that are better

described as ‘maybe’ or ‘sometimes’ or ‘partly’.

Teachers have used sliding scales of judgment since teaching began. Scales of A-E and 1-10. Sliding scales allow us to talk about better and worse; to discuss *improvement* with their pupils; to develop a sense of *quality*. This whole tradition of assessment was cast aside at a stroke by the implementation of the National Curriculum. There was not even a serious debate about the perceived advantages of yes/no tick-list assessment as against sliding scale assessment. The digital was somehow regarded as superior to the analogue, despite the fact that sliding scale analogue systems was what teachers had always used. In retrospect it is quite astonishing that this digitisation of assessment was allowed to get to the lunatic point at which it arrived in the early 1990s without being challenged to justify itself.

And another product of this digitisation was that the authors of the scheme felt obliged to keep inventing lots of different digits to strive for. In the end, National Curriculum assessment was premised on the idea that in order to improve you had to pick up some extra digits – which meant doing something different and extra. This is seriously mistaken for – most of the time – all you need to do is to do the *same thing* to a higher level of quality. The German (Thuringia) 6 point scale recognises that fact.

The consequence of this argument

Norms and criteria co-exist in any assessment regime. This is an escapable fact of life. A criterion establishes a target – or at least it establishes the bearing along which the target lies. The final location of the target however is a range-finding exercise that is inevitably normative.

There are several important implications of this argument, but they all revolve around one central truth which is that **standards reside in teachers**. Standards do not exist in attainment targets or in programmes of study, or in examination syllabuses. These documents have no meaning beyond that

which teachers bring to them. Without the values, skills and experience of teachers the criteria are nothing. And this argument raises three questions; first about **defining** standards; second about **maintaining** standards over time; and third about **raising** standards.

1 Defining standards

In these politically correct days, my use of the 'battlefield' metaphor is probably a little suspect – but I'm afraid I have to take it a stage further. Because the act of assessment (fixing a standard) can helpfully be seen through that metaphor. It involves identifying the target bearing; estimating the range; firing a ranging shot; and then recalibrating in the light of the where the shot hits.

It is a five stage process;

identify the criterion
place it on a scale (of better/worse)
pitch an initial judgment
check the surrounding cases
adjust and confirm

Teachers have known this for a long time. But in recent years they have become guilty about doing it – assuming that the simple yes/no judgments that were required of them must somehow exist in a different world where this tried and tested process was no longer applicable. It **is** applicable because assessment is about judgment – not about measurement, and the qualities that teachers seek to make judgments about exist in a bewildering variety of shades of grey. There is no black and white. Accordingly it is not only quite proper, it is also necessary to hold one up against another to become clearer about the nature of excellence.

2 Maintaining standards over time

Are pupils better now than they were in 1970? This question is a bit like asking whether Allan Shearer is better than Bobby Charlton. I remember the 1966 World Cup team: Bobby Moore, Bobby Charlton, Nobby Stiles, Norman Hunter. Would they beat the current England team?

Those with an implicit faith in the objectivity of assessment criteria might immediately start to compose a few to measure the two sides

- | | |
|----------|---|
| Criteria | <ul style="list-style-type: none"> • is able to stand on one leg while kicking ball with the other • is able to 'bend' the ball from a free kick or a corner • is able to hack down opposition attackers whilst maintaining an expression of innocence |
|----------|---|

But when I play with my boys in the garden, I can stand on one leg and kick with the other; and I can bend the ball from a free kick. The problem is I can't do it very well. I can do it somewhat better than my wife, but somewhat worse than Shearer or Charlton. If we are assessing footballing excellence – it helps to say that, in their respective times, these players were the best that England could find. This is of course a normative judgment. And it gives us a scale of excellence to conjure with. But it does not help us to say which team would have won; because

Rules have changed
Kit has changed
Balls have changed
Grounds have changed
Fixture lists have changed
Terms of employment have changed
Money has changed

It is just not possible to say which team would win.

And it is exactly the same with 'standards' in technology. The syllabuses have changed – which is to say that the criteria on which performance is measured have changed. How can you expect a constant measure if you keep changing your ruler? But more important than that, we know that our assessments are normative. And we know that schools have changed, young people have changed, our society has changed. Societal norms, behavioural norms, and educational norms are constantly shifting. So measuring trends over time is like using

an elastic ruler to measure the length of a bucket full of eels. It cannot be done. It certainly cannot be done by statistical juggling of one year's data (there are more A-Cs this year so standards must be slipping – or rising). And it can't be done using the US system – which holds levels the same *regardless* of standards.

The best – most likely – prospect of success would be for informed panels of expert examiners to make judgments about the respective demands – and the associated performance levels – in different years. But it would be a very unreliable tool. The late Desmond Nuttall was a guru of assessment and made a detailed study of the problems of measuring performance trends over time. He concluded...

...the measurement of change in the level of performance of educational systems is not possible as there is no way of establishing an unchanging measuring instrument over any length of time. (Nuttall D 1986)

3 Raising standards

For the process of National Curriculum assessment to work properly, it needed the professionalism of teachers. I have already explained the critical role they might have played in calibrating and sharing and hence validating the standards that were achievable and appropriate. But that opportunity was lost – or rather it was squandered in 1990, 91 and 92 by an arrogant process of implementation led by an excessively macho administration, supported by a gung-ho SEAC. Teachers were to be given the answers and all they had to do was get on with it.

One measure of this centralised arrogance is provided by the weight of paper that landed with regular – earth shattering thumps on the doormats of schools. On a memorable day in 1990 I answered the phone at college and found myself talking to a government dispatch office. The official informed me that a delivery of National Curriculum documents was on its way and would I please make arrangements to receive it (I wondered if he wanted a red carpet). I suggested that – as with any delivery – it should go to the reception area

of the central stores. "Oh – said the official (sharply) – I was just checking that you have got a fork lift truck". And he wasn't joking.

The ethic that underpinned all this paper – was that teachers would simply be told what to do. 'The centre' will specify the *tools* of assessment and the *criteria* of assessment, and hence the *standards* of assessment.

But my argument has been that standards do not exist in all this paper. They exist in the experience of teachers. And it follows therefore that to raise these standards, we need to extend and enrich our teachers. As in the days when we were striving to establish CSE standards, so again we need to have in place the procedures that allow teachers to debate and share their values and understandings. But now there are some formidable obstacles that did not exist in those far off days of the 1970s. I was recently in a school where they had achieved quite excellent GCSE and A level results in technology. I asked the department head about the extent to which he was being used in the LEA to help other schools to improve. His reply was double barrelled and devastating. "First (he said) I haven't seen anyone from the LEA for years – I don't think they're there anymore. And second, even if they were still there, why would I want to help other schools to compete with us?"

I wonder how the Secretary of State would have reacted to this. Would she be delighted at this internalisation of the ethics of the marketplace – or would she be horrified at the extent to which her government's policy is destroying a powerful means (arguably *the* most powerful means) for disseminating and raising standards.

I am quite convinced that the only way to raise standards in technology is to engage teachers in professional activities and debates that extend their understanding of pupils performance and help them to recognise and embrace ever higher targets of achievement. In short, the need is for more professional development in schools and more collaboration *between* schools. But the policy of the last 10 years has consistently been to shred the LEAs – which

were the principal source of support in most schools, and to create a competitive environment between schools that is more conducive to secrecy than to open collaboration. Whilst the rhetoric of the last few years has been all about raising standards – the policy has consistently acted to make it harder and harder to achieve. The excellent departments of technology that exist around the country today, are excellence **despite** these policies – rather than **because** of them.

In conclusion

Technology in the curriculum has been formed in the last 30 years in parallel with a sequence of developments in examinations and assessments. This has forced us constantly to confront and debate the *definition of performance* (ie what do we mean by technology?) and the appropriate standards of excellence (ie what counts as good and poor). If, in that 30 years, there is one thing that we should have learned about standards, it is that they depend more on the understanding of teachers than they do on any form of words in syllabuses, or programmes of study, or level descriptors. You cannot know 'quality' by reading about it. A 'standard' is what *emerges* when a teacher adopts a criterion of assessment and interprets it in relation to the work that s/he is engaged in with students. And far more light is thrown onto the matter when teachers are encouraged to share their individual interpretations and agree a common one. In this way, standards are both backward looking – drawing on previous experience – and forward looking – shaping the expectations that we have of our current students. If we are seriously concerned with raising standards in technology, then it is the **understanding** of teachers, and the **experience** of teachers, and the **practice** of teachers that we need to enrich. This is a long-term game and an expensive one, and there are no short cuts.

Notes

1 The General Certificate of Education (GCE) was a 16+ examination designed for high ability pupils. It supported option choices for Advanced (18+) courses and subsequently for university entrance.

2 Certificate of Secondary Education (CSE) was a form of 16+ examination designed for school leavers of average and below average ability.

3 The Secondary Examinations Council (SEC) was set up as a 'quango' with statutory

responsibility for overseeing all matters to do with examination and assessment in secondary schools.

4 The General Certificate of Secondary Education (GCSE) was established in 1986 as a single system of examining for all 16+ pupils.

5 The former GCE Examination Boards (typically centred on universities) were compulsorily merged with the CSE Examining Boards (typically centred on regions of the country) to form five 'competing' Examination Groups. (Southern, London and East Anglian, Northern, Wales, Midland).

6 The Department of Education and Science (DES) and the School Examinations and Assessment Council (SEAC). This latter body took over from the SEC (see note 3) when the looming requirements of national curriculum assessment in primary schools rendered the 'SEC' title inappropriate.

7 This is not just a UK problem. In the USA currently a group of 'experts' from ITEA is drawing up (ie writing down) the new curriculum 'Standards' for technology. And interestingly they are looking to our work for the National Curriculum as a guide. To quote from a recent press release... "the standards will be developed at grades 4, 8 and 12....The project will create teacher preparation and enhancement standards, pupil assessment standards, and program standards.... these standards will provide a framework for assuring a quality articulated technology program at the state, region, district and school level."

References

- Bruner, J (1964) 'The Course of Cognitive Growth' in *American Psychologist* vol 19 pp1-15 and (1968) *Towards a theory of Instruction*, New York. Norton
- Hargreaves, A (1989) *Curriculum and Assessment Reform* Open University Press
- Kimbell, R (1994[a]) 'Progression in learning and the assessment of children's attainments' in *Innovations in science and Technology Education*, Ed D Layton UNESCO Paris
- Kimbell, R (1994[b]) 'Assessment of Design and Technology' in *Technology Teaching* Ed. Frank Banks Open University Press
- School Examinations and Assessment Council (SEAC) (1986) *Craft Design and Technology for GCSE: A guide for teachers*, Open University Press/SEAC
- School Examinations and Assessment Council (SEAC) (1992) *Children's Work Assessed: Design and Technology and Information Technology*, London SEAC
- Thuringia Ministry of Education (1992) 'Marking scale for the curricular units in the handling of materials' *Arbeit und Technik in der Schule* Ministry of Education; Thuringia; Erfurt
- Nuttall, D (1986) 'Problems in the Measurement of Change' in *Assessing Educational Achievement*, Falmer Press
- Williams, R (1965) *The Long Revolution*, Penguin
- Copies of the full text of this lecture are available from the author at Technology Education Research Unit, Goldsmiths College, New Cross. London SE14 6NW.*