

Professor John Eggleston Memorial Lecture

Assessing design innovation: The famous five and the terrible two

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The 'paradigm' debate

In recent months Andy Breckon – our recently departed and much missed chief executive – has provoked a debate about the current condition of design and technology. Are we doing the right things? Are we aiming at the right targets? Do we need to update and upgrade our ideas of what design and technology should be?

In part, as a response to that prompt, David Prest, the design and technology adviser in Cornwall, undertook an analysis of the design and technology National Curriculum Order 2000. Specifically, he examined the aspiration expressed in the 'distinctive contribution' statement, and then analysed the extent to which that aspiration was evident in the programmes of study (PoS) and the attainment target (AT).

Let us remind ourselves about the aspiration for design and technology.

'Design and technology prepares pupils to participate in tomorrow's rapidly changing technologies. They learn to think and intervene creatively to improve quality of life. The subject calls for pupils to become autonomous and creative problem solvers, as individuals and members of a team. They must look for needs, wants and opportunities and respond to them by developing a range of ideas and making products and systems. They combine practical skills with an understanding of aesthetics, social and environmental issues, function and industrial practices. As they do so, they reflect on and evaluate present and past design and technology, its uses and effects. Through design and technology, all pupils can become discriminating and informed users of products, and become innovators.' (QCA, 1999)

This statement was developed in December 1998 by a team of people working for a day at QCA. In the Spring 1999 edition of the *Journal of Design and Technology Education*, I reported it as follows in the editorial:

'...there was a clear desire to make an overarching statement about design and technology; what it stands for; why we want youngsters to study it; what it uniquely contributes to the curriculum. Before getting into the detail of the substance of the Order, and any changes one might or might not wish to make, we felt the need to articulate the overriding principles and purposes of design and technology. Fortunately, this desire was mirrored in QCA's own agenda. They too see the need to spell out the distinctive

contribution of individual subjects; their aims, values and purposes ... Good guiding statements of principle help us to interpret the detail of the Order, and prevent us from losing sight of the main game.' (Kimbell, 1999)

But the question Andy Breckon was raising in his challenge to the design and technology paradigm, was whether the substance of the design and technology Order (the PoS and the AT) lives up to this statement of principle. Does the Order require students:

- to deal with rapidly changing technologies
- to intervene creatively
- to work in teams
- to deal with social and environmental issues
- to be innovators?

David Prest's conclusion was that most of the time it does not. There is no requirement to be creative, to work in teams, to deal with environmental issues, to be innovative. The programmes of study do not require them to be taught, and the attainment target does not require that they be *assessed*. Indeed, it is worse than that, for close scrutiny of the assessment regime – particularly at GCSE level – suggests that the very reverse of these qualities is being required and provided.

Subversion or professionalism?

The percentage of students achieving A-C grades is important to teachers. Teachers know what is required of their students for them to get A-C grades. Accordingly, teachers have developed very well organised systems for guaranteeing that their students get A-C grades. They have checklists of things that have to be in the portfolio to guarantee particular levels.

1 sheet considering 'the problem'.

6 sheets of 'research'

- one of which contains a letter (to a company/user/supplier)
 - one of which is the reply and how the student can use the information
- etc.

The result of this checklist approach – both in terms of the portfolio and for the final product outcome is that

- it is (typically) not creative – but formulaic
- it is (typically) not using new technology – but traditional making

- it is (typically) not in teams – but individual
- it is (typically) not dealing with social/environmental issues – but largely technical and (sometimes) economic
- it is (typically) not innovative – but safe.

This is not happening because teachers are idle and malign – but because we are systematically rewarding them (i.e. rewarding the students) for producing work that is formulaic, traditional, individual, technical, and safe. If we reward those qualities – teachers cannot be blamed for making sure that their students demonstrate them.

Initiatives supporting creativity

In the last couple of years, DATA and others have been busily developing new strands of work in design and technology that encourage the absorption of new technologies and help to provide settings for youngsters to develop their creativity.

The CAD/CAM in Schools Initiative is one of these. The Pro/DESKTOP software has been astonishingly effective in raising the number of students involved in engineering-style CAD modelling in design and technology, and recently the initiative has taken a further step forward into the textiles arena. Using a very intuitive CAD package, ProSketch, teachers are now able to bring textile and fashion design right to the leading edge of commercial practice. I am pleased to report that the training in this amazing CAD system is taking place at Goldsmiths College – where Rose Sinclair (one of our new lecturers) has been pioneering developments.

Initiatives have also emerged specifically concerning creativity. Lego are currently in the midst of a development programme (in 14 schools across the UK) using the programmable Lego brick. For the first time students can build autonomous robotic devices without having trailing leads to computers. The magic 'brick' can be programmed very simply to allow devices to be designed for independent use. The initiative is aimed at Key Stage 3, and links to 'systems and control' issues in the environment (e.g. waste disposal; energy saving; handling hazardous materials). There are several aims for this project, one being to encourage more students in Year 9 to opt for 'systems and control' GCSE courses. But the *primary* aim is about encouraging youngsters' *creative response* to difficult tasks (wicked tasks) in the environment.

But ultimately, all initiatives in schools come up against the assessment hurdle. And with creativity and innovation that hurdle can be

seriously problematic. Despite the current tendency to associate the term 'assessment' with hard-edged performance measures of students and teachers, the etymology of the word 'assessment' is interesting. It derives from the late Latin *ad sedere* (to sit down beside) with all the implications of a one-to-one formative assessment dialogue between teacher and student. Perhaps in the schools of ancient Rome, 'assessment' had this humanitarian face. I wonder if there was a Roman OFSTED?

But the charge against our current assessment regime for design and technology is that it is systematically rewarding the wrong qualities and that, in consequence, teachers are encouraging youngsters to produce work that is formulaic, traditional, individual, technical, and mundane. We measure what is measurable, and that typically leaves innovation and creativity out in the cold.

Factors influencing innovative performance

There is a huge literature about creativity and innovation – but a much smaller one about how to assess it. As a starting point, the evidence suggests that many factors influence it. I have clustered these factors into three groupings, concerning the 'person'; the 'environment'; and the 'person-process'.

- 1 **the person** traits: character/personality (heart)
assets: knowledge and skill (head/hand)
- 2 **the environment** social environment (peers)
learning environment (teachers)
physical environment (setting)
- 3 **the person-process** task finding
spark generation
development and elaboration

I will take these in turn – identifying the essence of why they are thought to be important to innovation and indicating their strengths and their weaknesses in terms of their potential for assessment.

- 1 **the person** (a) traits: character/personality (heart)
(b) assets: knowledge and skill (head/hand)

I have divided this grouping into two and they might be seen in the same way as Dormer's view of designing. He sees designing as 'above the line' and 'below the line'.

'Below the line' design is the design that the consumer does not see – either because it is literally out of sight (as in the molecular engineering that produces new synthetic materials) or because it refers to

components that make the object work but do not visibly add value to the product. (Dormer, 1990)

Above the line – by contrast – he sees as the visible stylistic featuring of design.

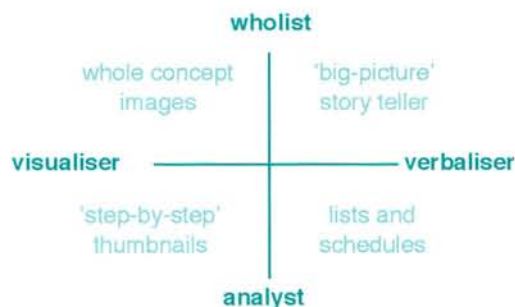
I think we might see ‘the person’ in a similar way. What drives so much of our behaviour and our performance lies hidden away ‘under the line’, in the realms of ‘personality’ and ‘character’. Whilst I do not see these as fixed – they appear to be less amenable to change than the more obvious assets of the student that lie ‘above the line’. Here we are dealing with the skills and knowledge of the student – all of which are meat and drink for the educator.

1 (a) personality and character traits

There are of course any number of assessment tools that are used in psychology and psychoanalysis to diagnose these underlying features of personality, but they do not appear to me to be the kinds of assessment tools that examination boards would see as central to their territory.

Nevertheless, at the diagnostic level, there are valuable tools like the Myers Briggs index (see Riding and Cheema, 1991 and Riding, 1992) that indicate the ‘cognitive style’ of the learner. One of the classic forms of these analysis tools uses twin axes (visualiser/verbaliser and wholist/analyst) to indicate the preferred cognitive style of the student. Lawler (1996) has applied these ideas specifically to design and technology students, and suggests (in red) how this style might play out in terms of the observable designer-like behaviour.

Figure 1.



Clearly, the form of designing currently favoured in GCSE examinations will be evidenced very readily by visualising analysts, and this will be supplemented by the need (in portfolios) for the verbal analyst skills of scheduling and listing. The combined result of this is that the ‘analyst’ is generally advantaged by these assessments – and since the analyst/wholist axis is heavily gender related (with boys far more typically operating as wholists) Atkinson (1995: 35-47) is able to

demonstrate the gender bias of these currently preferred models of designing.

1 (b) assets of knowledge and skills

The issue of ‘above the line’ testing of skills and knowledge is clearly much more commonplace and (apparently) straightforward. But (I fear) not so, when attempting to assess innovation. It was German philosopher Heidegger that described thinking (we might say designing) as a movement into *not-knowing*, into tackling the un-known. And the question we have to ask is not ‘what skills and knowledge do students possess’, but rather ‘what (if any) skills and knowledge separate the innovative designer from the mundane rule-follower?’ This is a VERY different and difficult matter.

I would suggest that the issue has to be dealt with at two levels; first in terms of baseline knowledge and skills for design and technology, and second in terms of contextual (task-related) knowledge and skills.

Baseline knowledge and skills might be thought of in terms of the programme of study for design and technology as it currently exists in the National Curriculum. Knowledge and skills with (e.g.) materials, systems, tools, processes, manufacturing. This is the common ‘stock in trade’ for **all** design and technology students and is not (in my view) a helpful place to start assessment for innovation. It is too broad and not sufficiently focused on the act on innovation.

Task-related knowledge is a different matter. This would clearly need to be focused on the act on innovation, or at least on the project area within which such acts might be expected (or at least hoped) to arise. A student innovating in the area of medical apparatus, must know something about the *patient condition* that the apparatus is seeking to ameliorate. This is not design and technology knowledge, but it is important task-related knowledge and lies at the heart of capability for the design and technology student.

‘When embarking upon a new design, the package of knowledge and skills necessary for the success of the venture will emerge as the design progresses, and so the need to acquire knowledge and skills (and sometimes extend the boundary of knowledge and devise new skills) becomes a clear requirement for the designer.’ (CNAA/SCUE, 1980)

Clearly, it is not sensible to use this task-related knowledge (e.g. about arthritis) in itself, as a basis for testing innovation – since it only applies to a student working on this particular project. What might be important to

assess however is the student's ability to *access the knowledge that they need* to pursue the task.

2 the environment

- (a) social environment (peers)
- (b) learning environment (teachers)
- (c) physical environment (setting)

There is an enormous amount of evidence that the environment within which we operate influences our performance – and not least so in terms of our creativity and innovation. For the purposes of this paper I have sub-divided this category into three parts; concerning the social environment (focusing on peers), the learning environment (focusing on teachers) and the physical environment (focusing on the setting).

2 (a) the social environment

The evidence for the social nature of innovation is ubiquitous. Burns and Stalker (1986) put it very bluntly.

'Invention, even more than science, is a social phenomenon ... it is a human activity that can only be fulfilled when certain social conditions obtain ... The notion of the hermit genius spinning inventions out of his intellectual and psychic innards is a 19th C myth ...' (Burns and Stalker, 1986)

Some relevant evidence arose within the APU study (Kimbell et al, 1991) and centres on the role of collaborative groups as part of the designing activity. One of the project fieldworkers reported as follows:

'This was a strategy (putting students into round-table, product discussion groups) that I had previously not put any emphasis on in my own teaching and I found it by far the most useful device for helping pupils extend their ideas. The pupil's response to each others' criticism was a major force in shaping the success or failure of the artefact in their eyes. Pupils saw this as a very rewarding activity and would frequently change the direction of their own thinking as a result ...' (Kimbell et al, 1991)

Being able to work together in collaborative teams is one of the real teaching and learning strengths of design and technology, but it raises serious challenges for assessment. We are forced to examine ways in which this might be tackled, and the approach used for the APU study might be one starting point.

The approach there was not to attempt to assess the groupwork directly – but rather to assess the individual work of students who were enabled to take advantage of group

input. This effectively sidesteps the most problematic area (shared assessment) and places the focus on individuals being able to extract benefit from group activity. I shall return to this point later.

2 (b) the learning environment

Teachers have an enormous impact on students' creativity and innovation. Creative and innovative acts are (at least potentially) risky acts, and I have noted earlier the importance of a trust relationship between teacher and student as a pre-condition of creativity. Students will not go out on a limb and take chances if they believe that – should they fail – they will suffer serious penalties.

The literature in this area is endless. As examples, Sears and Hilgard (1963) found

'... a strong negative correlation between the expression of creativity in elementary aged children and teacher behaviour characterised as formal group instruction and using shame as a punishment technique'. (Sears and Hilgard, 1963)

And Craft (1997) found

'One of the biggest challenges for children when creating is having a go at making something which they 'own'. This can carry considerable risk for children, as they may create something which does not meet the approval of the intended audience. There is a need to allow children time to incubate their ideas and to come to terms with the challenges of risking failure before owning their creative work ... (and as a result) ... a powerful theme in our own research was the belief that self esteem and self confidence must be nourished in order to be creative.' (Craft, A., 1997)

The problem, however, for the immediate task in hand (assessing design innovation) is that *teachers* are not part of the assessment framework. At GCSE, AS and A2, we cannot sensibly assess teachers (except perhaps indirectly through the success of their students). For the moment therefore, whilst recognising the powerful impact of the classroom learning environment on students' innovation, we can merely note the fact and move on.

2 (c) the physical environment

Reports from OFSTED continually draw attention to the impact of the physical environment on student learning, and DATA itself regularly produces analyses of school provision (highlighting the lack of equivalence from school to school). We might be tempted to assume that the breadth of provision in a school (e.g. of materials, tools, and equipment) might have a significant impact

on student performance. But this is another area where truth may be somewhat counter-intuitive. Since our concern is with student innovation, it might equally well be argued that a detailed experience with a limited range of materials and facilities might be *more* valuable than a shallow experience across a wider spectrum. There is, to my knowledge, no empirical evidence on this point – so it remains a matter of opinion.

The physical and learning environment categories overlap in some important areas, not least concerning the ways in which the physical environment is *presented* to students. If the studios are full of challenging and interest-grabbing displays of work; if materials and tools are available without endless queuing to see the teacher; if technician support is organised also to be a learning resource, then student work is likely to be enhanced. But this does not help with our immediate task, since we are not assessing teachers and schools. So once again, whilst recognising the potential impact of the physical environment on students' performance, we can merely note the fact and move on.

3 the person-process

- (a) task finding
- (b) spark generation
- (c) development and elaboration

I have called this category 'person process' because it is indivisibly to do with the person and the process of innovation that he or she uses. This process is widely written about – particularly in the context of innovation in business – but also somewhat in the context of innovative design processes. In the specific context of design innovation, see for example: Beveridge (1980); Kelly *et al* (1986); Roy and Wield (1986); Broers (1999: 87-96); Myerson (2001).

The literature suggests that the process might (without too much distortion) be categorised into the three subsets identified in this grouping: concerning task recognition; 'spark' generation; and development. At each point, innovation can be displayed (or not), and the consequences of innovation demonstrated (or not).

3 (a) task finding

A significant part of the art of innovation involves seeing the world differently. Our mundane and everyday experience may (in some people and to varying degrees) be transposed into weird 'other' realities, and this transposition is the source of much potential innovation.

What would happen if water was magnetic; if friction did not exist; if house bricks were 'intelligent'; and if iron did not rust? The history of invention is littered with examples of people who sought to do things (and create things) that demanded such conceptual restructuring.

The submarine (1776); the escalator (1894); the aeroplane (1905); the ballpoint pen (1943); the 'dyson' (1985) all came about (at least in part) because the designers in each case refused to be constrained by the conventions of current product reality. They exercised their imagination to re-formulate the world and speculate about hitherto unimagined possibilities. This is what I mean by task finding. It requires (at the least) an open-minded willingness to see the world 'otherwise', and (ideally) a mind that deliberately, *playfully*, tries to reconfigure the world differently. It has to be said that this conceptual playfulness is more often evident in literary and artistic realms than it is in the technological (*Alice in Wonderland*, *The Hobbit*, *Blade Runner*, *Matrix*). Perhaps this is because of the down-to-earth practicality that lies at the heart of design and technology. The harsh reality of (e.g.) material behaviour is exactly the 'stuff' of design and technology. These realities tend to root us in the pragmatic and the purposeful, and typically this is at the expense of the playful. But 'playfulness', 'openness', 'delight in uncertainty', 'ambiguity', 'letting go', are littered through the literature as key attributes of creative innovators.

I believe that it would be well worth exploring this 'playfulness' territory for assessment purposes. Quite what the instruments would look like is difficult to say, but it is possible to imagine tasks that would be relevant to this challenge. I explore some possibilities later.

3 (b) spark generation

Jane Darke (1979) wrote convincingly about the design process from the point of view of architects. She was writing in the 1980s at the height of the 'design methods' movement – which typically described design as a logical sequence of steps. Her work emanated from interviewing architects to see how they *actually* originated their designs, and she describes the 'primary generator' as the key to it all. This is what I call the 'spark' that drives the project. In Dyson's case it was to use a cyclone system (for the first time) for a domestic product; in the Wright brothers case it was to warp the wing to create lift; in Ive's case (the iMac) it was simultaneously about transparency and colour. Even with the relatively naive designing of students it is commonplace for their work to be driven from

a central idea or 'spark' to which all other considerations are sublimated. The question for us is 'where does this spark come from and can it be assessed?'

In a recent series of workshops at the Design Museum, IDEO designers exemplified the techniques that they use quite deliberately to foster and promote such insights. As an example; taking two words at random and thinking about what they might 'mean' together. 'Porpoise-post' and 'scary-mud' arose during the session and the teachers used these **deliberate discontinuities** as 'thinking matter' for new product starting points. By deliberately creating such tensions, IDEO designers generate starting points for ideas through 'post-it' brainstorming.

Another technique is 'technology transposition', or 'solution transposition' – taking a solution in one field and applying it to a different field. What does an 'accordion-chair' look like or do? And for whom? Again, deliberate discontinuities are used to promote new thoughts, but the process can be unsettling to those who thrive on order and neatness. And that is exactly the point. The literature suggests that innovators are not afraid of such untidy discontinuity – they revel in it, and in a lively fantasy life.

'IDEO is a zoo ... pitting dozens of minds from different disciplines against one another in raucous pursuit of zany ideas ... there may sometimes appear to be chaos during the innovation process, (but) 'it is focused chaos.' (Myerson, 2001)

Such chaotic working demands suspended judgement, 'to see where things might lead', and as one of the IDEO team pointed out, the general principle with their work is 'to try stuff and then ask for forgiveness'. Such blatant risk-taking is at the heart of innovation, and demands the trust relationship I discussed earlier.

3 (c) development and elaboration

In design and technology, we are familiar with the way that design ideas progress. One of our principal conclusions from the APU project concerned this critical relationship between the concrete *expression* of ideas and the *development* of ideas.

'... the act of expression pushes ideas forward. By the same token, the additional clarity that this throws on the idea enables the originator to think more deeply about it, which further extends the possibilities in the idea. Concrete expression (by whatever means) is therefore not merely something that allows us to see the designer's ideas, it is something without which the designer is unable to be clear what the ideas are.' (Kimbrell et al, 1991)

Most recently, and in the context of IDEO's model of product innovation, Myerson (2001) talks about the centrality of modelling.

'we build lots and lots of imperfect prototypes not because we think we've got the right answer, but to get responses from buyers and users. Then we can fix their complaints. We're into multiple realisations of what the future can be. 'Faking the future' describes the rough and ready IDEO formula of building lots of crude prototypes ... Kelley describes this as 'fast fearless prototyping.' (Myerson, 2001)

This then is the challenge for assessing innovation in the context of idea development. We need to create assessments of students '*multiple realisations of what the future can be*'; to develop a model of assessment that rewards the 'rough and ready' testing out of (possibly zany) ideas. As we know, the current fixation of examinations in design and technology is to reward the absolute opposite of this; i.e. slow, painful, beautifully rendered, nonsense (with pretty borders).

I believe that here – probably for the first time in this paper – we have identified an area of assessment where no new techniques are required. But what is desperately required are new criteria of judgement that place the focus on *ideas and how they are being explored, challenged, developed and realised*.

So what do we do?

This analysis leads me to suggest that five of the categories discussed above have the potential to be developed to improve the assessment of design innovation.

the person: assets: head/hand

- the student's ability to *access* the skills and knowledge that they need to pursue their task

the environment: social environment (peers)

- the student's ability to extract benefit from *group* activity

the person-process: task finding

- the student's ability to be *playful* in restructuring the world to identify tasks

spark generation

- the student's openness to (and ability to use) *discontinuities* to spark ideas

development and elaboration

- the student's ability to explore, develop, and realise *ideas*.

Since open-ended project work is the standard form for assessment of design and technology for GCSE, AS and A2 Levels, it would not be

difficult to draft criteria for assessment that supplemented the current versions and ensured that these five qualities are reflected in – and fully rewarded by – the criteria.

But we can go further than that. It could be argued that some of these qualities are central to designing in general – rather than to innovation in particular. But the reciprocal argument is that some of these five qualities are really at the heart of innovation – and should be the focus of very specific developments in assessment practice.

If these are the famous five qualities, I have two nominations for you – the terrible two – the intractable two – the tantalising two – without which design can be *effective but lifeless*; can be *adequate but unexciting*. I suggest to you that the central qualities that we should be assessing if we value design innovation are the ability to be *playful in restructuring the world* and the ability to *spark ideas*. Where do you find these qualities in the current assessment regime? Nowhere. So at the least we can look carefully at these qualities and tease out criteria that reward them in students' designing.

However, we can go further than that. I think it is time that we grasped the nettle of assessment and admit the limitations of long-term project assessment. In the last few months, my two sons have just experienced A2 and GCSE assessments. I know how they were steered by their teachers (and by me) and I know the extent to which dangerous (risk-taking) territory was avoided. There is so much at stake with these final assessment projects that teachers and students are very risk-averse as they undertake them. We cannot blame them.

So I propose another instrument. A short (maybe 1-2 hour) activity – structured through a response booklet and using an administrator script much like the APU style test activities that we developed in the late 1980s and that Kay Stables and I (2000: 195-203) outlined in our paper 'The Unpickled Portfolio' at the DATA millennium conference.

There are two reasons why I think this format works well for assessment purposes.

- in all the research circumstances in which we have adapted and used this form of performance assessment tool (approx 10 different projects), it has never failed to generate student performance well beyond the expectations of the teachers. It is a format that works for students.
- we proved in 1989 that it can also work, purely sending it by post to a very large number of schools and students (700

schools and 10,000 students). It is a format that can be administered efficiently.

Taken together, these two factors suggest that the format could also be made to work for AS and A2 assessments, if not for GCSE.

The focus of the instrument of course would be specifically on the 'terrible two' qualities of design innovation; on 'playful restructuring' of the world and the ability to 'spark ideas'. I propose a structured activity that deliberately presents discontinuities to students – that deliberately encourages them to be playful with them – that deliberately plays down the importance of right answers and that deliberately lets the student make up what will count as useful knowledge for the activity. I haven't trialled any of this – but I would love to – and I would start with something like this ...

The snail shell has evolved through millennia and serves many purposes (mostly for the snail). How might the concept of the snail shell be developed and put to use in ... (pick one of these)

- the medical industry*
- the transport industry*
- the communications industry*
- the sports industry*

NB. Whenever you find yourself in need of information – you are invited to make it up, note it down and proceed. Your ideas are more important than practicalities.

or

Materials science has produced a new polymer that can be moulded by hand (like putty or playdough) at room temperature, but when dropped on a hard surface (eg a stone floor) the shock impact transforms its properties. It becomes rigid and hard and bounces like a glass marble. How might this material be used in ... (pick one of these)

- the medical industry*
- the transport industry*
- the communications industry*
- the sports industry*

NB. Whenever you find yourself in need of information – you are invited to make it up, note it down and proceed. Your ideas are more important than practicalities.

These kinds of test activities could be structured through a series of sub-tasks (as in APU tests) and administered over a period of (say) 1-2 hours. An important part of their success would depend (I think) on some initial brainstorming and this might be in two parts. The first part would be group activity (say 3-6 students) and the initial 15 minutes would be devoted to IDEO style 'post-it' brainstorming

(each student with a different colour of Post-it Note). The second phase of brainstorming would be individual and in the booklet. The activity would grow from there. At the end, the teacher places the post-its in the appropriate student booklet.

It is essential that these test activities accentuate the *playfulness* that is central to concept innovation. This would be achieved (as suggested in the literature) through the discontinuities presented in the task. I can imagine all sorts of variants of this kind of test – and would love to try some out in pilot schools. The assessment criteria would need careful thought as would the training process for any markers. But these are small problems compared to the challenge of making the test itself ‘work’ in a way that encourages students to innovate new product concepts. So talking to students about how they react to the tasks would be an important part of the research.

I fully recognise that design innovation is not just about product concepts – but is equally about *development* innovation further down the line. I have suggestions for instruments there too, but time prohibits me from discussing them here.

What I am desperate to achieve is a new balance in the assessment of design and technology. A balance that does not just reward safe (plodding) risk-avoidance, but one that acknowledges the centrality of risk and that celebrates the uncertainties that are inevitably involved in designing. There will be a mass of problems to be tackled in any such development of assessment practice; not least concerning the reliability (consistency) with which markers can identify innovative responses from students. But the bigger problem – and the one that would really concern me through such a development – would be its validity. Does the assessment device really measure the essence of design innovation? Does it identify those students that teachers ‘know’ to be innovative – but who currently avoid it and just play the assessment game. I don’t want merely to create another game – or another orthodoxy for assessment. But I do want to find ways to reward and celebrate those innovative youngsters that we know are currently getting a raw deal.

Throughout the development and piloting of any such instruments, we should keep two things firmly in mind. First, that creativity and innovation is the underlying human condition that separates us from the rest of the animal kingdom.

‘Among the multitude of animals that scamper, fly, burrow and swim around us,

man is the only one who is not locked into his environment. His imagination, his reason, his emotional subtlety and toughness make it possible for him not to accept the environment but to change it. And (this) derives ... from the ability to visualise the future, to foresee what may happen and plan to anticipate it, and to represent it to ourselves as images that we project and move about inside our head. Man is not the most majestic of the creatures. But he has what no other animal possesses, a jigsaw of faculties which alone, over three thousand million years of life on earth, make him creative.’
(Bronowski, 1973)

Second we should keep in mind that design and technology, through the claims made in its ‘distinctive contribution’ statement, has nailed its colours to the mast. It claims ‘creative intervention in the made world’ as the heartland of its rationale as a curriculum activity.

‘It (design and technology) enables them (students) to understand how to think and intervene creatively to improve the world...’ (QCA, 1999)

Those of us here know design and technology well, are we are fully aware of the extent to which normal practice in schools is currently falling short of this ambitious claim. It is my belief that this short-fall is to a large extent the product of an assessment regime that completely fails to recognise *and value* risk-taking innovativeness. It is time that we put this matter straight, or at least it is time that we did our level best to try.

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