Evidence through the Looking Glass: Developing Performance and Assessing Capability

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Abstract
This paper discusses an approach to authentic assessment that has been developed through a series of research studies over the last 20 years. It presents a conceptual argument for how task-focussed, creative thinking can be heightened within a performance assessment context through using strategic evidence prompts. Using case studies of the originating project for this approach and then more recent studies, it illustrates the strategies that were used, the assessment evidence that was generated as a result and, most importantly, the positive impact on the designing and thinking skills of the learners involved.

Key words: Authentic assessment; evidence; creativity; designing.

Research in England for the Assessment of Performance Unit (Department of Education & Science) in the late 1980s embraced Design & Technology for the first time. The research team at Goldsmiths College developed new approaches to structuring assessment tasks and identifying qualities of capability (Kimbell et al., 1991, 2004: Stables and Kimbell, 2000). A series of projects conducted with Research Councils, industry and professional bodies has subsequently built on this work extending it both *practically* into new models and approaches to assessment, and *conceptually* by exploring the mechanisms of mind and the parameters of performance that comprise capability in design & technology. The work has been done with age groups from 5-18 in schools and with adults.

Drawing on this body of work, this paper presents a conceptual argument about how task-focused, creative thinking occurs and can be heightened through strategic use of evidence prompts when the task arises within the context of authentic assessment. In particular, it focuses on questions of *evidence*. By exploring the twin faces of evidence, we consider who it is for, how it can be provoked, what can be seen from it, what learned from it, and, ultimately, how it can support the development of thinking skills of both learners and teachers.

The brief we were presented with for the APU research first made us fully aware of the challenge of evidence. We were to assess the design & technological capability of a 2% sample of the 15 year old population of England, Wales and Northern Ireland (about 10,000 learners). Design & Technology came in the wake of subjects such as science, maths and English and these surveys had set certain precedents – e.g. that assessment should be largely *paper and pencil*, undertaken in *short time frames* and sent to randomly selected schools to be administered by teachers in the schools.

Since design & technology activities typically involve far more than just pencil and paper work, and since projects typically last for days/weeks rather than minutes, there were some serious challenges in the brief we were set. We were committed from the outset to assessing through authentic activity, where performance is linked directly to process. Creating assessment activities within these constraints forced us to focus very directly on how we could engage learners in a design activity quickly, how we could set a challenge that could genuinely be addressed in short time frames and how we could reap a range of evidence of capability in such a setting.

We outline below our approach to this first project and then draw on three more recent projects to illustrate the central theme of this paper; that eliciting evidence for assessment

serves a treble-acting purpose. At one level, when done effectively, evidence can deliberately be promoted through an activity and can thereby be exposed to scrutiny by assessors. This is the first and most obvious purpose of evidence in an assessment setting. At a deeper level however if (in the eyes of the learner) the activity is sufficiently authentic, then the prompted display of evidence enables the learner also too to 'see' (probably for the first time) the evidence that they have just created. Reflection on this evidence then enables learners to improve whatever is the focus of their thinking; the *product* they are designing. So not only do *assessors* gain insight into learners' thinking, through this display of evidence, but so too do *learners* themselves. When done effectively, their thinking is laid bare for them to see for themselves and benefit from. But the issue does not even end there, for at a yet deeper level, learners are affected not just by being encouraged to modify and enrich the product they are working on. They also begin to modify their design processes so as to maximise their ability to make their thinking explicit. Making this thinking explicit to others (including assessors) has the *double purpose* of helping them to improve their product, and thereafter the *treble purpose* of improving their more generic designing processes.

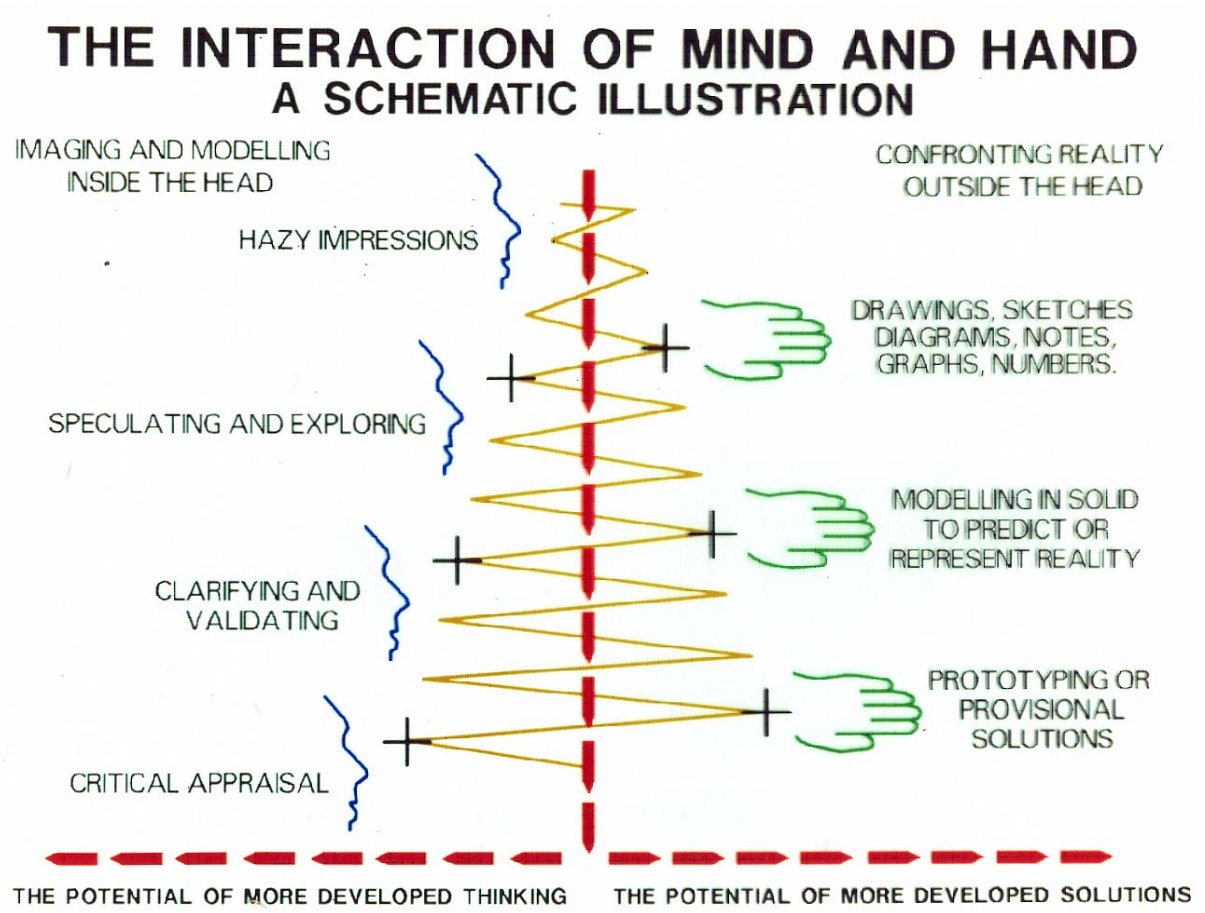
Our awareness of these layers of significance emerged first in the APU project in which we designed tasks for 10,000 learners based on short, paper and pencil activities. Our immediate concern was to develop assessment tasks that would instantly motivate and engage learners. We believed that if we wanted to assess performance, then to be valid, that performance had to take place in as authentic a way as possible. Our approach was to develop a rich context, with abroad range of design issues and challenges embedded within it, and to trial it with a group of 15year olds, both to see if it engaged them and to see the capability it laid bare. With this first activity we were not disappointed on the engagement front. We created a scenario of a local community taking over and developing waste-ground for community purposes – meeting spaces, children's play areas etc. We identified a range of design challenges and then engaged groups of learners in addressing particular tasks. The learners quickly took ownership of their task and from the way they handled it we could comment on their enthusiasm, effort, collaboration and so on (attitudinal things) but unfortunately, as it turned out, we could say very little about their capability. We had (as an evidence base) a few drawings and some models, but no idea about *why* they had done the things they had done or what they *thought* about them. We had virtually no evidence of their design thinking.

Our response to this - in the next trial – was to stop the learners every ten minutes and asked them to write down what the had just done, why, and what they planned to do next. This was a form of protocol analysis based on a version of concurrent verbalisation (see Ericsson & Simon,1993) through which we sought to 'get inside the heads' of the learners involved in the activity so as to reveal their thinking. Despite being somewhat laboured, it was a tactic that worked in so far as it provided some valuable insights into their actions. The learners' reaction was interesting, for they found it annoying and valuable at the same time. It had been tedious to stop and go through this protocol every ten minutes, but at the same time it had provided a 'pause for thought' that they might not otherwise have taken. We realised we could get them to reveal their thinking on task but that, as a way of operating, it was too blunt an instrument. By refining the approach, what prompts we used and when we used them, we could develop a more effective and subtle approach.

Critical to this was the model of design & technological thought and action we were developing concurrently with the activities. This model (Figure 1) rejected the prevailing linear and cyclical models of design process in the literature of that time (see Kelly et al., 1987). The model we were developing promoted a view of activity that took the development of a speculative or 'hazy' initial idea to the point of becoming an effective working reality through an iterative process of thought and action. From our first activity trial, it was

apparent that we could 'see' the *action* components through the tangible evidence of the drawings and models that emerged as the designing progressed. But the thinking elements, being more ephemeral, were largely invisible. The prompts that we then built into the task targeted this thinking and increasingly we found ourselves able to expose it to the light of day.

Figure 1. An iterative conceptual model to describe designing processes



The prompts were built into the activities through a structured, unfolding booklet that worked as a portfolio for the short activities, (which we later came to term an 'unpickled' portfolio, as it did not involve 'steeping' the learners in a long term project: Stables & Kimbell, 2000). Our concept of the portfolio is as a working document that grows dynamically with the project or task, rather than being merely a repository (Kimbell et al., 2007). To illustrate how tasks were structured in this way, the following is the sequence of events from one task.
Watch a short (8 minute) video, introducing a scenario and highlighting design opportunities and issues (e.g. around the increasing difficulties elderly people face in preparing food)

1. Consider the task and 'jot down' initial design ideas
2. Prompt 1 – what will the design need to do and be like if it is going to be successful
3. Prompt 2 – review work to date and annotate with a *red pen*, identifying which ideas are good – and why, and which need changing or abandoning – and why.
4. Continue to develop design ideas towards a solution.
5. Prompt 3 – review your work and note down all the design problems that still need to be sorted out.
6. Prompt 4 – note down what do you now need to know (that you don't already know) to take your ideas further. How/where will you fin out?

7. Prompt 5 – look back at the task and your own success criteria – how do your ideas measure up?

Our aim in this was to reveal the learners' thinking to provide us with evidence of capability. But in the process of doing this, the response of learners was unequivocal. They were being provoked into thinking more deeply about the matters in hand, demonstrating the rich double-sided nature of the evidence being prompted.
Within the task we ask learners to do something (for example some 'red pen' evaluatory annotations). We can then 'see' the level and depth of their thinking at that moment. But (critically) so do they. This process of asking for the evidence does a range of things:

- it tells them that this thing (red pen etc) is an appropriate thing to do;
- it allows them to think about it and answer the question / do it;
- it thereby allows them to recognise (metacognitively) that they have done it;
- in the process it improves their grip on the task;
- but (more important procedurally) it also enables them to import the thing (red pen etc) into their own practice … so their practice (including their thinking) becomes richer and more robust.

It is as if the evidence speaks in a mirror - to the listener (directly) and back to the speaker (indirectly) creating a form of playback. The 'playback' in turn has two benefits: directly improving the learners' product and indirectly improving the learners' process. So, in general, the more we can encourage the learners to speak to us, the more they hear themselves externalise their thinking, developing both the design ideas they are working on and the generality of their practice. The approach has importance in its potential for developing learners' self-awareness and the requirement to externalise their thinking supports learners' metacognition. In the context of well-designed authentic tasks therefore, good assessment has the effect not merely of *gauging* learners' capability but also of *enhancing* it. In three more recent projects, we have taken forward these ideas, extending the range of evidence being collected and (hence) offered back 'in the mirror' to learners.

Assessing Design Innovation was a project undertaken for the Qualifications and Curriculum Authority (responsible for all national assessment in England). The focus of this project – as the title implies – was on innovation, and our efforts were on the challenge of identifying (and then promoting) innovative performance. One of the approaches we adopted was with the use of a digital camera. Once learners were involved in the task, we created a photo-story-line of their work, including their evolving modelling, taking a photo approximately every hour throughout the six hour activity. (Figure 2)

This was originally done to provide assessors with a snapshot story-line of the route that learners took to their prototype solution, but we soon realised (once again) that this new kind of evidence was having an additional effect on learners' performance. This arose because these photos – once taken - were immediately printed and returned to learners as thumbnail images to stick in their unfolding booklets. Once learners realised that this was happening, and that more images would be taken through the activity, two significant things happened:

a) they began to *anticipate* the photos and were ready to show us what they thought of as the most significant developments in the work over the last hour.

b) they became more confident with their modelling – prepared to butcher existing models to extend them into new forms or arrangements. The hard photographic evidence enabled them to be less 'precious' about preserving the models themselves.

Figure 2. A photo-story-line

In both of these ways the evidence for assessment enhanced their performance on the task and we are confident that many of them will also have internalised this photo-story-line concept into their designing approaches.

Our current project, ***e-scape***, takes this idea yet further. The concept of e-scape is that learners' portfolios are no longer paper-based but digital. Learners work with hand-held digital tools (PDAs – see figure 3) using them as

Figure 3. Using the digital tools

- a sketchbook
- a notebook
- a camera
- a voice recorder

As they undertake the task, their work appears simultaneously and dynamically in a secure web-space. Here, given the right access codes, the work can be viewed not only by the learners themselves but also by teachers and assessors.

The single biggest innovation here is the newly possible use of voice files. We have repeated the routine of taking photographs of the evolving work, but have supplemented in two ways. First we have made learners themselves responsible for taking the photos, when cued by us to do so. They can choose what to photo and how to 'stage' it so that it best tells us about the evolving work. Second we have asked them to record a 30 second 'sound-bite' to explain how the work is progressing, what is working well and what needs further development. These sound files are fantastically interesting, revealing all kinds of evidence of learners' thinking as it unfolds. And, once again, the process of making it explicit for us naturally makes it clear also to them. They are working their thoughts out as they record them for us. Their evaluations of the process are highly revealing of this metacognitive benefit.

Finally, in another current project (*Creativity and Progression in Transition through Assessment for Learning in D&T*: McLaren et al. 2006, Bain and McLaren, 2006) we have sought to highlight this metacognitive benefit, using the approach to support 'sustainable assessment' (Boud, 2000). In addition to the self and peer reflection built into the activity we included a learner self-reflection tool through which they reflected on their own performance by focussing on the following:

- I was best at …
- the easiest thing was …
- three things I learned were …
- three things I want to get better at are …

Each learner completed two design tasks, with a nine-month gap between the first and the last. In some schools, intervention strategies focusing explicitly on developing self and peer evaluation skills were introduced during the time between the two tasks. What transpired was evidence of a relationship between these intervention strategies, levels of performance and the

quality of thinking displayed – including through the self and peer reflections. As with previous use of the tasks, motivation and engagement were high and attitude positive. Once again, the evidence prompts within the activity not only provide insights to support external assessment, but they also provided the clues to help learners improve their evolving prototypes. But quite explicitly in this case it was not only their product-based thinking that was enhanced, but also their self-awareness of themselves as designers and as learners.

Taken together, we believe that these projects demonstrate very clearly how evidence operates in complex ways with learners in assessment tasks. Evidence is – in a real sense – seen through the looking glass. And once seen, this evidence can be the spur for development both of the product being designed and of the mind that lies behind it.

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Professor Kay Stables. Having started her career as a secondary level textiles teacher, Kay has been researching design and design learning for the last 20 years. The main (but not exclusive) focus of her work is on learners within the primary and secondary schools, mainly within the context of the school subject of design and technology.. Her particular research interests are in the development and assessment of design capability, design thinking, design methodologies, research methodologies. She has been invited to speak about her research in North America, Australasia and Europe and has a special interest in international perspectives. With Richard Kimbell she has recently completed a major publication – Researching Design Learning – due for publication in Autumn 2007.

Professor Richard Kimbell. Richard was the first professor of Technology Education in London University. Between 1985-1991 he directed the APU D&T project for the DES and in 1990 founded TERU – the Technology Education Research Unit. Since that time he has undertaken research for a range of bodies, including research councils [ESRC, NSF (USA)] industry [e.g. LEGO, BP], governments agencies [e.g. DfES, DfID, QCA] and professional and charitable organisations such as the Engineering Council UK, the Design Council and the Design Museum. He has published widely, including his book Assessing Technology which won the ITEA outstanding publication of the year award. Most recently his research has focused on using new technologies in authentic assessment settings – work which having direct application within the existing examinations structures of England and Wales. With Kay Stables he has recently completed a major publication – Researching Design Learning – due for publication in Autumn 2007.