# Transformations

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I have always been aware of the butterfly effect. It is a theoretical phenomenon that argues that a butterfly flapping its wings in one place can cause catastrophic effects somewhere else. Whilst this example sounds a bit far-fetched, I do keep coming across less extreme but very interesting examples of it.

An example arose in a great book I am currently reading; "The Last Wolf" by Robert Winder about England in the 13th century. In 1281, Edward 1 ("long-shanks") required one of his knights, Peter Corbet, to rid England of wolves. They had in any event been in decline for decades. Magna Carta (1215) reports a reward of 5 shillings for a pelt, surely too big a sum to be easily earned, but lambs and travellers through dense forests were still threatened by packs of wolves, and frightening stories of tooth and claw featured large in early medieval consciousness. But by 1290, Corbet - with his hunting parties and dogs - had seen off the last of the wolves and was rewarded with a seat in Edward 1st parliament. The English county-side had been tamed.

It was not intended that this single action by an obscure Shropshire noble should transform the economy of England – but it did. Over the channel in France, Holland, Switzerland, Germany and Italy (and of course the whole of Scandinavia) the wolf-packs remained unchallenged. They could move in and out of the vast Russian (now east European) forests in numbers far too great to control, and right across Europe, shepherds were forced to bring their flocks into protective pens every night. Sheep farming on the continent was a hazardous business. But after Corbet, Winder describes how … "in England, an Anglo-Saxon – Viking – Celtic witch's brew of an island governed by Norman occupiers would turn into the biggest sheep farm in the world, and become the source of its finest wool."

The vast wealth created by the wool trade across to the continent is evident in the wonderful buildings in Essex and Suffolk on the route to the East Anglian channel ports, not least Dunwich which has long since been lost to coastal-erosion. But perhaps the biggest indicator of the significance of the wool trade is in the 'wool-sack'. In the 14th C Edward 111 commanded that his Lord Chancellor – whilst in Council – should sit on a wool bale to symbolise the huge importance of wool to the English economy in the Middle Ages. The woolsack remains central to parliamentary procedures to the present day.

What struck me as interesting about this wolf story was that so much had been transformed; our farming, our economy, our trade and even our parliamentary procedures, and yet it was (to me) a completely unknown incident. It seemed like a 'butterfly' story, with Corbet fluttering his wings in the forests of England in the 13th century and causing England to be completely re-made for the next seven centuries. And there is of course a connection between this butterfly example and the tricky business of teaching Design & Technology (D&T).

When I started teaching in 1970 I was surrounded by schools – and teaching practices – that were dominated by craft traditions in wood, metal, textiles and food. But fortunately this was a time in which experimentation was not only allowed it was deliberately encouraged – not least within the 16+ assessment processes. We were allowed to create our own courses and devise our own examinations. So I did. But a few years later I was faced with the challenge of encouraging other teachers (and student teachers) to build design thinking into their courses and thereby into their learners' experiences. On the face of it, this appeared to require a huge transformation of thinking from predetermined craft practice to learner-initiated design decision-making. Surely too big a step to be easily taken. So I experimented with ways to make the transition easier. And the more I experimented, the more I realised that the difference between them depended on where you were looking.

We might imagine a project comprising tangible and intangible elements. The tangible (observable) elements involve the materials and the tool processes that result in a product. They can all be seen, smelled and touched. The intangible elements are far more difficult to see. They exist as intentions in the mind of the teacher and as intellectual processes embedded in those material, tangible, bits and pieces.

Imagine a project. Learners are using a construction kit (like LEGO) to create a small, independently powered buggy with a steering system and a built-in light sensor. The idea is that - when switched on and let loose – it will trundle around the room and when it hits an obstruction (a chair leg) it reverses and turns away from the light. Its behaviour appears to be such that it is 'hunting' for darkness and it ends up in the deepest darkest corner of the floor. The tangible features of the project - the LEGO blocks and switches and sensors – might suggest that this is an appropriate D&T project. But to be sure, we need to know more than that which is observable in the product (the buggy). We need to get inside the head of the teacher and grapple with his/her intangible intentions. The buggy might be a challenging, design-rich experience for learners. Or it might just be a bit of vaguely interesting rule-following (LEGO-plan following).

But teachers' intentions *are* of course observable – not in the *objects* under construction but in the less tangible features of the learning exchange. They emerge through the questions that teachers ask; through the challenges they throw at learners; through the way the room and the working groups are set up; through the way that the modelling kit is presented; through the guidance about 'what counts' as success; and through the myriad other considerations that make up an appropriate pedagogy for D&T. The bottom line is that D&T is not defined by the tangible stuff that typically makes up its content. It is ALL about the intangible intentions that teachers enshrine in their method of teaching; their pedagogy.

In fact the tangible elements can sometimes be seriously misleading. On the face of it a room full of youngsters making mechanical buggies screams out 'Design & Technology!'. But it might not be. Conversely a room full of youngsters sitting and discussing something does not immediately shout 'Design & Technology!' But it might be.

So, if the buggy might be – or might not be – good D&T, and if the difference between them lies not in the materials, components and tools in the teaching room but rather in the teacher's intentions and practice, then – I argued to myself – surely it's a small matter to help all teachers to become great D&T teachers. How naïve. It is true, I think, that the

tangible differences between good D&T and not D&T are small. The buggy, the chair, the identity bracelet might all be either. But good design teaching involves a sophisticated pedagogy, and helping teachers to get to grips with it is a very challenging task, not least because of the uncertainties that inevitably arise as learners make their own design decisions.

Oddly this reverses my 'butterfly' notion. For it argues that small differences in the tangible/observable outcomes of projects result from the most profound changes in teachers' practice. So why would we bother? If the material outcomes end up looking more-or-less similar, why go through all that sophisticated practice to get there? Because, of course, its not the buggy or the bracelet that matters. It is the *learner* and how their design-struggle transforms them into creative and independent thinkers.

I was recently in a school where the conformist (Gove-ist) pressure on the curriculum has resulted in Design & Technology being 'merged' with science. And I note that the new curriculum in Wales specifies a Science and Technology Learning Area. In these tricky times it is more important than ever that teachers have a good grip on what makes Design & Technology what it is. The observable material content of projects is (I have argued) not critical and is completely negotiable. But the underlying purpose – and its associated pedagogy - is absolutely vital.

So how might we summarise those non-negotiable principles that define D&T and that represent our covenant to learners. By learning to think and act creatively and independently we can build a better world. Not following others' plans but working out for ourselves what improvements are worth making; how we might bring them about; and having the capability to enact them.

We realise these ambitious goals in the material world because the consequences of our decision-making are always so evident there. In a D&T learning environment, our ideas cannot hide or be fudged. Our thinking is squeezed between our design vision and the ruthless reality of the material world, which is an unforgiving and powerful teacher. But if the material world – the made world - provides a wonderful Montessori experience in which learners progressively acquire the capability of creative and independent thought, that is not the end of the matter. For a creative and independent thinker will not be told that they can only exercise their capability in that material world. They will – quite rightly – want to spread their wings and tackle tasks that go way beyond the concerns of the made world… into social policy, archaeology, economics, history, law and philosophy.

In short, the aim of a great Design & Technology programme is that learners will grow to be educated in the fullest and richest sense …enlightened, discerning, discriminating, and capable.

And a Design & Technology learner flapping her wings just might change the world.