‘They can never make what they draw’ - producing a realistic, appropriate and achievable design at key stages 1 and 2

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'They can never make what they draw' - producing a realistic, appropriate and achievable design at key stages 1 and 2

Samuel G C
Surrey LEA

Abstract
Teachers do not fear making, have always encouraged evaluation and respond readily to investigations but constantly ask how one develops children’s skills at AT 2. Generations of teachers who were never asked to design anything themselves are now being asked to help children achieve: “a realistic, appropriate and achievable design.”

This requirement is not easily satisfied at any level and depends a great deal upon the constraints that are placed upon the task. This paper will demonstrate the very high quality of designing that children as young as five can achieve but suggests that, paradoxically, only limitations of scale, materials and content lead to that high standard.

The projects illustrated show that careful structuring of this area leads to increased understanding of the task, improved classroom management and better targeting of the programmes of study.

Children can make a wonderful variety of things without any written work whatsoever; they can also produce drawings showing flights of fancy that could never be achieved in reality. How can we marry these two together, enabling them to produce ‘a realistic, appropriate and achievable design’?

In the not-too-distant past, making things in the primary school came under two distinct headings: there was junk-modelling, which as the name suggests was of very low priority and entailed activity aimed at increasing manual dexterity and allowing both children and teacher a rest from the intellectual requirements of ‘real’ work. There was also the ‘here’s one I made earlier’ activity in which the teacher would show the children how to make something and the teacher would copy her. Indeed, at secondary level there was little difference except for the absence of open-ended creativity; no junk-modelling here, just a line of prescribed table-lamps, coat-hooks, aprons and rock-cakes.

The introduction of Design and Technology has taken place against that background and left many teachers in a dilemma: most of them recognise that giving children strict instructions on what they must do is not beneficial. However, at the other end of the spectrum are those who simply allow the children to select their own project and have free access to a limitless range of tools and materials. Not surprisingly, this leads to immense difficulties. Children have wildly-ambitious ideas but lack the experience, knowledge and skills needed to bring them to fruition. Even when the teacher places some restrictions, problems still arise. If children are asked to design and make a
puppet, for example, one child might decide to make a string puppet; another a glove puppet and a third, a shadow puppet. Each of these children will need to make different investigations and learn different skills but how can the teacher ensure that this happens and also plan for continuity and progression?

Given this sort of situation, children will often produce a design, only to have it rejected by the teacher for a variety of reasons: it is too big; it would be too expensive; we haven't got any springs; you used textiles last time - I want you to use clay today. Any sensible child, though perhaps lacking in tact, would justifiably say: "Why didn't you say that in the first place."

All quality designing takes place within constraints, externally-imposed or self-created. In the world of literature, how many great poems have been written that have exactly fourteen lines with a change of mood or rhyme scheme at line eight? The answer, of course, is hundreds; the sonnet form imposes constraints but focuses thinking.

In all Design and Technology projects, a vital early decision to be made is: what materials are available and what size is realistic. This need not be decided solely by the teacher but does need to be established before designing can begin in any meaningful way.

Children need to have experience of a wide range of materials but perhaps, in the early years, only a limited range at any one time. A group of seven-year-olds were given some thread, pieces of bamboo cane (which they could not cut) and corriflute (which they could cut) and a small piece of garden wire which was their threading tool.

For about ten minutes the children explored these materials. They threaded, folded and cut. The teacher then suggested that they tried to make some string-puppets but they should try to draw what they wanted them to look like before they started making. Within half an hour all the children had produced

(Fig 1)
realistic, achievable but unique designs. They made decisions about shape, scale, the alignment of the corriflute and considered the problem of the pieces of bamboo coming unthreaded. (Fig 1)

I was delighted by all of their designs but staggered to see the quality of one in particular. For a seven-year-old I felt this to be the Design and Technology equivalent of a Keats' sonnet. (Fig. 2)

(Fig. 2)

This child had obviously acquired considerable design skills. I use the word acquired rather than taught since his teacher was as surprised and delighted as I was. Here we return to our historical precedents: if we as teachers never learned to design, how can we help our children?

Limiting the choice of materials requires one particular style of designing: it demands that the designer matches the design to the scale, size, quantity and properties of the available materials. There is therefore a far greater opportunity for there to be similarity between the design and the end result. The alternative method is to design what one wants and hope that such materials are available or can be produced. This could lead to a child designing a lighthouse which needed a battery that was two centimetres wide and fifteen centimetres long. Such a battery could exist but almost certainly does not. How much more sensible for the child to be involved in discussion concerning the size and shape of batteries that are available. I believe that wherever possible children, in their early years, should design "life size". This becomes much easier when the child has information on the sizes of materials and components that may be used.

Pictures or diagrams do not necessarily take the place of words; they are both capable of conveying meaning. Children can be encouraged to label the separate parts of their design and, if possible, write a list of what they will need.
Here some seven-year-olds designed a garden for a very small friend, again with limits, agreed after discussion, on what could be included and what materials were available. (Fig.3)

(Fig.3)

Perhaps of great significance, given the increasingly crowded curriculum, is that the children discussed what their little friends would need in the gardens, designed them and made them within two hours. Nor are we considering end-products that show creativity but lack finish; the children were all justifiably pleased with the appearance and quality of what they had produced, as were the teachers and parents. There are a sizeable number of teachers who are finding great problems with reconciling the high levels of thinking that go on in some projects with the poor quality of the final outcome.

I do not advocate all projects to take so short a time; indeed, I would have liked the children to explore their own gardens, grown plants themselves and visited garden centres. What I would claim is that we often embark on too many long-term projects and therefore do not give the children the opportunity to explore as wide a range of contexts, materials and issues as we might.

When we design in three-dimensions, the skills and concepts required are

(Fig 4)
certainly more advanced. Children will often attempt to draw in some sort of perspective. This can look quite artistic but does not really help with the making. This drawing (Fig 4) looks attractive but does not give the designer or anyone else important information: the length of the wings, for example.

This design, on the other hand gives far more information. (Fig 5)

Such design techniques are not excessively difficult but do need to be taught. Children can try drawing familiar objects from the front and from on top. They can play games of the 'Mexican riding a bicycle' variety. They can draw objects such as pencil-sharpeners, cups and shoes from different directions or they can develop skills and conceptual understanding by working backwards from a completed project.

Whilst drawing a finished project is recording rather than designing, it can be very valuable in the encouragement of three-dimensional concepts. This piece of work by a six-year-old shows the way that even very young children can gain an awareness that objects are the same height viewed from the front or the side, that circles do not always look round and that in a front or side view of an
object some things are hidden. (Fig 6)

The technique of showing 'hidden' parts of a design is also something that can extend and clarify a design. This example by a ten-year-old shows an idea for a sledge. (Fig 7)

Construction kits can also provide a valuable link between ideas and final design. This design for a water-powered saw was first modelled in Lego, then
I do not suggest that there is just one method of designing. For many children with limited experience, designing will mainly take the form of discussion with teacher or other children. I would claim, however, that it is important at every stage to give the children an opportunity to put thoughts on paper. As yet we have no clear idea of the capabilities of children and my experience has lead me to believe that we seriously underestimate what they can achieve.

Another method of designing involves trial-and-error. This immediately sounds like a licence for children simply to miss out the design stage and move straight into making. What it actually means is that some aspects of a design cannot be achieved without investigation. Let us take the following idea: Santa's sledge is to be moved by a falling piece of plasticine tied to a length of string. (Fig 9)

How heavy should the piece of plasticine be? Even given information such as the weight of the sledge and the area of the base, it is certainly not possible for children, nor I suspect their teachers, to answer this without actually trying it. This design for a pecking bird by an eleven-year-old shows an awareness of this. (Fig 10)
The reference to the amount of weight needed demonstrates a realisation that no more can be accomplished on paper at this stage. Similarly the six-year-old with his catherine-wheel wrote: "The difficult bit was the plasticine weight. If it was too heavy it spun the catherine-wheels too fast. If it was too light it didn't move them."

Tasks such as "design a boat that will safely carry a cargo of one house brick" are fraught with difficulties. I suspect that the average child could suggest a design for a boat that might possibly float but the only way to discover its stability or ability to carry the brick would be to try it and see.

So what do I suggest is a sensible way forward? If teachers are to cover the programmes of study adequately, plan, record children's experience and teach them successfully, they cannot afford to become little more than classroom technicians. It is easy to spot the teachers who allow too wide a range of projects. Some try to work with each individual child and a few, the very gifted with boundless energy, succeed and survive; a few, sadly, hand the entire project over to the children with no attempt to intervene other than to prevent accidents or reduce the volume of noise; a considerable number allow the children completely free-rein in their designing and then tell them that the weekend's homework is to make the product - then it's the parents' problem!

There is a lovely phrase in the teachers' guidance for SATS issued by the DES. It says: "Do not be afraid to interact with children's planning [of the game] to propel it in the direction necessary for your assessment." In the same way as merely asking children to write a poem or a story only rarely leads to a quality product, we must consider and plan a range of constraints if children are genuinely to be extended in both their designing and their thinking and if the structuring of teaching is to cover the programmes of study in a structured, even manner. Such structuring enables the teacher to target specific areas of study and gives an opportunity to ensure that all children gain access to the full range of experiences offered by Design and Technology.

Some, perhaps many, will question my suggestion that children's opportunities to explore should have parameters. To them I would say that I want children to be able to take control of their own learning but choice can only be based on experience.

The fact that Design and Technology is a National Curriculum subject does not give it a right to credibility with teachers or parents. If we do not target aspects of the programmes of study, we risk repetition and omission. If we ignore the ways in which we can help children achieve work of quality, we will lose public respect. If we accept vague scribbles as design-work, we will never leave the era of junk-modelling.