

Beyond their Capability? Drawing, Designing and the Young Child

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Abstract

Over the last four years I have become increasingly interested in the processes involved in drawing for design and the way that young children (aged 5–9) use drawings to aid their thinking about products that they are planning to make. The assumption by the writers of the National Curriculum appears to be that even young children can use drawing as a means of modelling and developing ideas. This has been increasingly challenged and has led to modifications in subsequent documents. Yet informal observations of children's play and their inherent creativeness has suggested to others that they could use drawing as a design tool if only they were shown how. This has caused me to consider the nature of the underlying cognitive processes involved in drawing for design – as a tool for thought rather than just a recording medium – and to try to find out when and how these skills develop in young children. This paper discusses research into children's picturing and the demands made upon it by recent government educational initiatives in design and technology, and then examines some of the underlying processes which I believe contribute towards children's ability to use drawing as a design medium.

Drawing pictures

Historically speaking, the overwhelmingly greater part of research into children's drawings has been into drawing as 'finished product', rather than into drawing for intent to make, i.e. design production. Graphic development was assumed to be teleological, with Ruskin's ideas of what counts as art

innately implanted in children's heads at a time when artists such as Picasso and Mondrian were being applauded for discarding the tyranny of one and two point projection. Yet children's artistic ability (and even intelligence via Goodenough's Draw-a-man test) was measured by such 'camera shots' of the world around them in the style of western representational art, and assumed to be biologically determined purposefully creative and for which maps of artistic development could be plotted (typified by Lowenfeld (1947), Kellogg (1959) etc.)

The underlying assumptions of development towards attaining western conventions of pictorial representation led to the marginalisation of other drawing genres, some of which might have more potential as a design tool than the 'picture', which is not a springboard for future activity in another medium.

Wilson (1992) discovered that children from an Egyptian village with few outside influences had a very restricted visual vocabulary and showed far less diversity in their drawings than those of western culture. He argued that children's art is not inherently creative and untainted. They are actively learning from each other and the surrounding adult culture rather than by responding to intrinsic or individual sources. For designing as well as picturing, due credence needs to be given to the cultural determination of children's drawings.

Rogoff (1996) stressed that children function as part of a socio-cultural system, so that we must consider not only how involvement in some activities relate to involvement in others,

*Year 4 boy helping
Year 1 children turn
their drawings into
designs for making.*



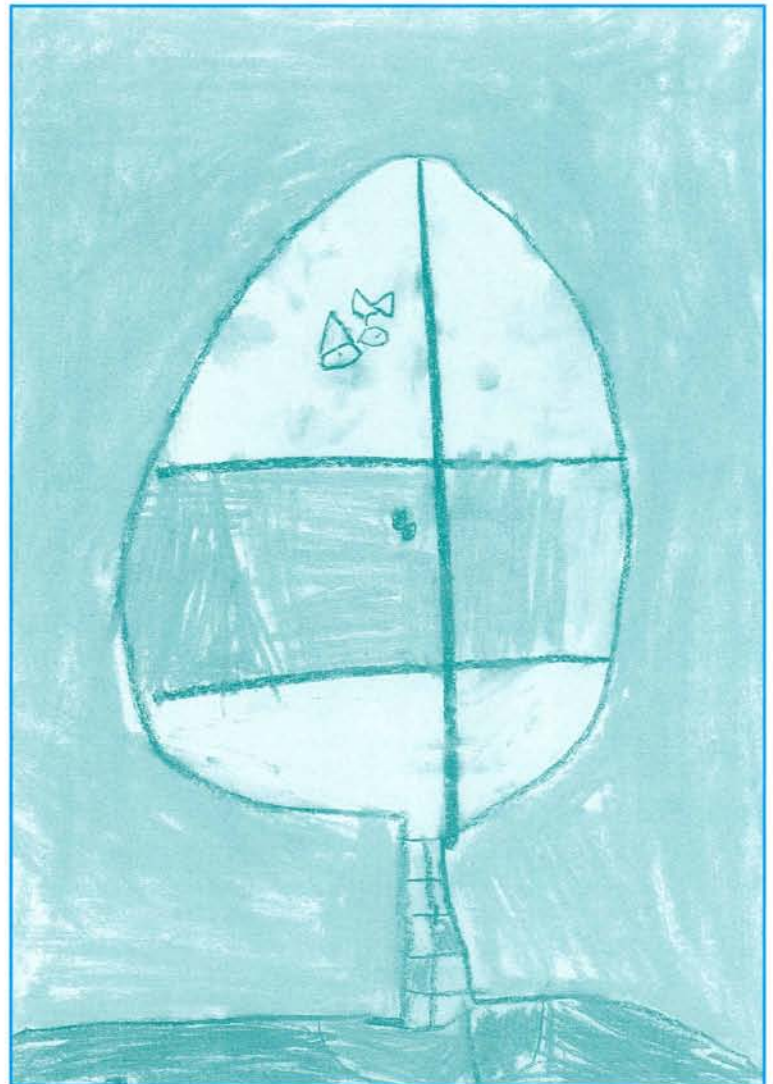
but also that we cannot separate mental processes from emotional, social and motivational ones. The effort put into finding examples of onset of mental ability before the ages stated by Piaget and others, suggests skills are seen as 'mental objects', as if they were contained in the child and not culturally shared. The question, asserts Rogoff, should rather be one of understanding children's changing roles as they participate in communities of thinkers; which implies that child art and design can be seen from a different, more socially orientated, viewpoint.

From the individualistic stance, Winner (1982) asserted:

"Unlike adults children (aged 6–10) cannot choose which style to draw in ... children are unable to choose how to express mood, either by colour or line. Drawings are produced by accident ... they see no alternatives in how to draw and are completely oblivious to alternatives ... Their work manages to charm adults, but to see them as artists is naïve."

Since the advent of the National Curriculum, children have been exposed to a wider range of art and artists than at any time in educational history, potentially changing, not only their picture-making, but also their designing skills. The introduction to many varied styles of art and drawing could help children to be more flexible about their graphic productions and enable them to be more willing to try out several designs. Year 3 children are quite capable of 'drawing or painting in the style of...' as shown by the example of Glen's self-portrait in the style of Paul Klee (figure 1). The sophistication of being able to take on board a totally new style of drawing and make it your own and produce a pleasing work of art in the course of two hours is within the capability of an ordinary seven year old.

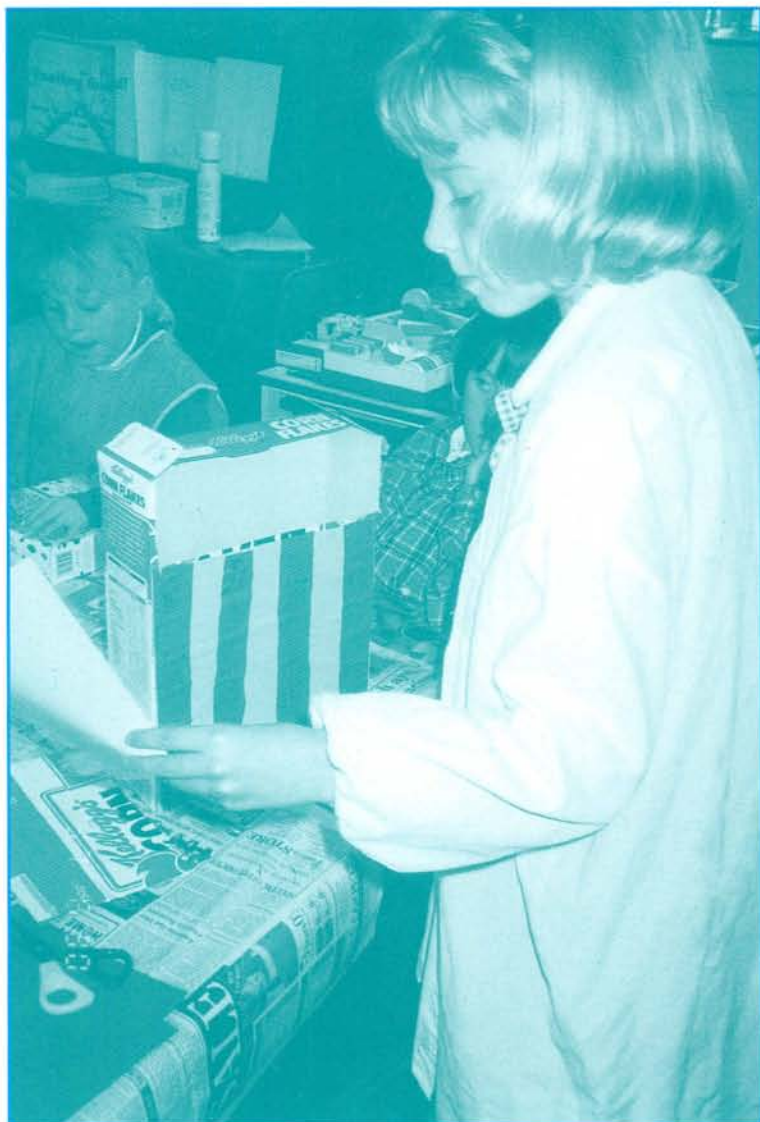
What this may mean for designing is that children's drawing skills are far more fluid and adaptable than was once thought, so therefore could encompass features of 'design drawing' if they were shown how. One of Vygotsky's maxims was that what children can do with help today, they will do alone tomorrow. To take the socio-cultural model put forward by Rogoff, we can induct children into almost anything we like. It is with great caution, therefore, that anyone should set about trying to do a Piaget-type job on design skills. It also means that exposure to different drawing genres could enable children to access and exploit these different genres for different situations if so taught. Unfortunately, as Anning (1993) commented,



"drawing is not habitually demonstrated (in the classroom) as a useful tool for organising and representing ideas ... (and) ... our education system rarely offers examples of adults modelling drawing as a tool for thinking."

Figure 1: Self portrait in the style of Paul Klee by Glen aged 7.

However, Fulton (1990) warns that in design education it is important not to lose sight of the knowledge of child art accumulated across the years. Thus whilst recognising the limitations of the art development scheme with respect to design drawing, it is important to remember their greatest contribution has been to recognise that the difference between child and adult art is not merely lack of teaching, but also resides in the perceptual and cognitive make-up of children at different stages of maturity.



Keeley Brown 2P
making Punch and
Judy theatre.
Consulting the design
drawing.

Design process – what the National Curriculum Orders for design and technology implied for children's use of drawing

The activities most closely associating drawing with designing are those of investigating and generating of ideas. It came as a surprise to me, some eight years after the publication of this document, that there was no research into young children's use of drawing for these purposes prior to its publication. Yet in 1991, 7 year-olds were required to be tested in their competence in these uncharted skills. Any literature relating to drawing for design purposes by children younger than 10 has come as an investigation into why the children seemed unable to fulfil the requirements.

The 'design' side of the design and technology Orders appeared to be heavily dominated by making explicit things that had previously either been assumed to happen

inside children's heads, or had not been considered in relation to young children's craft work (as it was previously known) at all. The newness of the subject in the school curriculum, together with muddled thinking about the role of drawing for design and the capabilities of children at this age has produced mixed messages about both.

Teachers, let alone children, did not assume drawing to be a procedural tool prior to the National Curriculum. There could be none of Burner's 'scaffolding' since teachers had little perception of the intricacies of the structure they were building. Neither, it would seem, did the curriculum writers. Yet this unfortunate document has since become a yardstick against which children's capability and statements concerning that capability are now judged. There appears to be a mis-match between what teachers know about small children, the demands of the document and what researchers know about the process of designing.

In contrast to the clarity of the process detailed in the original Design and Technology Orders (and still lurking beneath its more recent revisions) Buchanan (1995) states that design problems, by their very nature, belong to the class of 'wicked problems' as identified by Rittel. 'Design process' diagrams, says Buchanan, are based on desire for determinacy, and the desire for design to be considered as a 'science'. Designers, by contrast, work at two levels – general and particular – but there is no science of the particular. McCormick et al (1993) consider the linear model of the design process promoted via the National Curriculum not only to be a poor model of how people solve problems but that its imposition on children leads to lack of ownership of the task.

Baynes (1998) criticises the effort expended in (and since) the National Curriculum on getting children to produce a design drawing and then carry it out. "We don't know many real designers who work in such a peculiar way," says Baynes – and children can't. They don't work on the material in such abstract terms. He cites a bird house drawn by an 8 year-old. The product is very different to the drawing, because she carried on designing as she made it, "as adult designers do," Baynes adds. He feels strongly that the role of drawing is being undermined by the National Curriculum, by giving it a role which it cannot fulfil.

An added complication is that articles which give advice to teachers about how to develop design-drawing skills frequently use the word

'children' with no indication of age. For example, in discussing communicating ideas through design, Ritchie (1995) says:

"The ability of children to develop their ideas through drawing needs to be developed throughout the curriculum from an early age – so that 'drawing an idea' becomes second nature ... (but) ... As children get older they and their teachers can put too much emphasis on finished drawing quality."

What is this 'early age'? Four? Ten? When do these children 'get older'? At ten? or fifteen? One of the biggest problems for teachers of younger children (aged 4–9) is this blanket terminology. It is only by looking at the children's handwriting and spelling on the examples given in the text that we can judge that the "young primary" child must be at least 10.

Dunn (1990), equally, has no qualms about what children can draw:

"Graphic representations, in the forms of drawings, graphs and charts, are used to convey the design technology process and its results. The child grapples with the difficulty of transferring an idea to a two-dimensional format. Sketching freezes elusive ideas and provides a format for mental rehearsal as the child mulls over possibilities ... Just as a designer or engineer works with multiple drafts, so the child ... the project will evolve, possibly through several drafts ... a final two-dimensional rendering will capture the resulting changes in the original design."

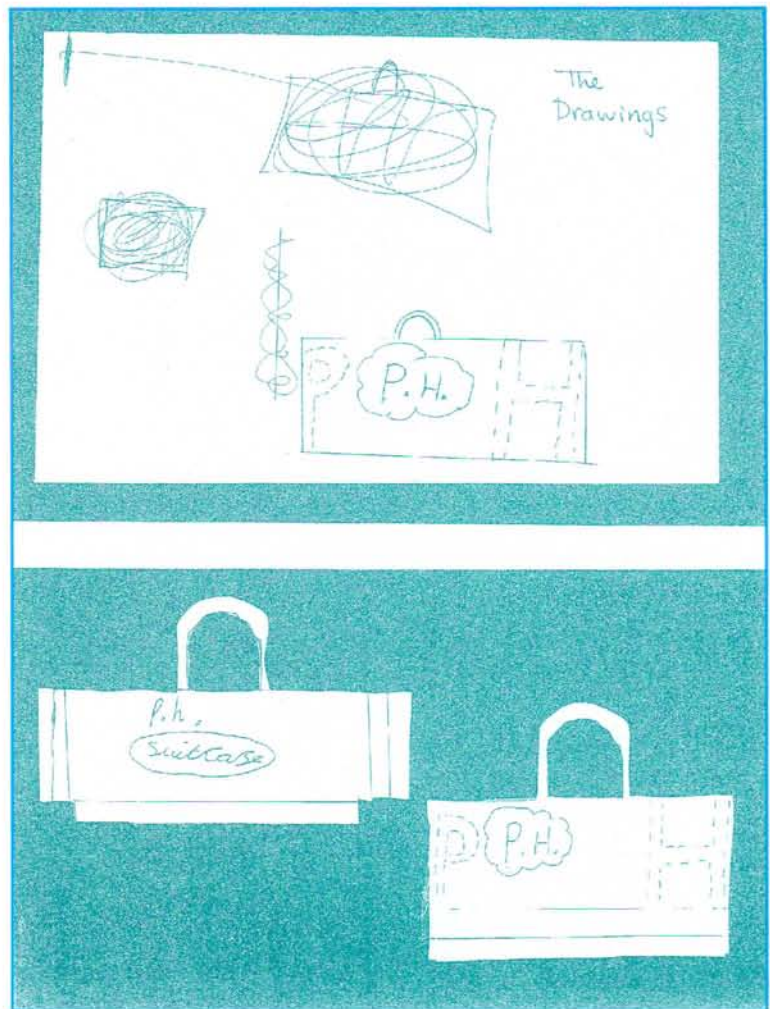
What age are the children and how long do they spend on the project? This is not Key Stage 1 on a Friday afternoon!

Williams (1985) portrayed younger children as possessing severely limited capabilities:

"In Infant schools, whilst children are at pre-reading stage and gaining control over spoken and written word, drawing and painting play an important part in self-expression. The children's drawing and painting consists of symbols, which apart from bodily movement and a limited speech vocabulary are the only means of communication available to them."

Yet this portrayal of a 6 year-old as a pre-verbal dabbler in paint is juxtaposed with assertions about what 'children' can do:

"The drawing, at whatever age or stage of development, must be simple and concise and ... consist of a few pencil lines conveying the idea of shape, function or the relationship of one part to another."



Normally at this investigatory stage, the different aspects would be shown on separate sketches rather than on one complicated drawing."

Figure 2: Design and prototype for 'Pandy's Suitcase'. Carleigh Year 4.

Wolverson (1991), more aware of the development of children's mark-making, describes children as initially inventing symbols and visual languages of their own:

"These invented languages are possibly simple imprecise marks which can then be read by the child and refined by him as he structures more carefully his own analogue for his existence."

However, in communicating with others,

"there is an implicit discipline ... one evolves a vocabulary and a syntax and offers them in a codified form ... If the work is meant to be an explicit item of communication then the process of designing and creating the object will involve a careful survey of the consumer, and sufficient clues incorporated for the code of its language to be accessible."

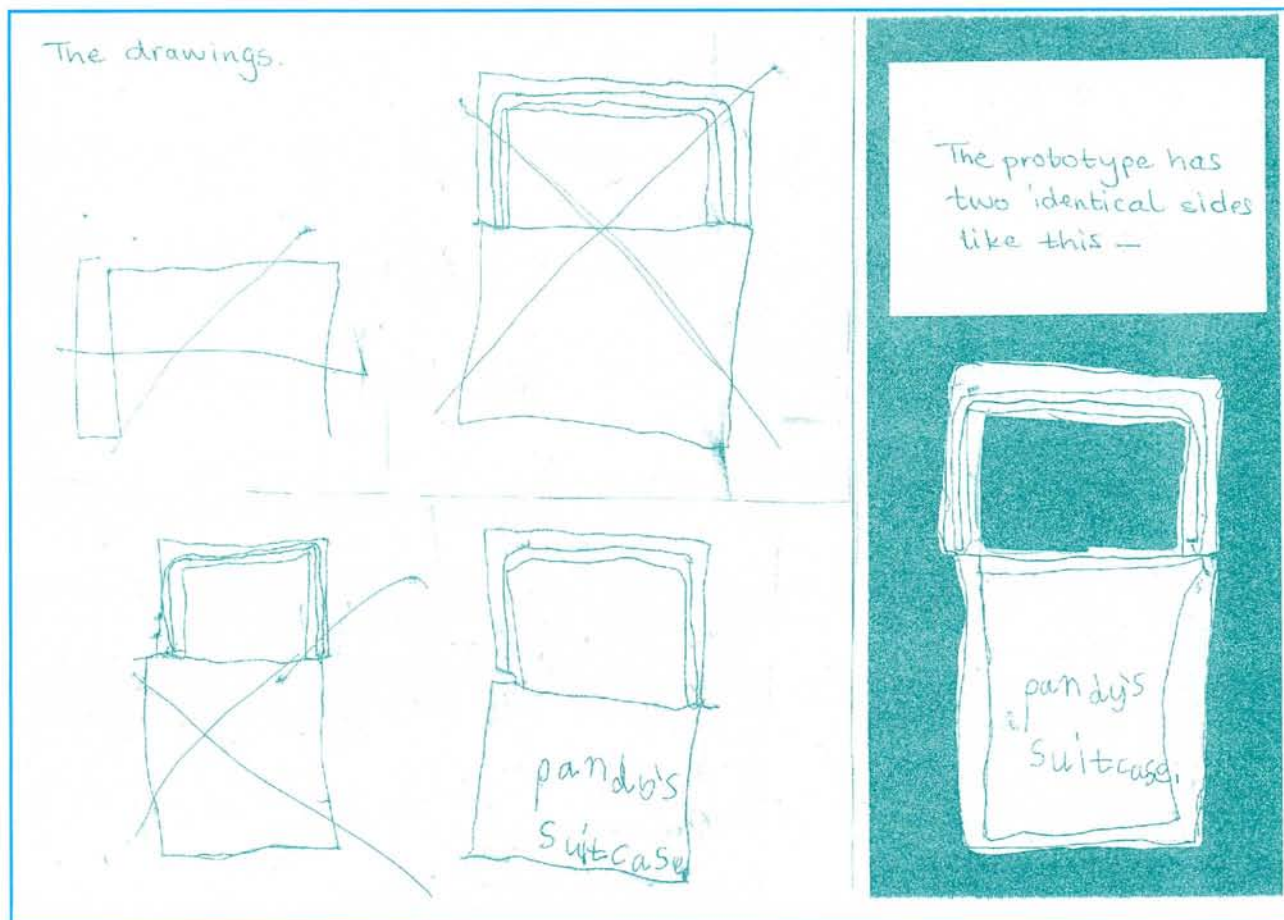


Figure 3: Design and prototype for 'Pandy's suitcase'. Emmy – Year 2.

This distinguishes two main purposes of the design drawing: as an aide memoire to the designer and as a means of communication to others. As Denton (1991) asserts strongly, modelling, and especially drawing, as a design tool is not an end in itself. Pretty 'design sheets' are inappropriate, yet this is precisely what is often shown in texts on children's designing. Dunn's (1990) examples of bird pull-toys made by children aged 7–8 show only the graph paper blueprints used as construction plans. The drawings of nodding toy dogs look far more like part of a 'how we made it' display than a working (or working out) drawing.

Figure 2 is the design and instructions for making the prototype of a suitcase for a toy panda by a Year 4 child, complete with crossings out as her ideas crystallise. However, her drawings give no indication that she made a three dimensional prototype with accurately measured sides and flaps for gluing. But I would argue that she used her drawing to support her thinking in an appropriate way. She knows how to produce a box shape from paper and once she had decided the proportions, dimensions and stylistic details, she can begin making. It is what Scrivener (1998) calls an 'idea sketch',

the first freehand externalisations which a designer produces, asserting that "sketching supports the cognitive processes involved in idea generation and discovery." Figure 3 is the same activity but by a Year 2 child. There appears little progression in thought, only a determination to draw her idea as best she can.

The Year 2 children studied by Ritchie (1995) seemed to know little about design drawing. Their playground equipment designs had sky and grass which, he comments, suggests they had forgotten the purpose of the activity (or, on the evidence of other researchers, didn't understand the concept of designing by drawing). They radically changed their initial ideas when asked to use reclaimed materials to make models and had to be encouraged to 're-image possibilities' after they had time to explore the materials. Ritchie stresses the need for children to come up with more than one idea, which he asserts will lead them to look critically at their ideas to identify strengths and weaknesses, highlight inappropriateness and explore aspects of the design in more detail. The teacher needs to confront the child with the practical reality of their ideas. He concedes that this needs tackling sensitively with young children.

Yet Garvey and Quinlan's (1997) Year 2 children thought that any suggestions from the teacher about their (single) design meant that it was 'wrong' and to be crossed or rubbed out. The children did not view what they drew as a blueprint for what they made:

"a number of children were unable to relate designing and making and considered them as distinct and unrelated operations."

Anning (1993) reports on two 6 year-olds who thought they were drawing a picture of a hamster cage as a present for the hamster rather than a means of planning a real cage that they would make. Stables (1992) found 10 year-olds quite capable of producing detailed designs for jungle houses, which they then followed, by that Year 1 children paid little heed to their plans for a 'home for a spider' once construction began.

Constable (1994) is quite specific about what she considers children need to be able to do in order to be successful designers-on-paper: to understand the purpose of the drawing as a working drawing, conveying sufficient information, probably a simple line drawing, annotated:

"And almost certainly containing different views and smaller details ... which young children rarely do ... (but) use some of the devices some of the time..."

Like Garvey and Quinlan, she found that the Year 2 children hardly ever looked at their drawings once they started making and even older children only did so when prompted by a teacher. Thus, once again, finished products did not resemble the drawings. She sees this as due mainly to resource limitations and the tendency to draw far too sophisticated a design which is beyond their practical capabilities.

My own research suggests that amongst young children drawing ahead of a task can appropriately support idea generation but not detailed construction techniques.

Donaldson (1992), in researching the development of logical thinking, discovered that 6 year-olds did not appear to accept the limits imposed by the problem or the information she had provided, adding other characters to the situation ad hoc. She observed:

"They did not have a clear conception of this problem – this one and no other – which they could hold on to and use in deciding when the problem had been successfully dealt with, so that thinking about it should cease."

This may be one reason why, for young children, the drawing does not necessarily relate to future action. They do not perceive the drawing as in any way providing the design solution. It is one design solution, the model which they make later is another.

Modelling the construction and constructing the model

At the core of design capability is visualisation and the ability to manipulate models in the mind. As Fulton (1990) says, design is dependent on the

"ability to see existing circumstances analytically and to envisage the possibility of changing them. It extends to an ability to rehearse alternatives in the mind, and later to select and take appropriate action."

This fundamental skill of manipulating and rotating mental images enables us to explore multiple ideas and possibilities. It exists in all people, including small children. The ability to see and model both in the mind's eye and with the hand is a mode of thinking from which we derive our capacity to design and understand designing. To record such intentions in drawn form, however, is a sophisticated process.

Archer and Roberts (1992) claim that the aim of design education is to develop this cognitive modelling capacity. Archer had previously identified a distinctive capacity analogous with that for language and mathematics, which he termed imaging and which Baynes calls design intelligence. It can either be externalised through models or it can be embodied in the construction or enactment of emerging responses.

Smith (1992) is not thinking of children designing in his chapter on the imagination, but he raises some useful points. The imagination often does not concern itself with detail in its creations; detail would usually be inadequate and confining. Instead, the imagination composes broad specifications, which can accommodate all sorts of contingencies and variations. Authors and artists do not wait to have every detail worked out before they begin. As long as it conforms to the outline they had in their mind, or as modified along the way, they say "this is what I had in mind." All our intentions and expectations about the world are generated by the imagination in the form of specifications. We rarely set out in advance precisely what we would like to achieve, nor do we anticipate exactly what is likely to happen. Neither course would be particularly productive. But as long as what transpires is congruent with the general pattern of what we had in mind



Brenda Deeback and friend – 4M Planning their work for Punch and Judy theatre. Collaborating through drawing.

then we can consider that our desires have been met or our predictions fulfilled.

Play and creativity/reality and fantasy

A baby picking up a plastic bottle *explores* its properties, the pre-schooler makes it *be* something, the infant school child might make it *into* something and finally, in middle childhood, the bottle will be a *component* chosen for its physical properties. This goes beyond Bruner's enactive, iconic and symbolic representation, since his observations were centred on the emergence of early play activities. His categories do not extend to the 'making for play' activities in which children of school age engage, e.g. making clothes for dolls, constructing hides and dens, which are closer to the activities of design and technology.

In this 'making for play' children are prepared to do a fair amount of pretending. A doiley can be a doll's hat or a large cardboard box can be a train today and a house tomorrow.

Total realism is not the aim, all that is required is enough to satisfy the requirements of the play. These are tools for play – a fantasy world which mirrors reality but occupies a different plane of existence. When the game ends, the tools are discarded or re-assigned. The symbolism which accompanies the fantasy role-playing of small children is vital to the abilities which underlie design as manipulation of symbols. Those children who have rich imaginative play are better at visualisation and hence design tasks.

For the children to have ownership of the task, the adult has to suspend their hold on reality and enter a world of metaphorical fluidity where boxes can be telephones and yellow paper is waterproof.

Into this 'making for play' comes the adult, the teacher or researcher, who suggests that a home for a spider or a cage for a hamster would be a good thing to design and make. For the children to have ownership of the task, the adult has to suspend their hold on reality and enter a world of metaphorical fluidity where boxes can be telephones and yellow paper is waterproof. Whereas in design and technology they are expected to design for something called 'reality'.

This year one child's answer to the Key Stage 1 Science SATs question 'How could we help the seeds in the dark cupboard grow better?' was 'Draw a picture of the sun and rain and pin it up inside the cupboard for the seeds to look at'. What a lovely, rich, fantasy world she lives in. I really want to create a story in which a little girl drew a picture of the sun and rain for some poor seeds which the bad teacher had put in the dark cupboard and overnight the seeds grew and grew... Isn't this the stuff of children's literature? Of metaphor and poetry and art and design and why are we asking little children to be so coldly logical when all they want to do is maintain their own personal playspace.

Winnicott (1971) described the characteristics and function of play as arising from the capacity to make bridges imaginatively between our own inner reality and the external. Children's play occupies a space between this inner and outer reality in which they use objects from outer reality with ideas from inner reality to create a 'dream potential'. Surely these are the same skills that designers use. Except that for adults, design is needs driven, whereas children are playing – what they create forms part of their fantasy

world and therefore the solution does not need to fulfil the criteria in a realistic way.

The design drawing fails to fit in to the playspace. A drawing or painting fulfils no function in the children's play or imagination once it is finished. It may be shown or given to someone else – to Mum or Nan or to their teacher. At the end of the day my desk is often littered with drawings 'for you' from my Year 1 class, but I do not get presents of models. They want to keep them for playing with. A model can be manipulated, become a springboard for play, stimulate the imagination further. Drawings have no such function in the children's minds. Models might go into the role play area. Drawings don't. Neither do they produce drawings in there, even if pens and paper are placed ready. They write messages to go in the bottle, spells for the witch or bills and 'open' signs for the shop, but they don't make drawings to play with. Drawings, it seems, are not play-props.

Equally, little children do not play with their drawings. They do not want to have several tries on one sheet, as a planning and exploration tool. They want to produce a picture, including what the weather was like behind and with the grass and flowers in front. It is a genre which they are just mastering and in which they want to demonstrate their skill.

Metaphor and analogy

Gardner (1984) perceives cognitive development as proceeding by streams and waves. Progress is made in one area (stream) and then this flows over into other areas of cognition, or may even cause re-orientation of the whole of perception (waves). He does not, however, account for or name the mechanism by which this latter might happen.

I want to suggest that the primary intellectual pathway is in perceiving similarity, between two objects, between a present object or situation and a previously encountered one, or any number of more complex constructs, including the designer's attempt to capture the possible future in the present by manipulating previously stored mental images. Despite the apologists for science insisting that all is rational and logical in their domain, it is well documented that many major breakthroughs have been the result, not of experimental technique or unswerving logic, but by metaphoric leap. What could be less scientific than seeing snakes in the firelight biting their tails and realising with a flash of inspiration that this is the chemical structure of benzene?

Seeing the similarities and patterns in things enables us to make the leap from one area of knowledge to another, from one symbol system to another. Analogical fluency allows

us to construct in one symbol system a pattern for construction in another. To draw what we will make.

The predisposition towards use of analogy and symbolism emerges early in life. I had only to repaint the back wall of the Year 1 classroom role play area with trees as a Desert Island and my five year-olds played beach parties with virtually the same props as they had used when the back wall had painted bricks and was Jack's Giant's Castle and they fee-fi-fummed around making giant's cakes and served up giant's dinners.

In their playing and their making children use their perceptions of the structural analogies in the situations which they perceive all around them, sometimes by serendipity, sometimes by intent, using and combining them playfully and creatively to design a self propelling, shared world. In this, they are acting in exactly the same way as adult designers, yet so often given a piece of paper to draw what they would like to make, they fail or if they produce a drawing, they do not refer to it again once they lay down their pencil, even if it is propped up in front of them whilst they are engaged on the 'making'.

Perhaps little children do not perceive the potential of the analogy between what they can draw and what they can make? If a child has not grasped the symbolic nature of drawing, that a drawing can become context-free and, therefore, changed and manipulated, rather than simply being iconic, a static representation, they are unable to exploit the analogy and they are not able to use drawing as a design tool. The Year 4 girl (figure 2) has used drawing to progress her thinking whereas the younger girl (figure 3) has simply attempted to improve her drawing of the object.

Conclusion

If making explicit, modelling and developing of ideas through drawing are considered desirable and to be promoted in schools, then we need a clear understanding of the ways in which young children can begin to develop these skills. We cannot simply rely on children's ability to produce pictures which become more representational with age. The ability to project their thoughts and ideas into drawn form and use the result as a springboard for future thought and action is a sophisticated one.

For these are not isolated skills but are integral with the learning strategies of the developing mind. Children can play pretend 'as if' games from earliest childhood (and begin to draw at a similar age) and yet they do not appear to put the two together until the

pretend play stage is all but over. The reasons behind this and the relationship between analogical understanding and the use of sketches and drawings *for intent to make* is the focus of my future research.

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