

The Types of Drawings that Young Children Produce in Response to Design Tasks.

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Abstract

This article comes from the author's research into young children's use of drawing to support their design thinking. Part of that process was to sort and classify several hundred design drawings produced by children aged five to nine years over a three year period. The issues underlying asking children of this age to commit their design ideas to paper are discussed before the classification system is described. It must be stressed there is no sense of 'levels' or 'age norms' attached to these. They are simply a classification system. However, they do divide into two main groups, which are classed as 'static' and 'travelling' depending on whether the child perceived the usefulness of drawing as clarifying the task criteria or moving design ideas forward, which relate to the authors understanding of design drawings as both containers for ideas and conceptual journeys.

Key words

design drawing; primary design and technology; understanding purpose; design journeys.

Introduction

My research into design drawing began with a question from a six year old: 'Why are we doing this twice?' Since then I have observed many children getting better at understanding the need to plan what they want to make. What has become clear is that children will not use drawing for planning if they do not understand why they should do so.

This article is based on my attempt at classification of children's design drawings as a precursor to devising ways of enhancing their capability (see Hope, 2003). Any attempt to read 'levels' or 'phases' into these classifications must be avoided. Whilst younger children more typically produce the kinds of drawings described at the beginning of the article, once children have an understanding of that the purpose of design drawing is to develop ideas about what they are going to make, then they will choose the kind of drawing that best suits their needs.

'Why are we doing this twice?'

The children in Year 1 had heard the story of Flat Stanley by Jeff Brown. Now they were going to make a puppet of Stanley to put inside an A5 envelope to tell the story of him being posted to California. They were shown a table loaded with suitable materials to clothe the figure and given paper on which to draw their plans. Some were working with older children near a tape recorder because I was hoping to capture some examples of the older ones scaffolding the learning for the Year 1 children. There was also a tape recorder near some Year 1 pairs, hoping to capture articulations of unsupported design understanding as a comparison.

The question, which heads this introduction, came over clear and strong on the audio tape. A strident little voice demanding to know why they had to redraw the figure onto the card and decorate that rather than the one they had just drawn on the paper. I cannot recall my reply but I do recall their solution: one child decorated the design sheet and one made a copy of it onto card.

When I started researching design drawing with young children in 1996 I was not sure myself what the reasons were for asking such young children to draw their ideas. Before the introduction of the National Curriculum, I had seen children of all ages quite successfully making all sorts of models without ever drawing them first. I justified the pre-drawing to the children in terms of wasting materials: we don't have many boxes/artstraws or whatever, so you need to plan what you will do with yours to avoid wastage.

I began to think in terms of the process from the child's point of view and to parallel it to how ordinary adults use drawings (as opposed to professional engineers, architects etc.). I collected examples from friends and family: my husband's cross-sectional sketch of the new patio to see if the levels of the drains worked out, my daughter's plans for a new wardrobe, my sketch for a model crocodile with moving

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limbs and a coat to show my Teaching Assistant what I wanted the children to make. I also went and looked at Turner's sketches and drawings, behind the scenes at the Tate. The skill in common to all these tasks, which the application of pencil to paper was used to support, was planning.

What is the purpose of the drawing?

Central to the ability to use drawing to develop design ideas is understanding the purpose of and advantages of using drawing as a design tool. Egan observed Year 1 and Year 6 using drawing only at the beginning of the 'design and make' activity. Most of the drawings I have analysed have been of this sort. For young children certainly, I agree with her conclusion:

Drawing the idea "in the mind's eye" supports the development of visualisation skills. If, however, the drawing is regarded rather as a working drawing than as a first expression and exploration of the idea, which will inevitably be modified in the exploration, there may be little scope for children's understanding of the drawing to develop. A working drawing, after all, freezes the idea rather than freeing it. (1999: 116)

It is important, therefore, that children are explicitly taught the role of drawing for developing design ideas as they are not able to second guess this. Examples of design drawings need to be shown to children, so that they can see the way design ideas are developed, good ideas are carried forward, less good ones are discarded, and ideas with potential are combined to make a final 'best fit'. They also need to know when to stop drawing, and when to come back to it later in the design process. However, for young children (Key Stage 1 - lower Key Stage 2) making their design ideas explicit through drawing at the beginning of a design activity is sufficiently challenging.

Forward planning

Drawing for designing is teleological. It is used to support an intended activity, perhaps by crystallising ideas or by planning out the main stages of construction or the materials to be

used. The ability to plan ahead depends on the designer's level of knowledge of the materials and techniques to be used, as well as of the problem to be answered. Young children frequently lack both.

During the course of the research, three Year 2 boys were captured on video fitting a variety of round objects down a roll of newspaper and shaking them back out again for nearly 15 minutes. Their solution to the problem set in the lesson (how could Frosty the Snowman fetch his shopping from the shop on the next hill if the lake between the two hills had thawed) was to build a high level tube railway. What they were doing was trying to find something that would pass down a tube made from the rolled up newspaper, into which the shopkeeper could put Frosty's food.

The video also captured two boys discussing their design drawing. They were prodding the paper with their pencils and saying things like 'What you could do is...' but the suggestions related to the logistics of getting food from 'there' to 'here' rather than about the logistics of making a model of these ideas with the materials to hand. They were happy to enter into the world of Frosty and his shopping problem and conjecture solutions and allow the lines on the paper to stand for those conjectures. How it would be made was far less important than what it will represent in their imagination.

Both these groups of children were faced with a double-edged problem: they have to enter into the fantasy of the problem, but then have to swing back into the reality of how to make a model of it with the materials to hand. They were playing with ideas, concepts, materials, and at being designers.

Stables (1997) stressed the parallels between playing and designing and the utilisation of play and fantasy as design strategies (citing Jones, 1981). She described children designing litter collectors for a park. The creations were 'only boxes' yet the child had imbued them with a whole range of useful litter collecting functions. The children on my video were

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doing exactly the same. Since drawing exists in that twilight world between idea in the mind and reality in the construction, it would seem to be possible for children to use drawing to support their design thinking.

Relationship of drawing to making

Comparing the finished product with the drawing can be salutary. Children often have grandiose ideas which cannot be realised with the materials provided. Changes do not always come from misunderstanding the relationship between drawing and making but may result from not anticipating the results of actions on the materials. This can happen just as easily for adults, for example, the students on Cooper's WISE project were unable to anticipate the complexities involved in realising their designs (Cooper, 2000).

For the three Year 2 boys experimenting with the rolled up newspaper, collaborating on one child's idea meant that the other two abandoned the ideas they had drawn to make their own version of the tube train because they had invested so much time in experimenting with it.

Another boy in the same class, C, produced a range of ideas on paper, including a jet plane with swept-back wings. He began to make this with a cardboard roll fuselage and lolly stick wings, but abandoned it when construction became too difficult. Instead, he adopted the rope-bridge solution developed by other children because it was far easier to make, even though he had not drawn one on his paper.

Development of understanding of design drawing

Children's ability to draw from the imagination is frequently assumed in the primary classroom, yet as one of Garner's adult interviewees commented:

Few people can actually sit down and draw something they have imagined.
Garner (1993: 192)

The metaphorical nature of all drawing, and of design drawing in particular, was one of the major theoretical constructs of my research, that marked the transition from collecting and classifying young children's design drawings to believing that I could improve their facility with the genre. Baynes (2002) reached the same conclusion whilst researching pre-schoolers drawing on softboards. Debriefing the children whilst replaying their drawings allowed the children to report on their cognitive processes whilst drawing.

The way that children use drawing in a design context hinges on their perception of the purpose of the drawing. Many primary aged children use drawing to develop initial ideas and then do not really refer to it once they begin making (Egan, 1999). However, their understanding of how the drawing relates to developing these design ideas changes considerably across the primary years.

Duckworth commented that:

Making new connections depends on knowing enough about something in the first place to provide a basis for thinking of other things to do....The more ideas people already have at their disposal, the more new ideas occur and the more they can co-ordinate to hold up still more complicated structures.
(1987: 14)

Understanding that drawing can place-hold ideas and free the mind to consider new possibilities and improvise on those already recorded is one way in which even more wonderful ideas can be generated and developed.

The dual metaphor of drawing as both a Container for ideas and a Journey on which to develop them has been a major building block in developing my own understanding of design drawing and of how to explain its function to children (Hope, 2001).

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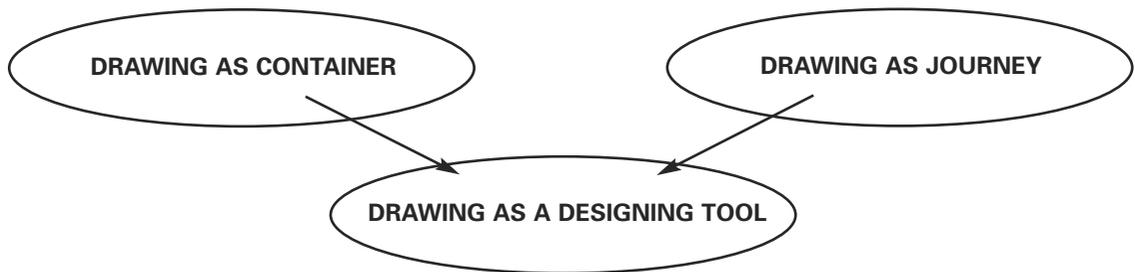


Figure 1.

Both sides of the metaphor are equally important in using drawing to develop design ideas. Young children will readily use drawing as container, but will not intuitively realise that it can be a part of their design journey and so support the development of their design ideas.

Classification of Drawing Types

As part of my research into young children's use of drawing for designing, I sorted and classified several hundred drawings collected across four years into Drawing Types. There are no age norms attached to these. Many Foundation Stage children can begin to record their intentions if the task is simple - a puppet of a well-known story character, a collage of a meal on a plate, whereas some Year 2 children may not have yet made the connection between drawing and making. Conversely, I have observed Year 2 children treating their drawings in an interactive way in discussion with a friend, yet I have been shown an unlabelled single item on a page by Year 4 children who announced 'I want to make this'. I called these Drawing Types: Picture, Single-draw, Multi-draw, Multi-design, Progressive and Interactive. Children's design drawings can be split into two major types: static containers for ideas (Picture, Single-draw, Multi-draw) and vehicles for travelling on a design journey (Multi-design, Progressive and Interactive).

The examples used in the following descriptions all come from the same design task, conducted across most classes in a three form entry Kent primary school with children aged five to nine (approximately 350 children), making a puppet of 'Flat Stanley' to fit inside an A5 envelope. No special design sheets were given to the

children. All drawings were done on blank paper. Pink card was provided as a base for the puppets along with a range of other paper, fabric and suitable materials for construction.

Drawings as static containers for ideas

Before children understand that drawing can be used to move their ideas forward, they record single ideas that relate to the task in hand. The drawings are of three main types, which I have called Picture, Single-draw and Multi-draw. Of these, Single-draw and Multi-draw may be used by the child to clarify the task to themselves. They may have some initial ideas about making the product but these will not be recorded in the drawing. Their design ideas begin to flourish once they have the construction materials in their hands.

The picture (Figure 2) - the child sees the drawing as an end in itself, rather than future-planning. The child may include features of narrative or representational drawing which are inappropriate to the genre of design drawing. The child is not addressing design problems and client needs, they are drawing a picture that relates to the subject or problem. The drawing is perceived a product, a completed activity, which does not cascade into the making process. Therefore, the drawing may either be abandoned completely and something entirely different is made, or the picture is decorated to make a collage of the subject instead of making a separate product at all. The child has seen the two activities, drawing and making, as unrelated except for subject matter.

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Figure 2. Picture - this six year-old has drawn a picture of something she likes drawing (princess) and then made a collage of the task set to the class (Flat Stanley to go in A5 envelope). She was oblivious to the planning and designing and model-making around her.

Single-draw (Figure 3) - The drawing is seen as a record of an idea that might be made, to show the teacher before making it or something like it. The genre of design drawing, an object, intended to be made, disembedded from its background or context, has been grasped but the drawing is not used to develop design ideas. It is a drawing of what they have been asked to make. Once allowed to handle the materials, the drawing is frequently forgotten,

although copying it exactly without any subsequent development or modification is equally common. There is no record on the drawing of constructional issues having been considered. Although typical of early Key Stage 1 children, this type of drawing persisted into Key Stage 2, especially in response to tasks in which children wished to use drawing simply to clarify the task rather than to develop a solution.



Figure 3. Single-draw - this Year 3 child's current characterisation of the human figure has remained undeveloped into a problem solution. He has drawn another similar, but not identical, figure on card.

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Multi-draw (Figure 4) - The child seeks to perfect their drawing of a single idea by redrawing several times rather than using drawing to develop and explore design ideas. They may alternatively label or annotate the drawing, even writing whole sentences about it. There is evidence of understanding of the needs of the client, but only one solution to the problem is recorded. Using drawing to clarify the task may lead to improvements in the

drawing or addition of annotation, neither of which move the design ideas forward. Drawing is not used to explore a range of ideas or develop the idea recorded. Attention is focused on the appearance of the drawing rather than to developing design solutions. Surprisingly, after spending time perfecting the drawing, it does not necessarily inform the making since the child has not really seen the role of the drawing as a way of modelling real outcomes.

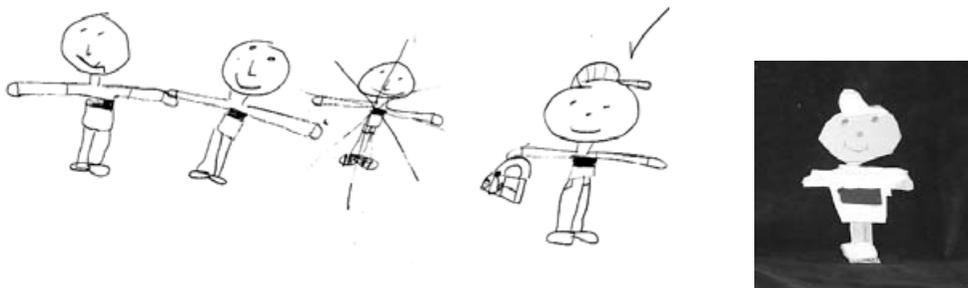


Figure 4. This Year 2 girl has had four attempts at drawing the figure to her satisfaction. Apart from the addition of the hat and bag to the drawing with which she was finally satisfied, the ideas have not moved on from the first sketch.

Drawings for travelling : a design journey

Once the child has begun to understand that drawing is a good medium for developing ideas before engaging with construction materials, they are able to use drawing and writing to progress their design ideas. Depending on whether they can see lots of possibilities or have a clear idea of a single possible solution, then they will choose one of two main forms of drawing, which I have called Multi-draw and Progressive. The child's choice of these is dependent on the task set and their initial response to it. Finally, the child has sufficient understanding of how drawing can be used to support their design thinking that they can choose to exploit a range of drawing techniques, label, annotate their ideas and begin to have a conversation through the drawing, both with themselves and others. This I have called Interactive.

Multi-design (Figure 5) - The design sheet will be filled with different ideas, some related more closely than others. The object made may even be yet another different idea. The child is using drawing to try out lots of ideas related to client needs and to working out solutions to the design problem, but without thinking too much about constructional issues or evaluating how any of the ideas would work out in practice. The product to be made may be selected on the basis of 'best drawing', even though it may not represent the most fruitful or practical idea for construction. There is frequently a very low level of annotation with this use of drawing.

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Figure 5. The arrow indicates the idea which this Year 2 child told me he had made. The swirly pattern was drawn on his model but then covered over by the green felt.

Progressive (Figure 6) - The child has begun to understand that drawing is a good medium for developing an idea before engaging with construction materials. This type of drawing is common amongst children who tend to go for the 'one right answer' approach to learning, and the boundary between Multi-draw and Progressive is often blurry. Annotation is used in a common sense way and words will be

used as a shorthand for ideas, including colour and surface finishes. A clear path through drawing into making can be seen. The product that the child makes clearly relates to the ideas that have begun to develop in the drawing, although they will feel free enough to include ideas developed by others if these are judged to be better than their own.

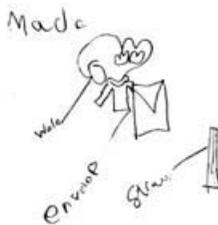
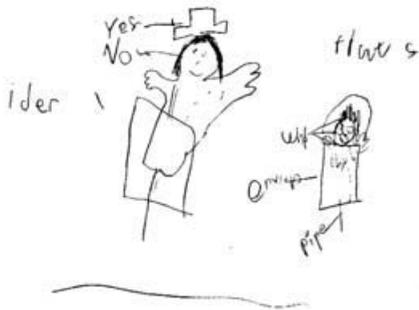


Figure 6. This Year 2 child has had the idea of making Flat Stanley into a pop-up inside the envelope. His three drawings of his ideas show a cut-away drawing as well as an outside view of his idea and a 'parts needed' diagram.

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From these beginnings of understanding the role and effectiveness of using drawing to develop design ideas, children begin to use drawing, writing and discussion interactively. This is not to assert that writing and, especially, discussion does not take place in conjunction with more simple types of design drawing. Children's conversations as they draw frequently bear witness to a level of engagement with the task that is not reflected in the drawing itself. However, these ideas are just as frequently forgotten or overridden once construction begins. Putting ideas on paper is important for clear development of design ideas.

Interactive (Figure 7) - At this point the child begins to have a conversation with the drawing. The child sees the drawing as a means to work out what will be made and how to make it. Often more than one design idea is recorded, and these are thoughtfully evaluated and either discarded or developed through more drawings, combining elements of several drawings. Several related ideas, styles or construction methods are considered and combined to develop a product based on this process. Evaluation occurs as part of the total process. Further ideas about previously drawn solutions may be recorded after other solutions have been developed as the child begins to combine ideas. For example, in the example in Figure 5, the comment at the top left was added last.

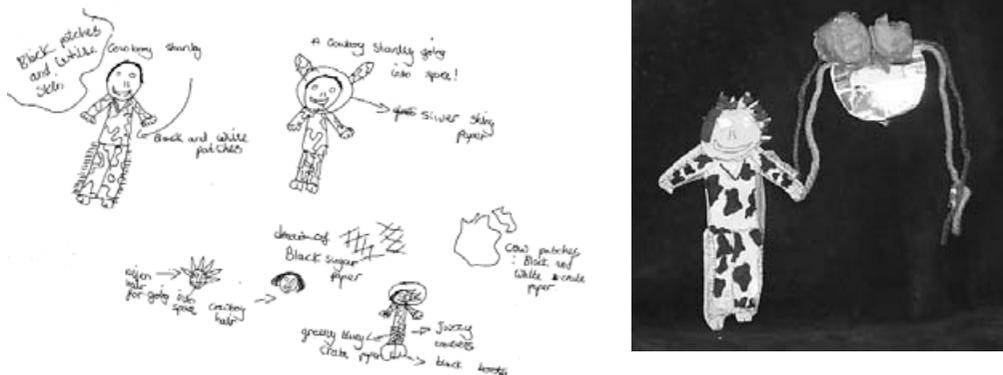


Figure 7. This Year 4 girl began with the idea of Stanley in a cowboy suit, then a space suit, which sparked off the idea of alien hair. All three ideas were combined into a cowboy in the process of changing into an alien, for which she subsequently made an alien space helmet.

Why children choose to draw as they do

This classification and analysis indicated a progression of some sort within Drawing Types: the youngest produced Pictures and Single-draws, the older children Multi-design and Progressives, with the occasional Interactive features. However, it was also clear that this was not a simple linear progression.

There appeared to be a competence level inherent in both Multi-design and Progressive drawing ability, in terms of symbolic

manipulation skills, which once reached could be exploited at will. Both Multi-design and Progressive Drawings demonstrated an understanding that drawing could be used to represent ideas that could be changed and developed, 'seen as' the real object as imagined in the mind's eye, a place-marking from which a design journey could be continued. Prior to this realisation, the recording of design ideas is static. A possibility is drawn but does not represent or support the flow of ideas about design possibilities or solutions.

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Such understanding enables children to choose to record multiple possibilities if they are swamped with ideas (Multi-design) or to develop their instant 'I know what to do' reaction towards a design resolution to see if it would work (Progressive). Understanding of the purpose of drawing for designing as being the recording and development of design ideas, sets children free from having to produce any particular sort of drawing, even to the extent of knowing when not to draw (for example, writing a list of materials). The possibilities recorded as quick sketches (typical of Multi-design) are multiple possible directions the design could go (like roundabout exits). The Progressive drawings, the developments of a single idea towards making is more like the unfolding of a route with few side-turnings.

Multi-draw forms the bridge between Single-draw and these design journeys. However, once the Journeying stage was reached, children would also use Multi-draw as a shorthand for situations where they did not feel the need for the support of the drawing. They did not, however, revert to Single-draw.

The round-cornered rectangle in Figure 8 represents this plateau of realisation. The arrows are double-ended to indicate the by-directionality of choice of Drawing Type that the freedom of this cognitive plateau allows. Children who produce Single-drawings have not begun to understand how drawing can be used to develop design ideas. They have learnt the genre (no background, clouds in sky, etc.) but have no grasp that drawing can be used as a tool for the development of design ideas, cut free from its ground anchor and used as the supporting structure for free-flowing ideas.

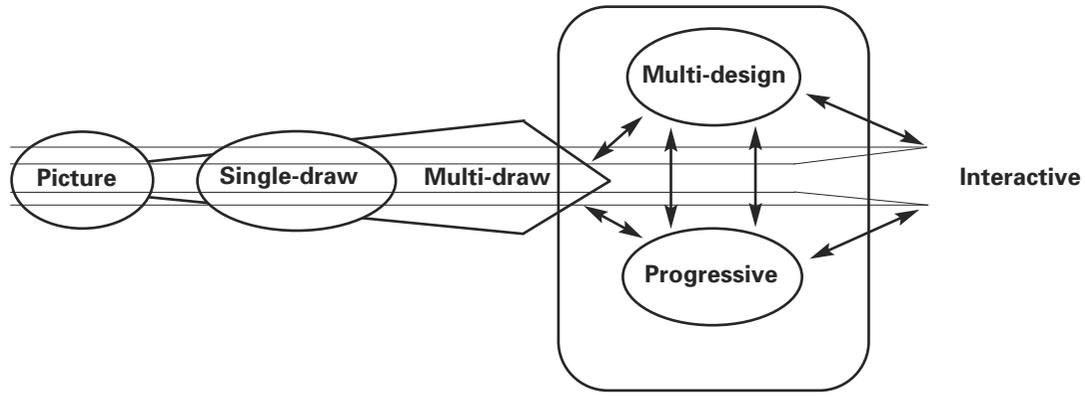


Figure 8. Developing understanding of design drawing as shown by Drawing Types.

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Relating this to the children's developing understanding of the purpose of drawing to support designing, Figure 9 demonstrates the

way this plateau of realisation allows children to become far more fluid in their use of drawing to support designing.

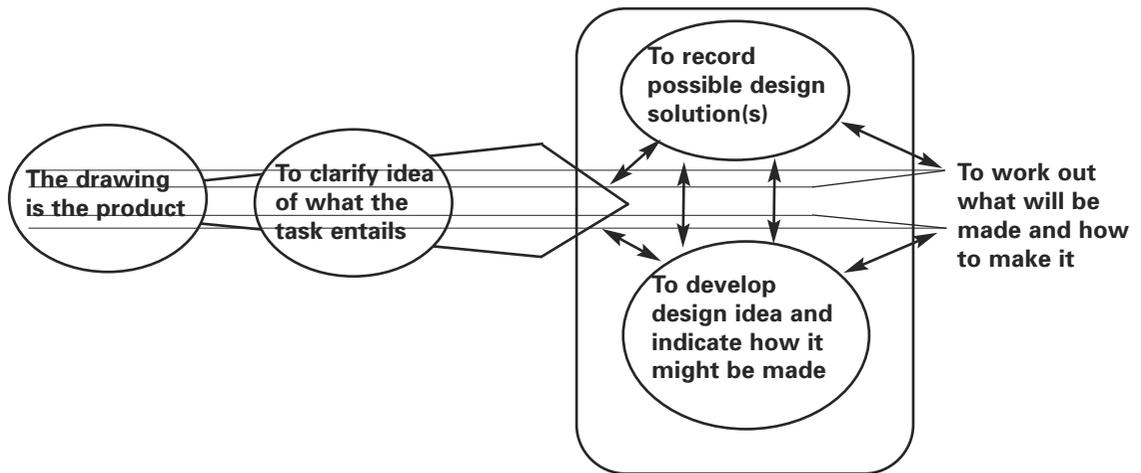


Figure 9. Developing understanding of purpose of drawing for designing.

Crossing the bridge between clarifying the task and designing solutions means that children can then choose the recording technique that they feel most appropriately fits their level of clarity about the task in hand. If they have a rush of ideas but are not sure which to choose, then they use Multi-design. If they settle quickly on one idea but need to develop ideas about its viability for making, they use Progressive drawing. Arriving on this plateau indicates arriving at an understanding of the Journeying aspect of the genre of design drawing. This transition may be evidenced by the use of Multi-draw. Its occurrence is divided between the static and journeying categories of purpose perception.

In conclusion

This classification into Drawing Types was the result of observation and analysis. The Drawing Types were not taught to the children nor were the children shown examples of any design drawings that were described as 'better' than

drawings they produced themselves. Although at a subsequent stage of the research, I actively sought to enhance children's design drawing capabilities, it was not through showing them or talking to them about these classifications or through suggesting that any of these Drawing Types were models to be emulated. I feel that it is important to stress this in conclusion as my aim in classifying the drawings was simply to understand what children's capability was, in order to have a benchmark against which I might attempt to measure any enhancement effects. My aim in attempting to enhance children's understanding and capability in using drawing for designing was not to move them through these Drawing Types as if they were stages of development. They were just one of the range of analysis criteria used to assess the success of the programme on which I embarked. Further details of the analysis instrument and the results obtained from the second phase of the research can be found in Hope (2003).

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