

**I'll choose green for my quilt cover!**  
**Primary Teachers' understandings of the concept of Design.**

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**Abstract**

The nature of Primary teachers' understandings of the concept of design in Technology Education continues to be questioned, debated and analysed. This presentation, based on the author's research in progress, will provide an overview of related literature to explore not only the diversity of teachers' understandings but also how this diversity is possibly constructed.

Is this diversity a reflection of the Learning Area's continuing evolution? Do Curriculum documents lead or mislead? Questions such as these will be posed with a view to generating thought and discussion.

**Introduction**

The purpose of my research is to give insight into teachers' understandings of Design in Technology Education. Personal observations would suggest that for some teachers the understanding of the concept of 'design' in Technology Education is limited to nothing more than allowing students to have a choice in the colour they might use to complete a worksheet. Hence the title of this paper, which refers to a Design and Technology task in which I observed a group of year 3 students colouring a worksheet picture of a quilt.

This example is cited in contrast to a class of year 6 students who were provided with a design brief to design and produce a quilt cover that was to be presented to a local senior citizens home.

These students were encouraged, to investigate through surveys, a theme which would be appropriate to the recipients. While engaged in this task, they discussed, shared and sketched ideas until each student had produced a design that they, and the senior citizen were happy with. The students then developed new technical skills related to producing patterns and sewing. While engaged in this technology and design activity the students also built on their skills to work collaboratively.

For some teachers the concept of design is understood to be a way of thinking that reaches beyond the boundaries of specific learning areas and curriculum. These teachers would suggest that all human beings constantly engage in the process of design as they investigate options, make decisions and evaluate outcomes in everyday life.

It is this diversity of understandings that provided the initial impetus for this research.

### **Literature in Review**

The diversity which is evident in the nature of teachers' understandings of 'design', is reflected in literature where a range of understandings are exposed. Hennessey, McCormick and Murphy (1993), state:

*... differing positions which education experts hold on the structure and nature of designing and problem solving have given teachers little help in trying to clarify their thinking.*

*(Hennessey et al., 1993:75)*

Thus I pose the questions, "How is the concept of design represented in the literature?" and "Does the literature serve to develop and clarify, or does it confuse and limit teachers' understandings of Design?"

At this point it is appropriate to explore how the concept of Design is understood by authors knowledgeable in the field of Technology Education and how these understandings may serve to inform or mis-inform teachers.

### ***Design as a Process***

The curriculum documents, *A Statement on Technology for Australian Schools* and *Technology - a curriculum Profile for Australian schools* (AEC,1994 a&b) state that 'design' is a process.

*All learning in Technology (education) involves Designing...it is a process through which students develop ideas and create imaginative solutions for learning tasks. They participate in decisions about what to do, why it should be done, how it should be done and how it might be improved. (AEC,1994 b)*

In attempts to support teachers in their understanding and implementation of this process a range of design models have been developed. A report, by the Assessment of Performance Unit (APU), (APU, 1994), reviews many of the models that have been used to "describe the process" of technology. Early models depicted a simple lineal process. This process commenced with the identification a problem, students then progressed through a series of sequenced steps to finally arrive at a solution (figure 1). Such a model, while providing a basic framework for the inexperienced teacher does not acknowledge the dynamic nature of design.

Kimbell's (1986), interacting design loop (figure 2), recognises the need that students may have to re-visit the various stages of a design process to reach a desired outcome. However, this model assumes that students will progress at some point, through all of these stages when this may not necessarily be the case.

The APU when reviewing the many models of design and technology state,

*...the models used to describe the (design) process become ever more confused as the subtlety of the process becomes apparent.*

*APU,*

Thus I pose the question, "Why, as educators, do we need to provide students with a model which 'breaks down' the process of design into parts or stages, be it lineal, cyclical or interacting?"

Perhaps the answer is, 'because it is easier to teach and easier to assess'. Liddament( 1996), suggests that:

*...it follows that that if design can be characterised in this way ( models of a design process), then it becomes amenable to pedagogic treatment; the very notion of 'process' with its explicability in terms of structure and order, suggests that pedagogic programmes may be developed which aim at exhibiting order.*

*Liddament, (1996:11)*

The strength of these models of design is that they enable teachers to identify, isolate and teach specific skills, for example how to identify a problem, how to analyse data, and how to develop ideas. As such, these models do provide a 'useful guide' to the type of activities that can be required of students when they engage in a design task. However, as the APU say:

*Used unsympathetically, the approach can reveal a greater concern for doing all the stages of the process, than for combining a growing range of capabilities which reflects the individual creativity and confident and effective working methods.*

*APU (1994:60)*

This point is further illustrated by situations, such as the one I once witnessed, where a student wanted to modify a model they were producing. When this student approached the teacher to discuss their modifications the teacher responded by saying that unless the idea was depicted in the original design (drawn plan) modifications could not take place.

### ***Design as Problem Solving***

Models such as these have been termed 'Problem solving' models of design (Liddament 1996). To many teachers, design is synonymous with problem solving, and these models provide them with a framework through which students can progress to solve a specific problem.

When implementing a sequential problem solving model of design, emphasis is placed on understanding and clarifying the design problem before a design solution can be found. This form of implementation can also be viewed as an *analysis - synthesis* approach, and it was advocated by engineers such as Asimov(1962) and design educators such as Archer(1963). It can be argued that such an approach is based on scientific method. Powell (1987) suggests that when design is approached in this way it is:

*...rather like the progress of a product on a production line, working its way inexorably through a series of controlled stages.*

*Powell (1987:192)*

Liddament (1996, p.11), argues that teachers need to develop an understanding which, ... *'draws attention to the metamorphic and evolutionary character of designing'*. That is, teachers need to be aware that when students design they implement processes which constantly evolve depending on the context of the problem, and the nature of the individual. Teachers with this understanding of design recognise that it is impossible to present students with a specific process through which to work. Liddament believes that it is this metamorphic character which

characterises the creative aspect of design which cannot be found in sequential problem solving models.

### ***Design as an interactive and dynamic concept***

In an attempt to create a new way of understanding design and technology the APU developed a model (figure 3) which depicted the interaction that occurs between the mind and hand as students engaged in a design activity. This model focussed on the thinking and decision - making process rather than on describing the activity in terms of the outcomes. In this model the student's thoughts and intentions, throughout the process, were as important as the products that were derived from them.

Anning (1994) explores the concepts of 'Designerly Thinking', what students need to know and 'Designerly Behaviour', what students need to be able to do. Anning suggests that separating the 'domains' is a 'pragmatic device' which serves to simplify the complexity of design and technology. She contends that it is this knowledge and practical interface that provides a distinctive feature of designing which teachers should understand. The APU suggests that such an interface is the essence of design,

*It (design) involves more than conceptual understanding - but is dependent on it, and it (design) involves more than practical skill - but again is dependent upon it. Ideas conceived in the mind need to be expressed in concrete form before they can be examined to see how useful they are.*

*APU,(1994:62)*

Williams suggests that technologists:

*...have in mind a set solution to a problem and deal with obstacles in the path to that solution in a determined and uncompromising manner.*

Williams suggests that the partnership of design and technology is an unnatural one and states that by partnering these two domains we as educators are "asking a lot of ourselves and a lot of our students". I look forward with interest to his paper.

It could be suggested that the method of 'design' put forward by Williams, could possibly be one of *Conjecture-Analysis* (Hillier,

Musgrove & O'Sullivan, 1972). This method of Design states that the conceptualisation of a possible design solution occurs at the beginning of a design process. Understanding and refinement of the design problem is achieved through analysis, testing and modification of the initial design solution until a desired outcome is reached.

Although implementation of this method would be welcomed by the student who always starts a design task with the words, "I know what I want to do". Its negative implication may be that time, resources and energy could be wasted on a design activity, because of a lack of detailed analysis of the initial problem. This implication is particularly relevant to primary aged students who at times may draw upon limited prior knowledge and experience to contribute to a design outcome.

Conversely, should teachers disregard these initial solutions as impulsive and unworkable when for the student they may be intuitive and ultimately highly successful? It could also be argued that the time, energy and resources given to an initial solution would not be wasted, regardless of its success or lack of it, as it is all part of a learning process.

Darke's(1979) research illustrates that for those with experience, for example for architects producing realistic conjectures are not difficult. However for students lacking in experience and known solutions, developing ideas that are initially appropriate can be difficult.

The APU would concur, and states that although a student may have a complete solution, at almost the start of a design activity, they could not have 'sorted out all of the issues and difficulties in the task'. The Unit would suggest that, as teachers, it is our responsibility to 'drag this internal image out into the light of day'. It is suggested that teachers do this for two reasons, to clarify what the student means, and secondly, by expressing and sharing their ideas students will recognise the possible difficulties they may need to confront in achieving their outcome.

The concept of *imaging* is closely associated with developing solutions, particularly an initial solution. It is important then, that teachers recognise the significance of the mental picture or image that students say is *in their head* when they are introduced to a design activity, rather than discarding this in favor of always preceding through a series of stages which may include drawing at least five possible design solutions.

That there is clear diversity of opinion from authors knowledgeable in the field of Technology Education from a range of educational settings and

countries is evident. In light of this diversity of opinion, I pose my final question, "How do teachers construct their own understandings of design? "

### ***Constructing an understanding of design.***

Anning (1994, p.155) has demonstrated that teachers' understandings of design in technology education are a combination of '*centrally imposed National curriculum*' coupled with their own '*practical, operational versions*'. Her research illustrates that teachers have not had time to reflect on their understandings to the extent that they can identify what specific concepts of 'design' they should be promoting in their classrooms. The infancy of the Learning Area, means that its history and subsequent body of knowledge is still evolving, as a result teachers have to draw upon a range of sources to inform and support their understandings.

My initial explorations would suggest that '*practical, operational versions*' of teachers' understandings are influenced by factors of an educational, social and personal nature.

For instance, the quantity of time in which a teacher has been able to engage in quality professional development programmes is a significant factor. Opportunities for professional development coupled with whole school commitment to developing innovative Design and Technology programmes are major contributors to developing teacher understandings. Attending conferences, engaging in discussions and debate can shape understandings. Observing students as they work on a design activity, listening to their questions and watching as they overcome problems certainly all serve to inform teachers' understandings.

Some teachers have looked to professional designers to clarify their understanding of 'design'. Harding (1995) & Davies (1996), when independently reporting on their experiences of working with architects in the classroom, identified 'key features' that were applicable to both students in the classroom and to architects in the field. These authors would suggest that, to understand a concept as complex as design, teachers need to have a clear understanding of how design functions in the 'real world'.

Fleer & Sukroo(1995) concur with this approach when they document a unit of work titled ' Architects and Building'. As part of this unit teachers and students were introduced to an architect who supported them in

developing their ideas of design. The classroom was organised to represent an architect's studio where students were encouraged to observe, explore and record their ideas and questions. When an evaluation of the learning was undertaken, the area where the greatest development occurred was in the children's ability to draw a plan and front view. As well as developing technical skills, such as how to use a ruler and use symbols to represent particular features, the children could identify a range of stages that an architect applied as they designed.

### ***Conclusion***

Simons draws upon the observations of authors Stake and Kerr (1994) to suggest that,

*...our knowledge is both personally and socially constructed; our understandings( of design and technology) inevitably incomplete...*  
(Simons 1996, p.232)

Perhaps it is the 'newness' and, as a consequence, the evolutionary nature of the Learning Area of Design and Technology that contributes to some teachers' understandings of design to be limited or incomplete. Perhaps it is the dynamic nature of design itself that contributes to the diversity of teachers' understandings. Or is it the range of views that are proposed in the literature that lead or mislead teachers as they construct their understanding of design? Continued research may tell!

For some teachers the colour of the quilt is currently limited to green, for others it is a rich tapestry of many colours and patterns, not unlike their understandings of design.

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