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# An (auto)ethnographic narrative of the teaching of designing within Design and Technology in the English curriculum

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## Abstract

During the 1980s there was a paradigm shift in technology education within the English secondary school curriculum, resulting in a series of National Curriculum iterations with Design and Technology (D&T) emerging in the mid 1990s. School inspection and academic discourse has identified the relative weakness of the teaching of design in comparison with making. This paper is presented as a personal narrative of the teaching of design, within a qualitative and interpretive paradigm. The findings highlight the challenges for D&T practitioners in their role as teachers of design, examining the nature of design education and how design concepts are framed.

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*Keywords:* designing; design learning; design and technology; design and make; teacher education; pedagogy; narrative

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## 1. Introduction

The purpose of this paper is to explore the nature of design learning and pedagogy through personal narrative, both as a learner and as a teacher of design. As a precursor to introducing a critical narrative, I will briefly outline some developments in practical education in the English curriculum that have led to Design and Technology as a discrete subject, relating to design learning. The narrative is analysed and reflected on with literature from both the education and the design community, making reference to challenges in the development of the subject and current challenges. Rather than propose a definition of design, as a learning activity, in the conclusions I will put forward a framework for understanding design for discussion.

A central paradigm in D&T has been the ‘design and make activity’, building on its craft based predecessors. Criticism has been leveled at D&T for perceived failure to live up to early expectations (Millar, 2011; McGimpsey, 2011). The purpose of this paper is to outline the challenges for teachers of D&T and their role as designers, and teachers of design, identifying both challenges and opportunities.

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These will be used to examine the nature of design education and how design concepts are framed within pedagogy. In this paper I will explore the teaching of design in the English secondary system and reflection on potential ways forward. The problems inherent with defining design education, let alone D&T as a whole, call for a continuing discourse between our D&T Association, teaching professionals and academics. The recognition that technology is constantly changing and design is a multifaceted discipline, calls for an approach which may be distinctly different to ‘traditional academic’ subjects.

## 2. Methodological perspective

As outlined above, the paper is presented as a critical and personal narrative, influenced though not presented as an autoethnography (Spry, 2011, 497-511). The rationale for citing autoethnography as an influencing methodology, is to attempt to capture an individual, practitioner, perspective that is absent from much writing on the subject. In the midst of rational and empirical writing on design learning, where well-intentioned and knowledgeable experts in the field attempt to clarify and define, the situated experience of the classroom teacher appears absent. It is in this context I seek to balance an unintentional hegemony, borne of extrinsic curriculum and assessment. As a qualitative study it sits within a naturalist paradigm (Guba, 1981), grappling with the “tensions and contradictions” of qualitative and interpretive research practices (Denzin and Lincoln, 2011, 6). The construction of the narrative expresses the author’s perspective on the design learning within Design and Technology (D&T), as a mirror to challenges and developments in the subject. The ontological assumptions adopted are relativistic (Lincoln, Lynham and Guba, 2001, 97 – 116; Guba, 1981), as is apparent through discussions with fellow teachers and academics that there are many definitions, and experiences, of design – Egon Guba’s “multiple realities” (1981, 77). However, understanding of design is co-created by communities of practice in context.

*“At the risk of disappointing you, dear reader, it is impossible to offer a single and authoritative definition of the central term of... design.”* (Erlhoff and Marshall, 2008, 104; cf Findeli, 1990; Ralph and Wand, 2009)

Claims of a positivist paradigm would, as such, be futile: although there is much agreement about the elements of design in terms of material consciousness (Sennett, 2008, 119 – 146) within disciplines and the concern with the adaptation and improvement of human experience (QCA, 2007, 51; Cross, 2010). My dialectic intention in this paper is to raise questions and prompt discussion. The standpoint is that of a “situated” educator (Olesen, 2011, 130; Lave, 2009), both as a teacher of D&T and, latterly, an educator of D&T teachers. Situated in the context of a standpoint epistemology, *not* in terms of being the member of an oppressed group, but rather of a *misunderstood* and *developing* subject, whose place in the curriculum is under scrutiny (Department for Education, 2011, 24) and where some teachers experience conflict between theory (of design) and practice (of pedagogy). The narrative is presented as an intrinsic case study (Stake, 1995).

## 3. A very brief, and non-chronological, history

At this point I must confess to a slight factual inaccuracy in relation to the claim, in the abstract, that D&T has existed as a subject for 16 years (1995 – 2011). Prior to the introduction of the English National Curriculum in the 1990s (NCC, 1990), when Craft, Design and Technology and Home Economics (alongside Information Technology and Art and Design and Business Studies) became part of Technology (DES/WO 1988, 30), Design and Technology or Design Technology was taught in some areas (Kimbell and Stables, 2007, 1-10). However, the subject in its current form, encompassing food, resistant materials<sup>i</sup>, systems and control<sup>ii</sup>, and textiles, sharing a common curricular framework (DfE, 1995) will be referred to as D&T, rather than previous iterations.

It is not my intention at this point to take a detailed walk through the historic milestones of the subject and its ancestor, but to highlight trends that contribute to the issue of design learning (for a historical perspective see Morley, 2002, 3-12; Atkinson, 1990; Penfold, 1987). In the period where D&T was emerging as a subject from its largely craft-based predecessors (Kimbell and Stables, 2007, ch.10), design was a focus of leading thinkers in the field and a shared praxis across all material areas (Archer, Baynes and Roberts, 2005; Kimbell et al., 1991; Kimbell, 1982). Design has been acknowledged (NCC, 1990; DfE, 1995; DfEE, 1999; QCA, 2004; QCA, 2007), though problematic (Ofsted, 2002, 2008), over the following years. The Office for Standards in Education have identified that “[learners’] progress in making [continues] to be better than their designing, an intractable problem reported over many years...” (2002, 4), an issue that has persisted in particular where approaches to designing were formulaic (Ofsted, 2008).

Since D&T emerged from Technology following the 1990 National Curriculum (NCC, 1990), with five attainment targets<sup>iii</sup> including Information Technology, in 1995 (DfE, 1995) with two attainment targets (designing and making), it has seen three revisions alongside other subjects in the National Curriculum. In 2000 the two attainment targets became one (DfEE, 1999), with a revision in 2004 (QCA, 2004) removing the statutory programme of study for Key Stage Four (14-16 years), thus the disapplication of the compulsion for schools to offer the subject to all learners at this stage. 2008 saw a significant rationalisation of the programme of study (QCA, 2007), which was largely welcomed by the D&T community (DATA, 2007, 10-13). In the brief life of the subject, there has been little opportunity for teachers to stand still and collectively reflect on their practice.

*“The desire for something more sustainable than decomposing materials is one of the sources in Western civilization for the supposed superiority of the head over the hand, the theorist better than the craftsman because ideas last.”* (Sennett, 2008, 124)

However, the apparent division between the cognitive aspects of designing and the practical making may go back much farther in western culture. Richard Sennett, in his book *The Craftsman* (2008), whilst not intentionally describing the division of labour between design and making activities, describes the changing roles of the craftsman, with the maker taking a diminishing role in design decision. Baynes et al (1997) writes about the “remarkable programme” instigated by the British Government in 1837, resulting in the Royal College of Art, which after 150 years the authors were hopeful of the realisation in “general education”! A more common milestone cited in relation to secondary education is the Samuelson Report (Cave, 1984; Musgrave, 1964; Argles, 1959; Montague, 1887) for the Royal Commission (Gove, 2010), which focused on practical and technical skills. Therefore the context for D&T education in the English secondary school system was within a culture of craft, rather than design.

It is in this context that I entered the profession at a D&T teacher, and from the perspective of a practitioner that I write this autobiographical narrative of the experience of design learning from the mid-1990s to the present.

#### 4. Narrative

This narrative is presented in the first person and presented systematically rather than chronologically. My intention is to use personal narrative to describe an experience of design learning and pedagogy: as learner and teacher. The perspective represented is that of a teacher beginning a career within a newly formed D&T curriculum.

Having undertaken postgraduate teacher training in 1997, two years after the second National Curriculum (NC) programme of study was published, introducing D&T, my first experience of design education (as a teacher) was in a 11 – 16 catholic high school in the Northwest of England in 1998. Having graduated in Architecture some six years previously, I had come to a career in teaching with a passion for design. However my first experiences of D&T education in schools was a strong culture of, and passion for, making. As a young teacher I found myself inducted into this culture (quite willingly). Design was not without value, but was structured within a linear model (Kimbell et al., 1991, 18), where

the path through the design process was clearly led by the teacher. During initial teacher education, tutors had clearly outlined the pitfalls of following a linear design process putting forward the design cycle (Kimbell et al., 1991, 19), but no guidance on how this might be achieved in the classroom/workshop situation, in the same manner as one may demonstrate a jointing technique for a particular purpose and material.

Experienced colleagues, who had gone through the transition from CDT to D&T, described how early exploratory models of design learning had adversely affected their pedagogical stance, although they would not have described it in these terms. One experience recounted, during the early days of NC Technology told of a whole year group being brought together with a common theme to be explored in a variety of materials. Learners were given a choice of which material area they wanted to explore the theme in, which resulted in some small group sizes and other large. The experience of moving from a controlled, craft-centred environment to an apparently chaotic model of learning was often used as an explanation for the managed nature of the design process that was presented. This transfer of focus was as stark as a switch from teacher-centred to learner-centred, or constructivist (Glassman, 2001; Vygotsky, 1978) pedagogies.

During this time I reflected on my experience of design learning, experienced whilst undertaking my degree in Architectural Studies, where the prevailing pedagogical method was to set a design brief and a presentation date, followed by studio based, self-directed, interpretation. The presentation of the design solution was given in a group ‘crit’<sup>iv</sup>, where the tutors would question design choices, highlighting virtues, but more often than not pointing out shortcomings! This process was repeated throughout the first and second years, with some pedagogical input on approaches to problem solving, such as problem analysis and simulated client briefs. The advantage of this approach was that it prompted self-reflection and self-reliance. However, it lacked a pedagogical scaffold to support learners. We experienced designing as problem-solving activities, without reference to meta-cognitive theories or practices (Oxman, 1999, 106)

This, too, was in contrast to the focus on active (Petty, 2009) and constructivist approaches to learning increasingly used and encouraged, which emphasis the teacher as a facilitator, scaffolding learning (Daniels, Cole and Wertsch, 2007, 317-320). On reflection, and supported by subject inspection reports (Ofsted, 2002), D&T had a clear framework of pedagogy for teaching the practical skills of making, but there was little, apparent, focus on how designing and design skills could be taught in the classroom. In addition to this, the experience and interpretations of my peers was strongly influenced by their previous discipline (i.e. architecture, engineering, fashion, catering). This is what Sennett (2008, 119-146) calls material consciousness, the influence of the tacit knowledge gained through interacting with material on our thinking. A further, extrinsic, factor at this time that influenced the approach to designing, was the assessment regimen, where the separation of the design skills of research, analysis, generation of ideas, development of a solution, planning and evaluation, subconsciously implied a linear approach to design (Rutland & Spendlove, 2007, 141).

However, during these early years I would describe myself as being a happy maker, enthused by working with young learners to produce high quality products. To this end, I turned to developing my skills as a maker – the word craft was rarely used in those days, and the D&T community as a whole appears to have put the term out of our collective memory. To address issues around subject knowledge and skill, I engaged in a design and make project (Figure 1) of my own alongside my first GCSE<sup>v</sup> Resistant Materials (RM) group. The RM project work undertaken in the department at that time was centred on furniture design, reflecting the experience and skills of the teaching team: therefore my project was a coffee table. However, the form of the table, whilst aesthetically pleasing, was influenced not by function or the needs of the potential user, but determined by the craft skills in the joints. The main constructional joint chosen, a wedged through mortise and tenon, was chosen for its technical merit.

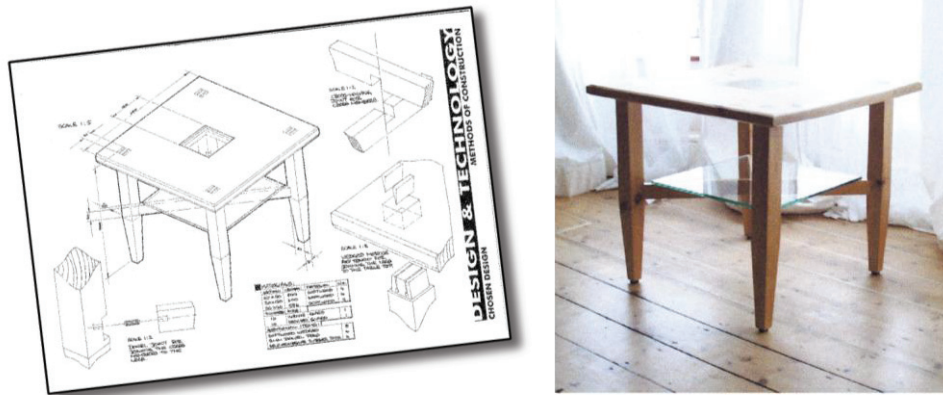


Fig. 1. An example of the author's early designing and making

The effect of the project was two-fold; firstly, it had an influencing effect on learners in the group, who rather than develop their own ideas were lead to attempt a technical feat beyond their abilities and time (leading to pedagogical frustrations). The second effect was to reinforce notions that quality making was rewarded in higher marks than designing. Whilst I was uneasy about the ritualistic and formulaic nature of design activity, this was an immensely enjoyable period, where the joy of making was experienced by both teachers and (most) learners. Designing was largely viewed as a drawing activity (Moreland and Jones, 2000, 292; Kimbell, Stables & Green, 1996, 97), with the design portfolio becoming a ritualised form of a linear design process (Atkinson, 2002, 173). This prescriptive approach to designing, whilst correctly criticised as design learning, reflected the internal and altruistic motivations, to help learners, alongside the external pressures on teachers to achieve good results (Kimbell in: Rutland and Spendlove, 2007, 142). This tension caused a palpable dissonance with colleagues feeling the pressure to compromise good design practice for instrumental measures to improve grades.

During this time I had begun studying for a Masters Degree, where I was able to meet with peers and explore different models of teaching design. At this time my dissatisfaction with the routine of following a linear design process, influenced by the examination Awarding Bodies returned. This was brought home by the attempt to introduce and trial an open design based project with a group of Year 8 (12-13 years old) learners: a proposal that met with some resistance from the head of department, who was concerned for the consistent experience of the group. As a result the project was a compromise between the existing project and the introduction of group designing and modelling activity and CAD/CAM<sup>vi</sup>. The limitations on the learners imposed a restricted range of construction method, thus ensuring the success of the made product. As such, this was not a failed experience for the learners or myself, but it fell short of expectations.

During this period of renewed study, I moved to another local school, with a subject leadership responsibility. Here the philosophy of quality making was similarly strong, the team dynamic and an increased level of autonomy lead to the opportunity to experiment. At the time D&T was coming in for criticism for the relatively weak teaching of design (Ofsted, 2002) and an initiative to address this within the National Strategies initiative, with a D&T Framework (DfES, 2004) aimed at improving quality in the teaching of design. The strategy focused on planning and teaching five "subskills" of design (p.14), focusing on progression and planning for the teaching of design across the whole of Key Stage 3 (11-14 years) rather than a linear process within each learning experience/project (p.18). As a lead for the delivering this programme with in the Local Education Authority, and subsequently leading training in three other education authorities, this initiative brought me back to the reasons for entering the profession. The introduction of design strategies, such as SCAMPER and 4x4 (Barlex, 2007, 140-169; DfES, 2004, 371-372, 380) had a dramatic effect on raising the quality of design ideas and the range of solutions (Figure 2) in a short electronics project with Year 8 (12/13 years) learners. These techniques were



combined with card modelling leading on the Computer Aided Design (CAD), rather than sketching a drawing. One noticeable effect was an improvement in the quality of work from boys.

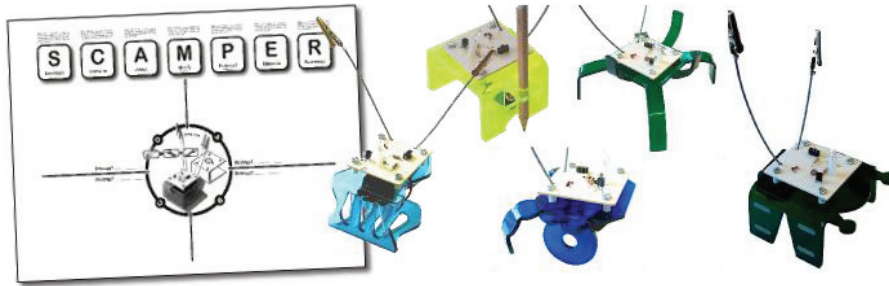


Fig. 2. An example of the author's teaching resources and Year 8 learners' D&T products

*“Since the one-year project ended, some schools who were not involved in the pilot have enlivened the teaching of design and technology in Key Stage 3. However, the influence of this well-conceived training has been weak nationwide, except in the few local authorities which have retained the capacity and advisory support to run subject training for their schools. One consequence of the failure to roll out this programme to all schools has been the continuing fragmentation of the curriculum in Key Stage 3.” (Ofsted, 2008, 48)*

For me, the success was in the introduction of a suite of strategies and activities to encourage designerly activity, something that I, along with many other colleagues, had not experienced during initial teacher education. The lack of local subject advisory support for an effective initiative addressing identified weaknesses in teacher training, means that it had limited impact. This has also been the experience for teachers in the other area of the English curriculum, which shares design – Art and Design. John Steers highlights the experience that, despite the inclusion of design in the 2000 National Curriculum, craft and design activities are dominated by fine art (2004, 26; cf Ofsted, 2009, 3, 7 & 31). This despite the increased number of teachers, who have been trained in craft or design disciplines (Steers, 2009, 136).

## 5. Reflections

From the autobiographical narrative presented, there are four areas of note with regard to design learning. Firstly, *design thinking* has been an area that develops individually and is influenced by prior experience. This can be from education and training, but also the discipline or materials experienced. Secondly, *design activity* has been identified and addressed (albeit in a limited fashion) by the D&T Framework (DfES, 2004) and is distinctly different from design thinking and processes (Mawson, 2003). As such, design activities can begin to address issues of teaching design skills. Thirdly, the *design context* both of the teacher and of the curriculum is influenced by the *personal subject construct*, including contextual subject, pedagogical and school knowledge (Banks, Leach and Moon, 2005; Banks et al, 2004; Shulman, 1986). Forth, *design pedagogy* synthesises thinking, activity and context for teachers and, consequently, learners. Personal experience and literature suggest that this is an area of considerable weakness, relying on *sustained* and *strategic* implementation at national and local levels.

There has been much written about design education and thinking, demonstrating the breadth of views of design from Herbert Simon's positivist “science of design” to Donald Schön's “reflective practice” (Cross, 2006, 99). Both Cross' taxonomy of design (2008, 101) and Archer's research programmes (Archer, 1979; Archer, Baynes and Roberts, 2005, 13-14) define the range of issues for researchers in design and design education. However, we must examine the missing link that leads Millar (2011) and McGimpsey (2011) to criticise D&T as having underachieved, though acknowledging the limitations of

time and external policy. Using the lens of the personal narrative, four areas that can be crudely aligned with Cross and Archer’s frameworks are highlighted: design thinking, design activity, design context and design pedagogy (learning, teaching and assessment). Table 1 (below), seeks to match these areas showing areas of agreement and highlighting the possible ‘missing link’ of design pedagogy, in which the sustained aspect of strategic implementation in the National Strategies was lacking (Ofsted, 2008).

Table 1. A comparison between Nigel Cross’s Design Taxonomy and Bruce Archer’s Design Research Programmes

Cross’ Design Taxonomy	Archer’s Research Programmes	Framework for Design Education
Design epistemology	Design axiology Design philosophy Design epistemology	Design Thinking
Design praxiology	Design praxiology Design language (modelling)	Design Activity
Design phenomenology	Design technology Design taxonomy Design metrology Design history Design pedagogy	Design Context    Design Pedagogy (inc. strategic and sustained implementation and dissemination)

Design thinking encompasses a wide range of disciplines and practices, both conscious and unconscious. In his book *Design Thinking*, Nigel Cross (2011) presents case studies of well known designers, including Phillippe Starck, Kenneth Grange and Gordon Murray. Each of which approach design from a distinctly different perspective. Starck with his elusiveness as to the design process, typified in the ‘juicy salif’ where the design was developed to an almost finished concept on a restaurant placemat (p.16-19). One might ask, how many marks he would get against the design criteria of a GCSE Product Design specification? Cross describes how Grange (p. 56-60) redesigned a sewing machine by immersing himself in the user experience and problem finding (Sennett, 2008, 19-37) as a prelude to problem-solving design. Murray, when faced with a change in the Formula One constructors rules, creatively subverted the boundaries to reintroduce ‘ground effect’ (p. 37-39).

Mawson (2003) discusses the impact of the imposition of an external design process as having a negative effect on design learning, arguing, “that the traditional focus on models of the design process [have] been based on fundamental misunderstandings of how professional and novice designers actually work.” (p.125) He cites the drivers of this misunderstanding as the needs of management and assessment. The narrative described above would seem to indicate that this likely, as does the body of literature around assessment and creativity. However, could it be that the well-meaning attempts of design educators to define the design process, albeit in a more sophisticated manner than the much-criticised linear model, have fallen into the same trap? The legacy of the linear model remains encapsulated in design assessment, but the cyclic model (Kimbell et al., 1991; Morley, 2004) presented as panacea, thought ultimately “became increasingly confused” (Moreley, 2004, 15). This issue is discussed in academic literature, but inspection evidence (Ofsted, 2002, 2008) demonstrates that this thinking has not been disseminated across the D&T workforce.

Mawson suggests a focus on design skills and technological practices (2003, 125), an approach modelled in the National Strategies D&T Framework (DfES, 2004). Though as highlighted above there were issues with the dissemination (cf. Ofsted, 2008, 48) of the training for teachers to implement it.

## 6. Conclusions

It is the conclusion of this paper that, whilst there have been challenges over the past 16 to 20 years in Design and Technology education, the factors influencing this have been complex and multifaceted. Tensions both external and internal to the subject have arrested the development of design learning in some, but not all, schools in England. At this point in time the subject is at a crossroad, politically

(Department for Education, 2011), with the need to justify its “epistemological roots”. As such, the question might not be whether to define design or the design process (again), which is elusive and possibly futile, but how we frame and communicate D&T praxis (Habermas, 1981), balancing the “cognitive-instrumental [science], moral-practical and... aesthetic-expressive [art]” aspects of culture and learning. This is not only with the decision makers, but more particularly with busy classroom practitioners. Research in design learning is well and good, but needs to be disseminated into widespread classroom practice in a language and form that they can use.

As Cross (2011) postulates, the nature of design cognition is defuse, personal and context laden. However, empirical study can reveal design practice, which as case studies can illuminate our understanding of how designers think. A solution might be to acknowledge and celebrate our differences and develop multiple models of design thinking, which are context and material specific. The Design Council’s Design for Innovation paper (2011, 14) highlights the importance of design learning and the role that good D&T plays in developing “decision-making and problem-solving skills”. In particular, where a cross-curricular and interdisciplinary approach is adopted, including working with design and engineering practitioners.

It is this unique approach that was originally envisaged for the subject (DES/WO, 1988, 29-30) and reflected in the most recent National Curriculum importance statement (QCA, 2007, 51):

*“... knowledge is a resource to be used, a means to an end... [it] is not possessed only in propositional form ('knowing that'), but that it becomes active by being integrated into the imagining, decision making, modelling, making, evaluating and other processes which constitute design and technological activity. Understanding (in the sense of the ability to use and apply knowledge in different situations), rather than knowledge (with its connotation of inert information)...”* (DES/WO, 1988, 29-30)

*“In design and technology pupils combine practical and technological skills with creative thinking to design and make products and systems that meet human needs. They learn to use current technologies and consider the impact of future technological developments. They learn to think creatively and intervene to improve the quality of life, solving problems as individuals and members of a team...”* (QCA, 2007, 51)

The distinct nature of Design and Technology education was envisaged by Archer’s three cultures of general education (Archer, 1975, 2005) as Humanities, Science and Design, with the latter being a new and untested area with no established pedagogy. When Findeli (1990) describes Laszlo Moholy-Nagy’s approach to setting up a Bauhaus school of design in Chicago, he suggests two “ingredients... necessary to set up any education system”: curriculum and pedagogy. The balance needed between vocational/humanistic, practice/theory or technology/art, reflects the concerns of Habermas (1981, 11) for “creating unrestrained interaction” between cognitive, moral-practical and expressive aspects of culture. What D&T in England has seen is an early focus on curriculum, which according to Moholy-Nagy (Findeli, 1990, 7) leads to “content-oriented... vocational” approaches. For the balance to be redressed, a sustained and strategic focus on design pedagogy is required to ground “everyday [designerly] praxis” (Habermas, 1981, 11) in the D&T classroom. This is the responsibility of the individual, school, teacher education establishments, subject and industry association.

As I now reflect on my experience of design learning, prior to entering the teaching profession, the question is not so much “Why wasn’t I taught within an explicit design process?” but rather “Why has process become a distraction in the development of Design and Technology in the UK?”

## 7. Postscript

And finally, what do we do when, having analysed a problem, generated, developed and modelled ideas, the conclusion is that a product (physical artefact) is not the best solution to the problem? The experiences of design in business, and beyond, by Bruce Mau (Berger, 2009) and Hartmut Esslinger (2009) raises a serious philosophical question for design and technology practitioners to address. The Design Council’s paper, Transformation Design (Burns et al., 2006), acknowledges the historical focus on



“‘giving of form’ whether in two or three dimensional”, broadening their vision of design to the “shaping of behaviour – behaviour of systems, interactive platforms and people’s roles and responsibilities” (p. 26). The dominance of making and artefacts (products or systems) in D&T, whilst an important facet for the subject, inhibits our ability to address this problem, as making forms an integral part of Key Stage 3 Attainment Targets (QCA, 2007, 58-59), GCSE and A Level specifications (for example OCR, 2012). David Barlex (2011) has proposed a four-part model for D&T: making without designing; designing without making designing and making and; exploring technology and society. This may form an interesting area for discussion.

When viewing artefacts of design as physical objects, this might seem like a step too far, however Cole and Derry (2005, 213-218) describes Marx Wartofsky’s (1979) three levels of artefact: primary (physical constructs), secondary (social constructs) and tertiary (ontological constructs or “imaginative praxis”). Bertelsen (2000, 17) develops this concept in the context of design as “three dimensions of design mediated by design artefacts; construction, cooperation, and conception.” There are those who study aspects of human development (Wolpert, 2003), who suggest that the involvement of early humans technological activity in the making of specialist tools (primary artefact) was instrumental in the development of language (secondary artefact). Therefore, if an artefact of design can be defined in such broad terms, the question is ‘where do we draw the line?’

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- <sup>i</sup> Resistant Materials is a descriptive term, used when referring to rigid materials requiring effort to cut, shape and form. In most cases this refers to woods, metals and plastics, as opposed to compliant materials such as fabric, paper etc.
  - <sup>ii</sup> Systems and Control encompasses electronics, pneumatics, mechanics and computer control.
  - <sup>iii</sup> Categories of assessment in the National Curriculum, defined with levels of attainment.
  - <sup>iv</sup> The summative presentation of a design project, to peers and tutors, for open feedback and criticism.
  - <sup>v</sup> General Certificate of Secondary Education – the standard qualification studied by children in England, Wales and Northern Ireland, between the ages of 14 and 16 years.
  - <sup>vi</sup> Computer Aided Design and Computer Aided Manufacture.