Creativity in Design and Technology and ICT: Imagining Possibilities in a Digital Age.

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Abstract

The issues raised in this paper relate both to the current climate in education and the changing demands within two relatively 'young' curriculum subjects: design and technology (D&T) and information communication technology (ICT, previously information technology, IT). Both subjects have ultimately evolved from the same subject as outlined in the first National Curriculum Order for Technology (DES/WO 1990) and continue to share similarities as identified in the National Curriculum for England 2000 statement of importance, as both subjects aim to prepare pupils for participation in a rapidly changing world using new technologies.

This paper will highlight how the rapid development of both D&T and ICT has been accompanied, and to some extent driven, by the emphasis which has been placed in recent times upon the increased use of ICT as part of the drive to raise standards in schools. The central tenet of this work is that whilst recognising the value of ICT, this imposed imperative and its impact upon both the content of D&T teaching programmes and the methods adopted for their delivery may have compromised the principal aims of the subject as exemplified in the National Curriculum statement of importance and also constrained the potential for the development of learners' creativity and imagination in D&T. The work goes on to make a case for a shift in emphasis and the adoption of ICT as a tool within a creative continuum rather than as the principal focus for learning.

By considering the role of ICT, and in particular ICT rich activities such as CAD/CAM and ECT initiatives within D&T, the paper will consider how constrained practice in both subjects has marginalized D&T capability and creative practice. This propositional paper will further argue that by redefining pedagogical models for D&T and the use of ICT within the subject, both activities have the potential to promote rather than to constrain creative practice and so offer the potential of enhanced levels of design and technology capability for all learners.

Key words: design and technology, creativity, ICT, capability, models, pedagogical.

Introduction

The issues raised in this propositional paper are deliberately provocative and speculative and relate to the current climate in education and the changing demands within two relatively 'young' curriculum subjects: design and technology (D&T) and information communication technology (ICT, previously information technology, IT). The paper takes the form of an exploratory starting point - based upon embryonic research - which it is hoped will lead to increased discourse and debate within the communities of ICT and D&T.

Both subjects have ultimately evolved from the same subject as outlined in the first National Curriculum Order for Technology (DES/WO 1990) and continue to share similarities as identified in the National Curriculum for England 2000 statement of importance, as both subjects aim to prepare pupils for participation in a rapidly changing world using new technologies. The statement of importance for both subjects should not be overlooked as they provide not only a rationale for the inclusion of these subjects but also point the way forward in terms of the development of capability, creative content, process and methodology.

Creativity in design and technology and ICT

The subject of D&T can be considered as having a significant role in the enhancement of pupils' creative capability within the school curriculum as creativity can be considered to be at the 'heart of D&T'. Indeed the on-going national debate centred on creativity and D&T is enhanced by continued academic interest within the design and technology community (Davies 1999; Howe 2001; Atkinson 2002; Kimbell 2002; Rutland 2002; Barlex 2003; Spendlove 2003, 2004) with an emerging theme of 'creativity in crisis' (Kimbell 2000; Barlex 2003). What this debate reveals is that a tension exists between current rhetoric and the claims that are made for the subject and the actual experience that is offered to children within design and technology (Hopper and Downie, 1998; Kimbell 2002).

Within this context of attempting to identify the unique educational components of design and technology, Harris and Watson (2003) draw attention to the academic and practical learning experiences that the subject has to offer and the inter-

relationship between high level conceptual (thinking) knowledge and procedural (doing) knowledge that underpins much of the work undertaken in schools. They describe design and technology as 'deliberately interdisciplinary' having its own 'distinctive non-verbal ways of thought' including the use of imagination and 'imaging'. The central tenet of the authors' approaches to the teaching of design and technology, which is employed as a starting point for this discussion, is the conviction that creativity is not an individual characteristic or an innate talent but it is the application of knowledge and skills in new and novel ways to achieve a valued goal (Seltzer and Bentley, 1999:10) and as such creativity is an ability that can and should be taught, nurtured and enhanced.

Within the broad curriculum area of information communication technology (ICT) there can be considered to have been a lack of emphasis upon such creative application within the new technologies. This has in part been due to an over emphasis upon the provision of digital technologies rather than the re-definition of ICT capability and the application of these technologies in a range of practical contexts. The repercussions for this are that ICT is employed across many 'notionally' creative subjects, including D&T, but frequently its exemplification lacks reference to truly meaningful applications of new technologies in creative ways. The consequence of the lack of considered application has been that valuable opportunities to develop creative capability and to employ imaginative solutions to practical problems and challenges are too infrequently exploited.

It is the view of the authors that ICT should therefore be seen as a set of tools, which can be adopted as and when they are appropriate within the broad creative process. By providing new tools, media and learning environments creative teachers and learners can use ICT to support 'imaginative expression, autonomy, and collaboration, fashioning and making, pursuing purpose, being original and judging value' (Loveless, 2002:2).

The recent resurgence of interest in creativity in D&T and ICT and the considerable amount of research effort currently devoted to the field is as much a reflection of the demands of society (or more specifically commerce and industry) as it is a response to the stifling effects of the measuring and accountability culture that currently pervades education and the need to restore balance to what has arguably become an overly utilitarian curriculum. Raising the status of creativity within education undoubtedly reflects the political and economic imperative of capitalising upon creative output.

Our aim must be to create a nation where the creative talents of all the people are used to build a true enterprise economy for the twenty first century-where we compete on brains, not brawn. (Blair, 1999:6)

Both ICT and D&T clearly have strong and unique vocational links and play an important role in the shaping of future knowledge based economies. D&T is very much orientated towards change in the made world which involves our clothes, food and infrastructure whilst ICT is very much part of the 'invisible industries' shaping the rapidly developing 'e' commerce sector of the economy. A common misdirection however, is the over-promotion of a narrow vocational focus adopting and reinforcing inappropriate models of industrial practice for both subjects which can constrain and inhibit the growth of pupils and the curriculum. This approach can result in reproduction rather than redirection of existing curricular as the vocational curriculum is shaped by the immediate rather than future needs of industry and can ultimately constrain the broader needs of pupils. Within this restricted model of practice, creative opportunities can often be negated when attempting to nurture creativity within the harsh realities of a quasi-industrial context. The creative constraints which such models offer are more likely to inhibit rather than enable learners to develop innovative responses to creative challenges where possibilities and novel responses have greater currency than orthodoxy and the re-modelling of the ideas of others. This is a justification that education, and more importantly pupils, should remain free of many of the creative constraints whilst they are allowed to develop their own responses to problems in a progressive manner.

Before this is considered further, it is important to first explore the context and conditions, which will enable the approaches advocated to succeed. A critical factor for success is the need for teachers (either as individuals or as part of a team of professionals within a school) to establish a clearly defined, academically supported framework within which children might be encouraged to work towards the development of creative capability. The authors' own experiences have shown that where there is a shared vision and philosophy for the teaching of D&T and ICT within a school, children are able to flourish and to frequently exceed the initial expectations of their teachers. The principal reason for this is that in order for creativity to be achieved there needs to be a measure of uncertainty and a level of risk taking. Indeed, without uncertainty there can be no creativity and without risk taking there can be no innovation. Unfortunately there has been no place for uncertainty within our heavily accountable

educational system in recent times and risk taking has been discouraged within an educational climate where certainty and pre-defined, measured outcomes are paramount. Therefore, in order to address this, schools and teachers need the security and 'licence' that are provided by a carefully considered, personal or 'corporate' approach to the teaching of creative capability where uncertainty and risk taking are accepted components of creative work. However, without adequate academic underpinning and the establishment of a carefully considered, effective philosophy within educational communities creativity will be unlikely to flourish.

The rapid development of both D&T and in particular ICT has been accompanied, and to some extent driven, by the increased emphasis which has been placed in recent times upon access and technical proficiency (Ofsted 2002) particularly through the New Opportunities Fund (NOF) training and the DfEE (1997) key document 'connecting the learning society' (Abbott, 2001) as part of the drive to raise standards in schools. Subsequently, it can be argued that this imposed imperative, and its impact upon both the content of D&T and ICT teaching programmes and the methods adopted for their delivery, has often constrained the potential for the development of teachers pedagogical skills and the potential for learners to employ creative methodologies and imagination in the execution of their work.

Both D&T and ICT have evolved during a period of unparalleled educational and technological change and it is perhaps as a consequence of the pace of this change that the current form of these subjects - and the place of creativity within them - can be considered to be confused and ill-defined (figure 1).
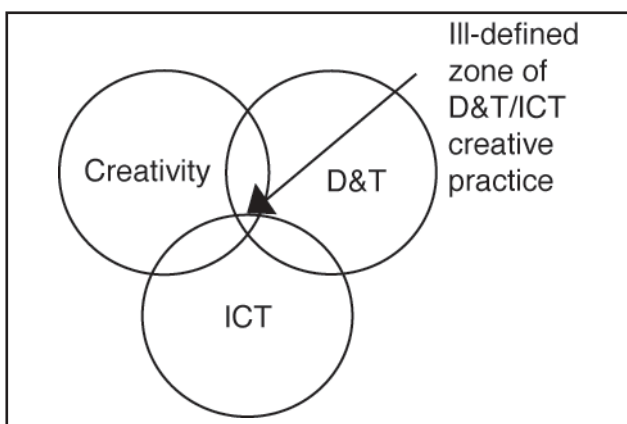

Figure 1: Ill-defined zone of creative ICT/D&T practice

There is also evidence (Downie, 1998; Hopper et al 1999; Atkinson 2000; Davidson et al 2002) to suggest that the focus of much of the work that is undertaken within D&T has become increasingly 'outcome' rather than 'process' led and with insufficient focus upon the development of individual creative ability, high order thinking and design and technology capability. Within the school curriculum this is manifested within both subjects by the evident failure to substantiate opportunities for 'high order engagement' (Harris 2003) within appropriately demanding contexts for learning.

What is now apparent is that both D&T and ICT have developed in parallel (figure 2) within the wider context of design and technology education and recent initiatives including the DfES/ DATA Computer Aided Design and Computer Aided Manufacture (CAD/CAM) and Marconi, DTI, DfES, TEP, DATA Electronic Communication Technology (ECT) initiatives have placed an increasing emphasis upon the application of ICT within D&T. However, such initiatives have done little to promote and enhance the application and integration of ICT to promote the development of D&T capability. This is frequently manifested in a de-contextualised, creativity deprived, sanitised, risk free experience for pupils which may enhance ICT familiarity but does little to engage pupils in activities related to the D&T national curriculum statement of importance. Ultimately this denies an opportunity to learners to work in real world contexts limits high order thinking and denies opportunities for creative strategies to be developed. The consequence is a frequently distorted curriculum which disproportionately focuses upon the development of ICT skills and which denies learners the opportunity to engage in fully rounded D&T activities.
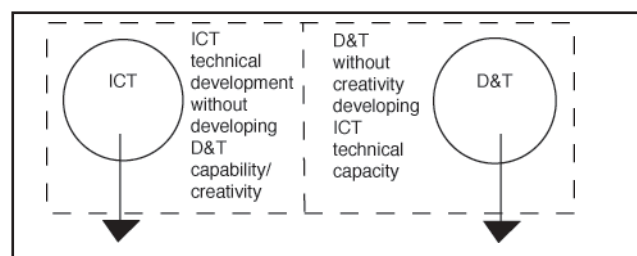

Figure 2: The parallel development of ICT within D&T

The reason for this parallel development of both subjects (at the expense of creative practice) may in essence be to do with the challenge and emphasis placed upon teachers to use new technology and a preoccupation with the development of technical capabilities rather than pedagogical practices. This however begs the

question how do you or should you develop a commonly agreed and universally practised pedagogy for two continually and rapidly evolving subjects? Current practice would suggest that within the context of the current discussion, you do not. The question of how it is possible to drive through such significant and potentially damaging changes to a curriculum without any extensive, prior, or indeed concurrent, consideration of the extended effects and consequences upon teaching and learning is also a question that is worthy of further reflection and discourse.

At present there exists strong anecdotal, rather than empirical, evidence (based upon classroom observations, support materials, discussions with leaders in the field, etc) to suggest that ICT is being employed in schools to provide a measure of 'validity' for educational activities which focus most notably upon CAD and CAM. When examined further, such educational experiences provide little opportunity for learners to challenge the design and technology programmes of study, certainly in terms of developing skills in design. The extent to which they allow children to develop specific skills in new manufacturing technologies is also questionable. In such circumstances ICT is being employed to justify and validate poor practice within D&T rather than to exploit technology to support and enrich creative learning activities.

These observations in no way diminish the commendable effort of the D&T community over the past decade to gain access to ICT resources and to develop their skills in this potentially exciting strand of D&T activity. However, ICT facilities (including CAD/CAM) are often introduced into schools without adequate consideration of how these resources might be effectively employed within a well-considered, thoughtfully constructed and balanced curriculum, which maintains the central aim of developing capability. The inevitable result of such a one-dimensional approach to curriculum development has been the appearance of capability (Ofsted 2002) rather than actual capability being developed. This is unfortunate, as it appears that ICT has the potential to support creative practice within D&T. The speculative proposal offered by this paper is that creativity has the potential to unite ICT and D&T. The resultant model of the curriculum (figure 3) potentially offers learning experiences which value and promote 'the essential disciplines of design' (Thistlewood, 1990) and where creative competence is as prized an outcome of that learning, as is technological understanding. Crucially such a model returns process to its rightful place as the central essential feature of our discipline, one which distinguishes design and technology from other curriculum subjects.
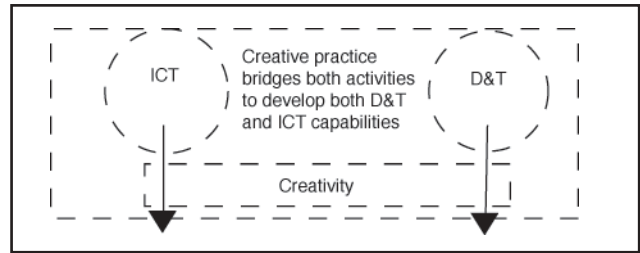

Figure 3: The parallel development of ICT within D&T

A dichotomy therefore currently exists where the use of ICT and new technologies currently provides legitimacy to poor practice in D&T merely because it utilises new technology! The preliminary model proposed (figure 4) represents one way of reconsidering future developments within the ICT and D&T domain. The model represents a way of viewing the complex inter-relationship of creative practice within ICT and D&T and exists purely as a model for future discourse rather than a model for adoption, it represents a starting point in the formulation of a pedagogical dialogue within the D&T and ICT communities. Within this model both D&T and ICT are inter-twined and inseparable, bound together through the application of creative methodologies and contexts that are inherently 'risky'. Emphasis would be placed upon the learner developing capability in D&T through rich and stimulating activities that are placed within demanding and appropriate contexts.
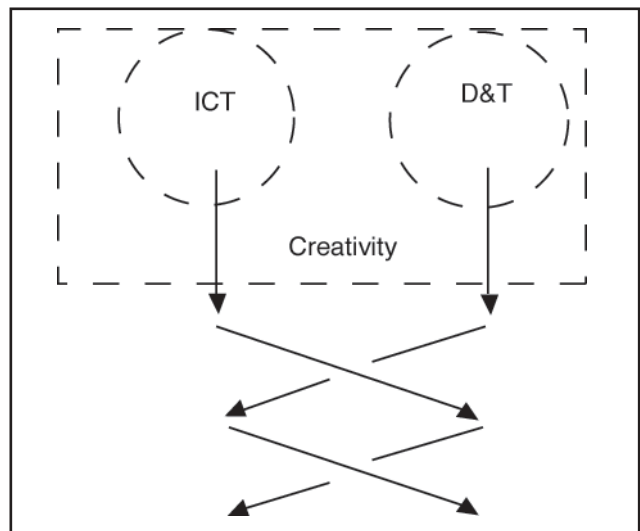

Figure 4: The development of ICT and D&T capability

Conclusion

It is now apparent that the rapid introduction of new technologies, the time taken for them to be embedded into the curriculum and the time for them to impact upon pedagogy (favourably and unfavourably) is increasingly becoming shortened. The consequence of this being that opportunities for reflection prior to the introduction of new technologies have decreased. Both ICT and D&T have suffered from innovation 'on the go' and will increasingly continue to do so as new technologies find their way onto the curriculum via both subjects. It is therefore critical that both subjects are able to establish and stabilise the essential creative opportunities that must exist in new technologies rather than be shaped and constrained by them.

The failure to appreciate an argument for capability will result in a methodology that develops a de-contextualised, creativity free, technical proficiency, with D&T and ICT skills that have limited transferable value and which will be redundant before the child has any opportunity to employ them.

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