WHAT ARE DESIGN AND TECHNOLOGY FOR?

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ABSTRACT
In 2011, a report by the Expert Panel for the National Curriculum review in the UK stated, "Despite their importance in balanced educational provision, we are not entirely persuaded of claims that design and technology (D&T), information and communication technology (ICT) and citizenship have sufficient disciplinary coherence to be stated as discrete and separate National Curriculum (NC) 'subjects'". D&T moved from a statutory NC subject to a compulsory one and became part of the 'Basic Curriculum' (with schools free to determine, "appropriate specific content."). It is now 2014 and the ramifications of this reclassification of D&T have impacted upon D&T-linked curriculum in Higher Education. This paper questions the stated perceived lack of coherence in "D&T" as a subject in Secondary Schools, proposes a possible pathway to understanding a framework for D&T curriculum in Schools and suggests how some of the excellent Higher Education D&T practices and outcomes might be maintained and improved upon if such issues were addressed appropriately. At an absolute minimum, Collini proposes, the modern University might be said to possess at least four characteristics: Provide some form of post-secondary education (more than professional training); further some form of advanced scholarship or research not solely dedicated to solving immediate practical problems; these activities are pursued in more than one single discipline; that it enjoys some form of institutional autonomy as far as intellectual activities are concerned [1]. Before defining D&T as a non-subject, consideration must be given to the excellent tradition of D&T in HE.

Keywords: Design and technology, education ecology, education policy, STEM.

1 INTRODUCTION

In 2011, a report by the Expert Panel for the National Curriculum review in the UK stated, "Despite their importance in balanced educational provision, we are not entirely persuaded of claims that design and technology (D&T), information and communication technology (ICT) and citizenship have sufficient disciplinary coherence to be stated as discrete and separate National Curriculum (NC) 'subjects'"[2]. Between 2003-13 there was a recorded 50% drop in the GCSE numbers for Design and Technology in UK Schools [3].

2 LIMITATIONS OF THE REVIEW

2.1 We are not entirely persuaded ICT has sufficient disciplinary coherence
Ruth Kelly, the then Secretary of State for Education, stated in her foreword to the DfES Harnessing Technology strategy report in 2005, "It is our goal to work towards ICT as a universal utility, creating more flexible learning opportunities for everyone."[4].
In 2006, four key objectives were identified, for ICT in Schools to achieve.
These were:
1. to transform learning and teaching, improving outcomes and sharing ideas;
2. to engage 'hard to reach' learners through the provision of special needs support, motivating learning experiences and increased choice;
3. to build an open accessible system with more information and services online, improving personalised support and choice; and,
4. to achieve greater efficiency and effectiveness through the use of online resources and improved systems and procedures.

Government-funded support for ICT really only began in earnest in the mid-1990s. The development of ICT in schools progressed unevenly across and within schools and technologies. Some seem to be content with achieving the government's targets in terms of numbers of computers and connectivity, while others appeared to be highly innovative, attempting to capitalise on the benefits that ICT had promised [5]. These two cited reports do not represent a comprehensive review of ICT in Schools, but they do highlight and typify many of the issues concomitant with the domain. If ICT was regarded, over a period spanning years, primarily as a universal utility, by the people and bodies responsible for strategy and policy, then it can be argued that a review, at the end of that period, was likely to find that there is insufficient disciplinary coherence for it to be stated as a discrete and separate National Curriculum (NC) subject.

2.2 We are not entirely persuaded D&T has sufficient disciplinary coherence

Bruce Archer and Phil Roberts, in a discussion about the course of work in the Royal College of Art's Design Education Unit in 1979, stated, "Design, like science or scholarship, is the product of a distinctive kind of activity and is governed by a distinctive capacity of mind. Designing and the development of technological awareness, as educative activity, consists in relating and drawing attention to purpose, the self, and the means and significance of Man's intervention in his habitat" [6]. Roberts reiterated sixteen years later that, "Design and Technology are not synonymous. Both are nouns, not verbs. The greatest weaknesses in common usage of these terms are philosophical and linguistic. More precise, and qualified, usage - which would involve careful attention to semantics - would have the effect of removing many common confusions" [7]. In 1999, the National Curriculum (first National Curriculum in England to include "citizenship") stated, "Design and technology prepares pupils to participate in tomorrow's rapidly changing technologies. They learn to think and intervene creatively to improve quality of life. The subject calls for pupils to become autonomous and creative problem solvers, as individuals and members of a team. They must look for needs, wants and opportunities and respond to them by developing a range of ideas and making products and systems. They combine practical skills with an understanding of aesthetics, social and environmental issues, function and industrial practices" [8]. This scenario, unlike the ICT story above, would appear to be an appropriate launching point for D&T as a subject, so what are the reasons for the decline in D&T numbers since that time? The Education Act in 2002 extended the National Curriculum to include the foundation stage. This made the six areas of learning in the foundation stage the statutory curriculum for children aged 3–5. Figure 2 shows the structure and illustrates that D&T was not statutory at KS4 (GCSE) where ICT, and indeed citizenship, were. Schools could fulfil the D&T "entitlement" by providing access to courses in the following areas: product design (including textiles technology, resistant materials technology and graphic products) or manufacturing; food technology or hospitality and catering/home economics; systems and control, electronic products, electronics and communication technology, industrial technology or engineering [9]. There, it could be argued, one might find a major contributory factor, to a review panel's claim that there is insufficient disciplinary coherence for D&T to be stated as a discrete and separate National Curriculum (NC) subject. Textiles, resistant materials, graphics, food technology, hospitality, home economics, electronics, communication technology and Engineering all fell under the D&T umbrella, and that broad spectrum certainly does lack coherence as a subject. Indeed there are parallels with the combination of Information and Communication alongside Technology to produce a utility. "Design" and Technology combined in this context look more like a utility than a subject.

	Key stage 1	Key stage 2	Key stage 3	Key stage 4	
Age	5–7	7–11	11–14	14–16	
Year groups	1–2	3–6	7–9	10–11	
English	■	■	■	■	National Curriculum core subjects
Mathematics	■	■	■	■	
Science	■	■	■	■	
Design and technology	■	■	■		National Curriculum non-core foundation subjects
Information and communication technology	■	■	■	■	
History	■	■	■		
Geography	■	■	■		
Modern foreign languages			■		
Art and design	■	■	■		
Music	■	■	■		
Physical education	■	■	■	■	
Citizenship			■	■	

Figure 1. Structure of the National Curriculum (2003)

3   PROGRESS AND ROADMAP

3.1 The Present

Figure 2, taken from the national curriculum in England Framework document (2013), illustrates the structure of the present national curriculum in terms of those subjects that are compulsory:

	Key stage 1	Key stage 2	Key stage 3	Key stage 4
Age	5 – 7	7 – 11	11 – 14	14 – 16
Year groups	1 – 2	3 – 6	7 – 9	10 – 11
Core subjects				
English	✓	✓	✓	✓
Mathematics	✓	✓	✓	✓
Science	✓	✓	✓	✓
Foundation subjects				
Art and design	✓	✓	✓	
Citizenship			✓	✓
Computing	✓	✓	✓	✓
Design and technology	✓	✓	✓	
Languages[4]		✓	✓	
Geography	✓	✓	✓	
History	✓	✓	✓	
Music	✓	✓	✓	
Physical education	✓	✓	✓	✓

Figure 2. Structure of the National Curriculum (2013)

As can be seen, D&T is not compulsory at Key stage 4, but a development from the 2011 report introduces the concept of four "entitlement areas": The arts (comprising art and design, music, dance, drama and media arts), design and technology, the humanities (comprising geography and history) and modern foreign language

The statutory requirements in relation to the entitlement areas are: schools must provide access to a minimum of one course in each of the four entitlement areas; schools must provide the opportunity for pupils to take a course in all four areas, should they wish to do so a course that meets the entitlement requirements must give pupils the opportunity to obtain an approved qualification. D&T therefore, as one of the four entitlement areas on its own, must therefore be offered. There is evidence that the DISPARATE DEFINITIONS AND SUBSEQUENT DELIVERY OF D&T over many years, rather than the subject itself, has consistently lacked coherence. Notice also that the subject "Computing" has replaced ICT, partly to define the coding (or writing) requirement as well as utility software packages (referred to as "reading" eg Word, Powerpoint, Excel……). The level of knowledge and skills (or lack of) in such a Computing subject, upon arrival at a University to undertake a D&T undergraduate programme also requires consideration.

On February 12th 2012, the pupils of Chesterton Community College ICT class were invited to road-test the long-awaited Raspberry Pi computer, shortly after the incumbent Education Secretary Michael Gove announced he was tearing up the current ICT curriculum, which he described as "demotivating and dull". Technology journalist Simon Rockman countered this argument: "Today's kids aren't interested (in coding). The world has moved on…what makes their applications work or what is inside the black box is as interesting as the washing machine or vacuum cleaner. [10]. This paper proposes that it has been the underlying attitude to, and prescribed culture driving the DELIVERY OF ICT, rather than the ICT subject itself, that lacked coherence.

Science Technology Engineering and Mathematics (STEM) related subjects have been high on the agenda in the arenas of politics, education and the media generally. Of the four, it might be argued, it is "Technology" that is the least clearly defined and, as a consequence, the least championed, represented and prioritised in any of those arenas. There are one thousand nine hundred and fifty five undergraduate programmes currently offered with Design and/or Technology in the title, with forty nine of them having Design AND Technology in the titles [11]. Many of these have a requirement for a D&T A level or equivalent at entry along with a portfolio assessment at interview. Figure 3 is an extract from the KIS statistics for one such programme, the BSc Product Design and Technology at Loughborough University, in July 2012. UG Design and Technology programmes, as delivered by a number of institutes (Loughborough, Brunel, Northumbria) have delivered hundreds of Industrial/Product Design & Technology graduates over decades who have made significant contributions to society in general, UK plc and the people around them.

£25,000

Average salary six months after the course

Typical salary range: £23,000.00 - £27,000.00

Average salary across the UK after taking a similar course

£25,000.00 after six months (salary range: £22,000.00 - £27,000.00)

£27,000.00 after 40 months (salary range: £24,000.00 - £30,000.00)

More on Employment & accreditation c

80%

Go on to work and/or study

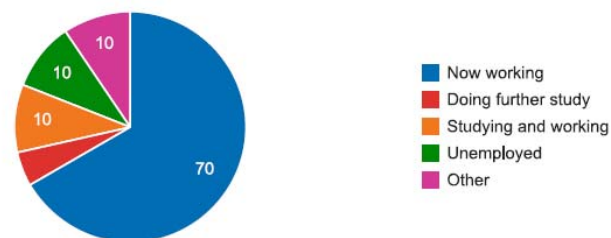This is what students are doing six months after finishing the course.

Figure 3. BSc PD&T Graduate Statistics (2012)

4   CONCLUSIONS

D&T, as a subject in Schools, has proven inherently difficult to define with sufficient disciplinary coherence, and this difficulty has been further exacerbated by historical attempts to include such a breadth of seemingly disparate disciplines under the D&T "subject" umbrella. In HE, there are exemplars of D&T programmes with pedigree dating back more than quarter of a century. Indeed the Design and Technology "subject", relating and drawing attention to purpose, the self, and the means and significance of Man's intervention in his habitat, in an HE context offers a seemingly good fit to three of the four minimum characteristics for a University: to provide some form of post-secondary education (more than professional training) ; further some form of advanced scholarship or research not solely dedicated to solving immediate practical problems and that these activities are pursued in more than one single discipline. The fourth, that it enjoys some form of institutional autonomy as far as intellectual activities are concerned, provides the icing on the cake expected for any subject. In summary, education is an ecology and lifelong in nature. Before defining D&T as a non-subject, at key stage 4 in particular, consideration must be given to the excellent tradition of D&T in HE. The cost of grappling with, and arriving at a consensus solution to, the elusive D&T domain will be repaid by the benefits of talented graduates equipped with the means to engage with and lead the enterprising era facing the globe in the short to mid term. There is an ecology here, and those involved at all stages of education must be aware of the potential impact upon other parts of the system, particularly Design education at HE level, in this instance.

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