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For

The Design and Technology Association, Wellesbourne.

Research Question Cluster Six:

- ***How can learning in D&T help towards building capacity for changing the future economy of the country?***
- ***What is the relationship between D&T and entrepreneurship?***
- ***In what ways does D&T learning help students to develop entrepreneurial competencies?***
- ***To what extent and in what ways does D&T contribute to the development of higher order skills (c.f. 'the hand is the cutting edge of the mind')?***
- ***How does D&T contribute towards creativity and innovation?***

Introduction

> We are in that strange interregnum when the old order has collapsed and the new order is not yet born... The old order has failed; attempts to bail it out, to breathe new life into it or to somehow prop it back up are doomed to history's dustbin. The key is not to limit or reverse the gains that the Creative Class has made but to extend them across the board, to build a more open, more diverse, more inclusive Creative Society that can more fully harness its members' - *all* of its members' - capacities. (Florida 2012a)

> Every single human being is creative. The biggest challenge of the creative age is to lift the bottom up and encourage a prosperous, vibrant and sustainable community for all. (Florida, 2012b)

Three opening observations are offered with regard to this cluster of questions. First, the questions have undoubtedly arisen out of the cultural, economic and political circumstances in which many nations now find themselves. Second, and equally without doubt, Design and Technology (D&T) is a subject capable of engaging with, and educating for, all of creativity, capability, enterprise, innovation and entrepreneurship. (Hereafter, these five words are referred to as the 'key terms'.) Third, were all the industrialists and design and engineering professionals who articulate their support for D&T (for example through the manifesto) to be invited to nominate their own terminology for the focus of the field, there would be little doubt that these words would figure prominently *but* they would do so neither unanimously

nor universally. Thus, these words arguably portray both the spirit of the times and the spirit of the subject. As such they are not capable of *defining* either the field of D&T or what should be taught. Rather, they encapsulate the kind of profile and dispositions that D&T pupils might display after successful graduation from a rich D&T programme.

Signs of the times - three international indices – are we really doing so badly?

The research for this paper led us to three established international indices that correlate strongly with the key terms. Each is significant in its own way and could be further examined if deeper understandings are needed of the international scene and how it is measured.

The Global Entrepreneurship and Development Index (GEDI) (Acs & Szerb, 2011), and the Global Creativity Index (CGI) (MPI, 2011) are derived from data gathered across approximately 80 countries for each index. Meanwhile, the Global Innovation Index (GII) (Dutta, 2012) draws on a sample of 141 countries. In broad terms, the United Kingdom may not be doing so badly according to the three rankings. Presumably, this situation could change – upwards or downwards.

Indices such as these are, of course, a long way from the classroom but they offer rich evidence of the ways that systems and governments view the world whether comparatively or competitively. They display the kinds of measures which can inform policy. Qualitatively, they differ from each other but they are nonetheless credible in also bringing detail to the picture portrayed by the five key terms. If these were used as lenses through which education for the key terms were to be examined, many of the variables engaged by the studies are arguably evident in current good D&T practice (given the resource limitations even in the best of settings).

On entrepreneurship…

The Global Entrepreneurship and Development Index (GEDI) (Acs & Szerb, 2011) ranks the UK joint 14th (with six others) out of 78 countries. Drawing on this work, Autio et al, (2012) discuss in detail the position of the UK against other 30 Organisation for Economic Cooperation and Development (OECD) countries.

The GEDI approach uses fourteen context-weighted measures of entrepreneurial Attitudes, Aspirations and Activities and it looks at these across both individual and institutional activity. Autio et al. (2012) point to the weaknesses the UK displays in the Attitudes domain and especially in the Aspirations domain: 'The UK scored only 23rd amongst the similarly developed economies of the OECD (30 countries) for Aspirations and 30th globally (78 countries). Although the UK scored 13th in OECD for Attitudes, it lagged 26% behind Sweden in this regard.' (Autio et al., 2012:8). The authors comment that: 'A closer examination reveals that the UK's low aspiration score was mostly due to its relatively weak performance in individual-level activity. The UK ranked only 28th (out of 30 countries) in the OECD for Product Innovation by nascent and new entrepreneurs.' (Autio et al., 2012:8).

Salutory commentary is offered when Autio et al. (2012) discuss (with the UK in mind) the interplay of *context* with both individual and institutional entrepreneurial endeavours:

> The GEDI approach recognises that entrepreneurship is fundamentally an individual-level phenomenon: if opportunities were not recognised and pursued by individuals, there would be no entrepreneurship. However, the GEDI approach also recognises that the outcomes of entrepreneurial action are regulated by the context within which the individuals find themselves. If the context does not support entrepreneurial growth, individual-level efforts will be stymied. (Autio et al., 2012:33)

Thus, in education, teachers might develop individuals (pupils) as entrepreneurs but those individuals will flounder if the necessary associated contextual conditions are not in place. Further, not only is the school the immediate context for entrepreneurial development but it, itself, operates within several broader contexts.

On innovation …

The Global Innovation Index (Dutta, 2012) ranks the UK at 5th of 141 nations (in 2011: 10th of 125) . The multiple criteria are rich and complex but two aspects are worth noting here. First, within the 'Human capital and research' category for the UK, the sub-section of 'Education' (non-tertiary) is ranked 38/141 for 'Current expenditure on education' and 64/141 for 'Pupil-teacher ration, secondary'. Second, the UK is ranked 8/141 for the 'Knowledge and technology outputs' and 14/141 for 'Creative outputs'. These output categories each contain twelve sub-sections, which include patent and trademark registrations, royalties, and exports of goods and services.

Innovation is something that is often constructed in ways that take creativity as an underpinning given and the total is then articulated as something worthy of pursuit as an *organizational culture*. Research reported by Keirl (2004) found that:

> There are traits of innovation which, when taken collectively, (as with creativity) point to the importance of establishing a *culture* of practice throughout an organisation. Thus innovation:
>
> - may or may not involve technology
> - uses creativity as a tool
> - involves risk-taking
> - has no reliable processes or measures of success
> - involves a leap of individual or collective imagination
> - happens in all organisations – public and private
> - is not the sole prerogative of research and development teams
> - is more than just new products but challenges current practice
> - is not simply 'new ideas' but must add value
> - is, in many respects, quite ordinary, good sense, unsurprising
> - infuses the ability and the will to innovate throughout an organisation
> - is anything but business as usual
> - may be innovation for some but old hat for others
> - is the monopoly of no individual
> - has no necessary relationship to funds invested. (Keirl, 2004:153)

The changing nature of 'industry'…

For a variety of historical reasons, Design and Technology remains susceptible to a particular 'pull' towards the technologised industries of production (of material goods). However, it is hard to delineate

where different technologies and their related practices begin and end. It is important to remember that all technologies have their cultural, social and political dimensions. Equally, the term 'industry' must be seen in its various guises. For example, Hesmondhalgh (2008) discusses the confusion, theoretical and otherwise, between the phenomena of *cultural industries* and *creative industries*. In whatever form differing 'industries' are categorised, each makes use of particular technologies, practices, skill-sets, and people.

Hesmondhalgh (2008) reports the emergence in the mid-1990s of the related concepts of *creative cities* and *creative clusters* (both 'contexts' or environments conceived to foster entrepreneurial development) and the strong link being established between such concepts and the economy. These ventures were lauded as the way out of economic inertia for communities, cities and countries alike (see also Florida 2003, 2005 on whom Hesmondhalgh offers some critique). In broad terms, Hesmondhalgh reports the transition from times of subsidies and grants for the (high) arts in essentially elitist ways to times of culture-arts-creativity as *industry,* that is, as functions of economy, 'workforces' (rather than artists, craftsworkers, etc) and production.

Hesmondhalgh (2008) draws on Howkins (2001) who claimed that: '…"the creative economy will be the dominant form in the twenty-first century" '; and who defined, '…the creative economy and the creative industries as those involved in intellectual property…(including)…those based on copyright…(as well as)…those industries that produce or deal in patent.' (Hesmondhalgh, 2008:560)

On creativity…

The Global Creativity Index (MPI, 2011) ranks the UK at 13th overall out of 82 nations.

> The Creativity Index…combines the three T's (Talent, Technology and Tolerance) to create the index. The three T's are made up of indexes such as: visible minority, foreign born and gay/lesbian population share for Tolerance; a Tech-Pole index and patents per capita for Technology; and Creative Class occupational share and educational attainment for Talent, amongst others. (MPI, 2012)

For each of the 'three Ts', the UK is ranked 18th for Technology, 19th for Talent, and 11th for Tolerance.

The research is grounded in the work of Florida (see various references below) who argues for a form of soft capitalism and who has, separately, entertained some criticism for his earlier work (see Wikipedia

reference which itself must be treated with caution, as well as Hesmondhalgh, 2008). Nonetheless the MPI and Florida work is significant and influential. Florida (2003) is encompassing in his conceptualization of the 'creative class', which he subdivides into a 'super-creative core' and 'creative professionals' (Florida, 2003:328). (It is rewarding to see teachers and educators identified as members of the super-creative core of the creative class.)

The more recent MPI (2011) work affirms the Creative Class as embracing educators and as being a driving force in sustainable economic growth. So encompassing is this class that it is deemed to make up '…40 percent or more of the workforce in 14 nations.' (MPI, 2001:iv). The UK is 11th in the Creative Class indicator of the Global Creativity Index.

Broader social impacts

With regard to all three of the indices it is important to remember that, despite current times and the highlighting of the economy as the key consideration for a nation's wellbeing, there is always a greater (and arguably more important) picture to consider. The United Kingdom is a country of considerable social inequality (Wilkinson & Pickett, 2009) and D&T does its best to address this by respecting student aspirations, developing confidence, embracing diversity and considering inequality of provision – technological or otherwise. The benefits of educational engagement with the study and development of any of creativity, innovation, entrepreneurship, capability or enterprise might well be considered in light of more than economics. In this vein, when discussing creativity and prosperity, the Martin Prosperity Institute based in the University of Toronto notes that:

> Nations that score better on the 3 Ts not only have higher levels of economic output but also higher levels of human development and happiness. We also find that the GCI is associated with greater economic equality—nations which score higher on the GCI have less inequality. Our findings suggest that there are two distinct paths available to greater economic competitiveness. On the one hand, there are nations like the United States and the United Kingdom, where higher levels of economic output and competitiveness occur alongside higher levels of inequality. On the other hand, there are a greater number of nations like Sweden and Norway, where high levels of economic output and competitiveness occur alongside far greater equality. This suggests a high-road path to sustainable prosperity, where the fruits of economic progress are broadly shared. (MPI, 2001:v)

This finding brings us to the significant matter of understanding and using concepts such as any of the key terms *in their fullest sense.* By this we mean that terms can come into vogue and common usage for little

other reason than being political rhetoric or as catchcries of appeals to what is deemed by some to be 'common sense'.

All of the key terms have some degree of research literature and histories to them and professional educators always benefit from the deepest possible understanding of what is meant by a key term and how it can be put to use. Through deeper research, critique and new knowledge inform best practice and help protect quality education from superficiality and short-term thinking. By way of illustration, one of the key terms - creativity - can be shown in its richness.

Key terms as whim or wisdom - 'creativity' as a case study…

If one of the key terms were to be nominated as both educationally worthy and as a condition of the success of the other terms it would be creativity. Deep and original speculation on its cultural significance in the world began with the likes of Mumford (1934) and Koestler (1975). The latter suggested that creativity could be understood to be significant in three ways – for the person (as fulfiment and achievement), for society (for wellbeing and growth), and for humanity at large (as evolution).

From a huge literature that has emerged from many disciplines over the decades, the meaning of creativity can be seen to be at once both pervasive yet elusive. (For this reason alone it is surely at the very heart of a subject whose name draws on two equally challenging concepts – design and technology.) From a psychological perspective there is the work of Vernon (1970), Boden (1992), Gardner (1993), and Csikszentmihalyi (1997); from the sociological there is Florida (2003); from the anthropological, Diamond, (1998); and from the organisational there is that of Whyte (1960), Drucker (1985), and Pugh (1990). These approaches (along with the political and philosophical) and their inter-relationships with education are discussed in more detail in Keirl (2004).

It is especially the case with *creativity* that the phenomenon permeates human activity, organization and existence in many ways. Its reduction to something merely instrumental is perhaps more telling about who would portray it that way than being a fair representation of the phenomenon in all its richness. It is worth noting the following from the Preface to Hong Kong's application of the Creativity Index:

> The Confucian Wang Yangming (1472-1528 A.D.) of the Ming dynasty advocated the consistency of knowing and doing in personal spiritual cultivation. By the same token, our action in the public sphere should be in-phase with the collection of information in order to understand ourselves and the outside world. We would then know our strengths and weaknesses and take appropriate actions.

> Starting with the local context and covering human, institutional, social and cultural capitals, the Study on Creativity Index assesses in a holistic way the capability of the Hong Kong community to innovate. (Ho, 2005:7)

In whose interests? The case of education, enterprise and entrepreneurship

As with Koestler's (1975) tripartite approach to creativity, so the educational engagement with the key terms can be viewed. It is reasonable to assume that, whatever the nuanced meanings of the five terms, each can have meaningful educational value at a personal level for the student, at an institutional level for the school and the community it serves, and for society at large. In fact, all of the key terms can be contextualized and, indeed, have their aims and meanings clarified by answering the question of whose *interests* are being served. This is one of the classic areas of contestation in the field of education.

So far as enterprise and entrepreneurship are concerned, a standard spectrum of interests would include: the 'economy' (a not unproblematic term), businesses, society, communities, and, far from least, pupils themselves. Many governments and businesses will frame enterprise and entrepreneurialism in terms of profit, jobs and the economy. However, the needs of charitable organisations or communities might be configured quite differently. As is ever the case in education, the issues can pivot around differing views on: what counts as general education; arguments over which 'subject' should take the lead on enterprise and entrepreneurial education; and, just what exactly are the skills of enterprise and entrepreneurialism. On this last, searches of the websites of such organizations as *Young Enterprise* and *Global Entrepreneurship Week* are quite unhelpful. The assumption would seem to be that *everyone knows* not only what the associated skills are but also what is actually meant by them.

Explorations of the promotion and rhetoric surrounding enterprise and entrepreneurialism in education show a mixture of understandings, a strong concern for the workplace, economics education, employment education, how to take up work 'challenges' as well as (often posited as being exclusive of each other) learning how to start and run a business or, more simply, learning about business. Drawing on the phraseology of some of these sources, the difference would seem to be between 'learning how to make a job rather than take a job' and 'learning how to take a job rather than make a job'. Matters are compounded when the DFE reports that:

> The UK is unusual in its approach to Enterprise Education, encompassing a broad range of skills and attributes that make an individual enterprising. Most countries focus on entrepreneurship education, driven by a perceived need for more business start-ups and a more entrepreneurial

economy.

> Consequently much of the research evidence concentrates on indicators of entrepreneurial intent and capability (a subset of enterprise in the UK context), with the development of broader enterprise skills seen as a collateral benefit rather than an aim in itself. (DFE, 2010:2)

This can be set alongside a DCFS (2010) statement on what students can expect from enterprise education and enterprise capability. The financial-business-economic focus is unequivocal as is the heavy onus placed on the teacher in the last sentence:

> Enterprise education consists of enterprise capability supported by better financial capability and economic and business understanding.
>
> Enterprise capability
> Enterprise capability is the ability to be innovative, to be creative, to take risks and to manage them, to have a can-do attitude and the drive to make ideas happen. Enterprise capability is supported by:
> - financial capability which is the ability to manage one's own finances and to become questioning and informed consumers of financial services.
> - business and economic understanding which is the ability to understand the business context and make informed choices between alternative uses of scarce resources.
>
> These descriptions underline how much Enterprise Education can give to students. They add up to confident, financially mature and self-sufficient young people who can progress through to adulthood able to recognise and grasp any opportunity that comes their way. Your role as a practitioner in bringing this to life for your students cannot be underestimated. (DCFS 2010:6)

Two further extracts from these governmental statements point to a serious lack of theoretical underpinning to such policy development. First from the DFE (2010) on enterprise education as teaching:

> Enterprise can be woven through every lesson and research *(not cited SK/AB)* shows that an enterprising approach to teaching encourages pupils to be enterprising too. At the heart of an enterprising teaching style is:
> - learning by doing;
> - facilitation of learning, rather than instruction;

- team-oriented and problem solving activities; and
- combinations of activities that appeal to student's different learning styles (visual, auditory and kinaesthetic).

This style of teaching enhances pupils' engagement with their lessons, and can improve their classroom behaviour and performance. (DCFS 2010:16)

And from the DFE's (2010) own evaluation report:

Critical Success Factors

Schools approach planning and delivering Enterprise Education in different ways. This evaluation has highlighted a number of 'critical success factors' that appear to be facilitating good enterprise provision. This appears to be founded on support and involvement from the Senior Management Team (SMT). Once this is in place, a series of actions are generated that further develop provision. These events comprise:

- Support of the SMT
- Enterprise Co-ordinator with dedicated time (usually accompanied by a strategy/policy for Enterprise Education)
- Time in the timetable
- High priority in the curriculum
- Time and resources for employer engagement
- Combination of external provision & embedded in curriculum
- Enterprising way of teaching (learning by doing)
- Relevant Continual Professional Development (CPD) for teaching staff
- Measurement of the impact of activity
- Reviewing sustainability (DFE 2010:3)

Nothing that appears in either of these statements is anything more than standard pedagogical and change management practice for the professional teacher. The first is merely a (partial) statement of good teaching practice while the second (with minor topic vocabulary changes) is merely a summary of what should happen when *any* curriculum innovation occurs. They make very disappointing reading for 21st Century education charged with addressing the five key terms.

Organisational theory, innovation theory and entrepreneurship theory all point to the need for institutions themselves to reflect and practice that which their policies and missions advocate. At this point an irony emerges and it may be summed up thus: best-practice D&T will already be doing as much as (if not more than) any other area of schooling to meet the aspirations of an education that delivers on all five key terms. Meanwhile, it is policies, cultures and other areas of schooling that must change (possibly modeling themselves on D&T-in-action).

Good D&T practice already includes: creativity in *all* its guises; risk engagement and management; resourcefulness; optimism in the light of setbacks; management of time, resources, change, people, and uncertainty; a can-do mentality; making ideas happen; teamwork, collaboration, and cooperation; being critical; and, in passing, learning by doing.

We would suggest that D&T practitioners are already extremely well placed to meet the issues *implied* in the cluster of questions with which this paper seeks to engage. We urge that the professional repertoire of such practitioners be strengthened, celebrated and promulgated across the profession. One simple way to do this is to foreground 'the D' of the subject's title and to let the 'T' share the limelight. In 1999 Roberts and Norman argued for '…the centrality of the notion of Design as lynchpin for curricular aims, and the recognition of "creativity" as entirely usual.' (Roberts and Norman, 1999:244). More recently the RSA has stated:

> 'In theory, and especially if you ask designers, design has the potential to unlock a practical competence, a critical spirit and a creative, resourceful optimism in young people. Teaching them design should enhance their ability to learn, respond creatively to challenges, and actively participate in society's evolution.' (RSA, 2011)

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