

FIRM FOUNDATIONS – BUILDING FOR THE FUTURE

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Abstract

Design and Technology (D&T)/Technology education in our rapidly changing society has never been more important. The skills, knowledge and understanding that are at the centre of this subject prepare young people for their future lives in so many ways. However the foundations that need to be put in place in primary education are often ignored either through ignorance or lack of interest at this crucial stage of young people's development. Unless the building blocks are in place then future progress inevitably will suffer. This paper seeks to identify some of the key issues that can affect the development of the subject in primary settings and offer some possible solutions to the identified problems. D&T/Technology is used throughout to signify that this is same subject, with a similar philosophy, in most countries; it is not centred on computers or just making. 'Practitioners' is used as a term that encompasses teachers and adult workers in primary schools.

Introduction

It is more important than ever that young children are prepared adequately for the world beyond school in the rapidly changing society of today. However the importance of primary education (3 – 11 years) in this process too often appears to escape the understanding and consideration of policy makers, educationalists working outside primary education, business and industry. As the first National Curriculum for England was being created in the late 1980s, the Design and Technology (D&T) Working Group under the leadership of Lady Parkes (1988) consisted of those from business, industry, secondary and high education backgrounds but no one with a real understanding of primary education was included. The belief that true education begins at the age of transfer from primary to secondary education is continuously promoted; visions of young children 'playing' their days away in primary schools or more recently, focusing on literacy and numeracy are projected; there is more status attached to teaching at levels beyond primary ones, often indicated by pay structures; curriculum development initiatives are often introduced at the secondary level; and numerous research projects, conferences and Continuing Professional Development (CPD) programmes focus on secondary and tertiary age groups. In research undertaken in relation to exploring 'Bridging the Gap' between primary and secondary education, Benson (2009) found that the majority of secondary D&T teachers interviewed had little understanding of the nature of primary education or D&T within the primary setting and therefore had no clear vision as to the ways in which the children's experiences could, or should, be built upon. These findings compare to others' work relating to primary education including Hargreaves and Galton, (2002), Capel et al (2003), Braund and Driver (2005) and OFSTED (2011). Although qualifications for teaching in primary schools are being upgraded around the

world, there was, and still is, the notion that primary teachers do not need a high level of study; it is not considered important that they should have studied at a greater depth to put in place a rigorous curriculum. A study of the recent major funded D&T projects in England shows that almost all were focused on those in secondary or tertiary education, with the exception of the Designerly thinking project (Benson, 2003, 2005), Butterflies in my Tummy project funded by National Endowment for Science, Technology and the Arts (NESTA) (Benson and Lunt, 2009) and Food in schools project, funded through the Department for Education and Skills (DfES). In relation to research, Harris and Wilson (2003) undertook a review of publications over a 10 year period, and this together with a review of conference papers published in, for example, England, Australia, Netherlands, New Zealand, South Africa highlights that primary D&T/Technology is under represented. The rationale for the creation of the Centre for Research In Primary Technology (CRIPT) and its biennial research conferences, started in 1997, was to give primary D&T a voice. Of course, it is only one of many subjects that primary teachers deliver in the classroom but nevertheless all this evidence should be considered when future research and curriculum development projects are funded.

In reality primary education forms the foundation upon which all subsequent educational experiences are built. Thus it is vital to identify the key issues in D&T/Technology education that, if addressed, will enable primary children to undertake activity that provides a firm foundation on which future D&T/Technology can be based.

Key issues

There is not an agreed group of issues that have arisen from the implementation of a D&T/Technology curriculum worldwide. Countries need, of course, to consider their own values and appropriate contexts within which to develop curricula but I would suggest that there are some key issues that can be identified and that would resonate with many, if not all, countries. It is crucial that all those involved with this subject area have a clear vision of what is involved and can relate the identified issues to their own work.

Understanding the nature of the subject

It may seem unnecessary to include gaining an understanding of the nature of the subject as the first key issue but unless the understanding is there, it is difficult to see how the subject can be planned for and implemented. Primary D&T has been in the English curriculum now for just over 20 years. One of the first activities that I still undertake with primary teachers/educators regardless of the focus of CPD is to ask them to put forward their ideas as to the nature of the subject. There has been a better understanding over the last few years; however it was not an instant change as the subject was introduced. Furthermore, data that was gathered from 2 major projects - one with Foundation Stage (3-5 years) practitioners (Benson, 2003) - and one with secondary teachers (11-18 years) (Benson, 2009) clearly indicated that there was still a lack of real understanding as to the nature of the subject with practitioners. A popular misconception

among both groups of practitioners was that making was at the heart of the subject and that, for example, designing, exploration of materials, and evaluation was peripheral, if there at all. This finding was particularly surprising in the case of secondary teachers, most of whom had studied the subject to degree level and were teaching students to examination level in their schools. The New Zealand curriculum has clear statements as to the nature of the subject, as does the English curriculum, but it is a 'must' that the understanding exists. It is therefore crucial that exemplification of the nature of the subject is given to support the words in documents. 'Key essentials' that should be included in D&T/Technology have been identified and modified over the years in England and used by those involved in the planning and delivery of the subject. This has culminated in the 'Key essentials' being published and placed on the Design and Technology Association (UK) website (www.data.org.uk) so that there is a consensus to use as a starting point. It is interesting to note that these are in the primary section – no such clarification exists in the secondary section.

I would argue that it is equally important that primary aged children have a clear notion of the subject. They need to understand its nature so they can engage in a more meaningful way with the activities. Little has been researched about primary aged children's perceptions of education and D&T/Technology in particular but more recently there has been a realisation of the importance of understanding, and taking into account, the children's viewpoint. (Rudduck and Flutter, 2004 McIntyre et al, 2005; Benson and Lunt, 2007) Certainly it is an area that deserves more attention

Valuing the subject

If the subject is to flourish in schools, then the importance of valuing the subject by both children and practitioners should not be underestimated. If something is valued, then it is loved, nurtured, and grown and in turn this is transmitted to others. Certainly in England and other countries there is much work to be done in helping to educate not only educators but the wider community as to the value of the subject. There is still a perception in England that D&T is about 'sticking boxes together' in primary schools and in secondary schools 'making a book end'. (Data collected from CPD courses). The subject provides contexts within which authentic tasks can be carried out, and allows for the application of knowledge from a range of subjects. It supports the development of, for example, creative, critical and evaluative skills, personal attitudes that are important throughout life, and knowledge and understanding that helps young people to understand the rapidly changing technologies in the designed and made world – all important from the beginning of schooling. One example from New Zealand that was reported on (Coburn, 2003) exemplified for me the real relevance and lasting learning that D&T can bring and the importance of including all children from a young age in appropriate activity. Children in this rural school built and furnished a house and Coburn reported on the positive lasting effects of this activity in their future lives. It is a subject that is relevant to a child, whatever path s/he chooses. Time needs to be given for D&T/Technology within the curriculum to ensure that all elements can be undertaken and that children have time to think through their actions. It is

interesting therefore to note that research findings (Benson and Lunt, 2007) linked to primary children's perceptions on D&T indicated that they enjoyed D&T – in fact it was always in the top 3 subjects, if not the top subject. This was despite some of their teachers indicating that although they did teach D&T they found it 'difficult', 'hard work' and were less than enthusiastic about teaching it. It is important to remember that primary teachers have to teach a wide range of subjects whilst those in secondary schools are usually teaching a subject that they have always enjoyed and studied to a higher level. However if the subject is to flourish I would suggest that more has to be done to promote the value of the subject through understanding both within and outside the school community.

Teachers' confidence in their subject knowledge

From the time of the introduction of D&T into the English curriculum, there has been clear evidence (OFSTED, 1998, 2002, 2003, 2007) of the importance of teacher subject knowledge to enable the planning and delivery of appropriate activities. OFSTED has identified the lack of subject knowledge as a key factor in the poor delivery of the subject in primary schools. Practitioners need the knowledge and understanding to be confident in their teaching. This issue is not confined to England. In a recent report (OFSTED, 2011) the importance of teachers having appropriate knowledge and understanding was highlighted by other countries such as Australia, Finland and Singapore. To be able to teach effectively, practitioners need to feel confident that they are able to support in-depth learning, even in the Foundation Stage (3-5 years). There is a need to be able to take learning further – taking into account the different depths of learning at all ages and stages of development. It is becoming clear in England that now that primary schools are once again moving towards a theme/topic based approach to curriculum planning, to make subjects 'fit' the theme/topic, activities are being planned that do not support the integrity of the subject. Many schools are reverting to a 'make activity' rather than a design and make and examples of inappropriate practice include, lighting a Victorian house, making Greek sandals, and making Roman jewellery. From data collected from CPD courses, I have found that many practitioners do not have the confidence in their own expertise to question whole school planning of these inappropriate activities and thus the integrity of the subject is being lost.

Attitudes

Confidence in subject knowledge has already been identified as an important element for practitioners. However to be able to plan and teach effectively it is important to be open minded and flexible, which requires a different type of confidence. It is necessary to be able to take risks, to not always feel in control of a situation, and to be prepared to change track or activity as the children's work progresses. This is not always easy, especially for those who feel more comfortable teaching in a didactic way, where the outcomes are pre determined and there is a set track on which the children progress. Time is often the issue here and practitioners, both primary and secondary, have identified that allowing children freedom is often a luxury that appears to be impossible as timetabling is rigid (Benson and Lunt 2007, Benson, 2009).

Certain attitudes need to be fostered that will help not only in the personal and social development of the child but in the development of knowledge and skills. The statement ‘all children are curious’ is I believe not true. Children at a very young age may naturally start to explore their designed and made environment but unless this attitude is nurtured, it will not continue. Unless children are encouraged to wonder, to question and to be excited by the world around them, they will lose the enthusiasm for exploration, for questioning and for investigation. There is much evidence that not all the apathy of some secondary children is due to their stage of development. To keep this curiosity alive, practitioners need to encourage the children to investigate further, to observe more closely – to persevere in their investigation and to ensure that projects are judged authentic by the young people. In an age when communication is of the moment, children are becoming used to instant answers and quickly move on from activity to activity. Linked to perseverance is the ability to think both critically and creatively about their actions and those of others. To support this development, children need time and to feel that they can share ideas and that these will be listened to and valued. The importance of social and emotional aspects of learning have not been placed at the forefront of educational issues in many countries and it is vital that children feel able to communicate and share ideas in a supportive environment, particularly in D&T/Technology as there are no right answers. There are many solutions that can be considered the ‘best’ depending on the criteria against which they are being judged (Humphrey et al 2008; Benson and Lunt, 2009). In this supportive environment it is then possible for children to work together with others to share ideas and then to either continue on their own path or work together to a common solution.

Knowledge and understanding

If children are to design creatively then they need to have appropriate knowledge and understanding to be able to realise, at least in part, their ideas.(Nicholl, 2004; OFSTED 2010) Certainly children cannot be creative without knowledge and understanding. The practitioner should always be aware of possible gaps that might need to be covered either for the whole class, groups or individuals. There has been a world wide debate as to what content should be included in a curriculum and each country has made its own decisions, in the main based on the country’s values, culture, and economic situation. For example New Zealand has chosen to include biotechnology as part of D&T /Technology together with South Africa and Singapore to reflect in part the importance and place of agriculture in everyday lives and the economy. Knowledge and understanding is identified in the National Curriculum documents of countries but it has to be realised that there needs to be practical clarification for most practitioners between documentation and the understanding needed to be able to teach for example mechanisms to 4 year olds. Children also need to know how to use and then choose appropriate tools, equipment and materials in order to realise their designs. Choice is vital if children are to be creative and find their own solutions but this can be threatening for the practitioner if s/he accepts that there is no one solution.

Delivering the D&T/Technology curriculum

At this time in England there is much debate about a new primary curriculum, due to be implemented in September 2012. Consultations are taking place and one of the main issues is the importance of subjects and their associated knowledge versus a thematic/topic approach. It appeared at first that traditional subjects will be favoured together with the teaching of these but the Government's position is less than clear. Certainly Robin Alexander's review (2010) of the primary curriculum is being looked at favourably. Specialists are advocated, subject expertise really matters, and the children's voice is used. The children identified their interest in pedagogy, their desire to have teachers who know their stuff, who explain things in advance so they know what a lesson is about, make sure the steps put in are not too large, and give the children records of what they have learnt. Schools though had started to make changes to the delivery of the curriculum before the new Government came to power May 2010 and had taken note of the Rose review (2009), that would have formed the basis of a new National Curriculum if Labour had won the May 2010 election. This has resulted in many schools choosing to adopt a thematic/topic approach. From data gathered on CPD Masters in Education level courses nationwide over the last 2 years, it is very apparent that this way of organising the curriculum is leading to the demise of the integrity of subjects and in particular D&T/Technology. Putting subjects together under an umbrella title does not automatically ensure that there is rigour in the subject matter as well as in the development of skills. There is already much research evidence that children do not necessarily transfer skills and knowledge from one context to another and whilst this research has mainly been carried out in secondary schools, it needs to be taken into account in primary schools.

Support

As so many primary teachers have little background knowledge of D&T/Technology, worldwide there is an issue related to both Initial Teacher Education (ITE) trainees and CPD for practitioners. After a surge in the growth of specialist D&T ITE courses in England in the mid 1990s and into 2000s that produced some excellent practitioners in D&T, the Teacher Training Agency (TDA) decided that not all foundation subjects needed to be included in the ITE curriculum. Thus trainees could opt for Art or D&T if Institutions chose to adapt their courses – and many did. Funding for CPD for practitioners was also cut after long courses were funded in the 1990s. The TDA however has supported courses at MA Ed level that are part funded. For over 10 years such courses in primary D&T have been accredited by Birmingham City University and delivered nationwide by local tutors. The impact of these courses was graded outstanding by OFSTED but they still only reach a very small proportion of practitioners. Short courses can have positive impact but only if the course is part of the school development plan and is prepared for and built on. South Africa started to provide excellent teacher support in the late 1990s as their Technology curriculum was introduced but as often happens, cuts in funding meant that this could not be sustained.

When reviewing the introduction of D&T/Technology education into countries worldwide a pattern emerges. Documentation is created and distributed but appropriate, practical resources are not developed and made accessible to practitioners until a much later date. In, for example, Chile, England and South Africa teachers were expected to interpret documents that were not written in a clear, practical way using terminology familiar to primary practitioners. An exception was Bahrain, where the introduction started with the youngest children, schools and teachers were introduced to this new subject through a rolling programme, and resources and exemplars of good practice were available at the commencement of the delivery of the subject.

Primary practitioners have a wide range of subjects to teach and few have a specialist background. My research has found that practitioners in different countries want paper based practical guides, containing background knowledge and understanding, information about what tools/equipment and materials can be used and how to use them, and exemplars of D&T/Technology in action. Of course, more and more electronic resources are being produced partly because of cost and as practitioners become more familiar with them they will prove invaluable. An example of a successful website can be seen at www.foodafactoflife.org.uk. The British Nutrition Foundation quickly realised that primary practitioners wanted a site dedicated to them, where they knew that there was practical, understandable and relevant advice about all aspects of the delivery of food technology in the Foundation and Primary phases. It has become the favourite 'one stop shop' for all aspects of planning and implementation. However, it should be remembered that busy practitioners do not have time to browse a number of websites for each subject they teach, and in the recent OFSTED report (2011) inspectors in England highlighted the fact that teachers and governors did not know where to find relevant resources for support, despite the publicity for key websites such as data.org.uk. The Techlink site in New Zealand provides much support and it is to be hoped that this is known in all schools.

Addressing the issues

Identifying issues is not difficult but it is the identification and prioritising of actions to be taken that is the stumbling block. I would suggest that the following are some key actions that would then allow for the development of excellent practice in primary D&T. Funding will always be an issue but it is vital to have a vision and a game plan that can be gradually, successfully undertaken.

At a national level

There needs to be a real understanding of the nature of the subject, the realisation of its value and a commitment to producing documentation that is clear, relevant and is not in a state of constant change. There need to writers/consultants that have a good understanding and experience of primary education and teaching, and practitioners need to be involved.

There needs to be a national programme of CPD that all schools can access, some of which should be face to face and include practical skills development.

There needs to be an active National Association (or equivalent) that can update, provide support and act as a sounding board at a national level.

Inspectors need to have a clear understanding of the nature of the subject in order that they can provide accurate and supportive ways to take forward schools and provide a national picture of D&T/Technology education.

At a school level

Head teachers/principals need to understand and be supportive of the subject if it is to flourish in a school.

There needs to be a clear understanding of what has gone before and what comes after each stage/phase of education. This can be achieved through liaison (face to face and electronically), visits to different schools, reviewing resources including websites and publications and auditing the children through a short activity or project as they move from phase to phase. Secondary teachers would have a role to play in supporting their primary schools in ways that are most appropriate for them. For example SKYPE enables communication between practitioners, between students and between students and practitioners.

There needs to be a mechanism whereby all practitioners have a clear understanding of the subject, whole school planning can take place, expertise is shared, and practitioners can readily access support materials and resources during the planning and delivering of activities.

In the wider community

It should be remembered that many adults will not be familiar with the nature of the subject. Parents may not have studied D&T/Technology in their primary school; those in business and industry can be confused and think the subject is linked to computers, or manufacturing.

Parent workshops, leaflets, displays in local community buildings and shopping malls have all proved useful in helping understanding. Invitations to local businesses, industrialists, and retailers to support challenges, to attend D&T/Technology events may stimulate interest and action.

Support mechanisms

There needs to be available a range of resources but that support the integrity of the subject. The resources would prove valuable if they were on a continuum so that practitioners can see what has gone before and what is to come.

Final thoughts

The Key Competencies identified in the New Zealand National Curriculum are at the heart of a stimulating D&T/Technology curriculum. If all young people are supported in the development

of these through D&T/Technology activity in school they will be well prepared for their future lives whatever avenue that takes. Of course they will gain much more through their study of Technological Practice, Technological Knowledge and the Nature of Technology. They will have an understanding of the designed and made world and of products and the issues that surround their design and manufacture and they will have skills that will help them to be discerning consumers. It may seem as though there is a mountain to climb but it is possible. In the recent OFSTED report (2011) in England it was exciting to see the improvements in primary D&T/Technology where teaching in design and technology was good or outstanding in seventy two percent of the schools visited and in none of them was it less than satisfactory. A decade ago over half the teaching was deemed to be satisfactory, unsatisfactory or poor. Children's achievement was good or outstanding in three fifths of the schools visited. It is a tribute to the tenacity and resourcefulness of primary teachers that these improvements have been secured, often with very limited training opportunities and resources.

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