Back to the Future: Where next in a world of cross-curricular primary education?

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Abstract
This article is an interim report on a research project concerning the place of Design and Technology in selected primary schools at a time of curriculum change. There is a particular focus on the influence of the processes surrounding acts of designing as they may impact on the wider curriculum. The process of design may have wider applications in a future curriculum which will embrace features such as "creativity" on a more intensive scale than hitherto. It may also become diluted as subject focal points become less obvious.

This study is focused on student teachers and serving teachers in what are termed "Partnership" schools. Partnership is an arrangement by which Canterbury Christ Church University establishes secure training platforms with schools. Teacher education students may thus undertake their placements in appropriate and controlled surroundings in order to develop and practise their teaching skills and become rounded and successful teachers. Partnership schools receive a succession of primary education student teachers throughout the school year. Generally the placements become longer as the student teachers progress through their studies.

It is the case that many of the schools within the "partnership" arrangement with the Faculty of Education at Canterbury Christ Church University are moving towards cross-curricular approaches to learning and teaching. For research purposes, they are an accessible stock of schools within which trends in the shifting curriculum can be identified and have been treated as an opportunity sample for research purposes.

Key words
cross-curricular, primary education,partnership school, designing, project work

Introduction

I need to declare my own interests and concerns as they impact on the narrative concerning the reporting of this project. These concerns colour both the nature of the research questions and the ways that data has been captured and analysed.

I have a commitment to the field of design and technology education and a belief that designing and making things should be an essential and integral part of the primary curriculum.

It is my belief that acts of designing concern the modelling of possibilities (Parkinson, 2007). This accent on the shaping of future possibilities reflects I believe the wider scope of human ingenuity. For me, technological activity and thought requires acts of making, modelling, modifying, mending and manipulating our world. These, the "Five Ms" are I believe, fundamental technological traits and help define humanity itself. They naturally embrace acts which carry the significance of physical modelled forms and accompanying cognition through design ideas with their higher order activities such as reflection and synthesis.

The concerns about the future curriculum which have prompted this study are summarised in the following key issues:

- Will design and technology be subsumed by topic or project work? If so will it lose its identity?
- How will we continue to understand the place of designing and making in a curriculum which will have breadth and cross-curricular links, at the expense perhaps of depth and a philosophical accommodation and commitment to the notion of the "Five Ms" concerning making, modelling, modifying, mending and manipulating?

Discussions within the University have revealed similar concerns about the emerging primary curriculum. Jonathan Barnes, a colleague in the Faculty of Education at Canterbury Christ Church University has made his own independent research into this area. From his findings concerning creative cross-curricular learning, Barnes (2002) concludes that: "The temptation to conflate Design and Technology with other subjects, such as science or art, and the resulting loss of its identity, is an issue with potentially serious consequences." (p.24).

Of the five technological traits I have identified, I believe that it is modelling – essentially the core of the process of design – that holds the key to the identity of design and technology itself.

The situation and structure of the project

The project was enacted through the agency of a Research Informed Teaching (RIT) grant awarded via the host institution. By their nature RIT projects are designed to engage students in the process of research. Thus acts of higher education teaching can enhance the student teacher learning journey beyond information reception

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and reflections on practice into questioning and analysing. The student teachers engaged in the research were in the second year of a three year BA in Primary Education programme and were developing an area of special interest/future co-ordination role in design and technology.

The principal research instruments employed were verbally administered questionnaires. These were administered by the student teachers on placement in their partnership schools. The questionnaires were aimed at school design and technology subject co-ordinators.

The student teachers themselves also completed questionnaires which had parallel questions to those given to serving teachers. Thus the data released could be employed to compare and contrast the values, attitudes and understandings of student teachers and serving teachers in their schools.

Twenty four sets of raw data suitable for research purposes were completed by both student teachers and school design and technology co-ordinators. It should be noted that in small schools some teachers had multiple roles in co-ordinating several areas of the curriculum. The survey data collected from schools includes an overview of their relative size and a classification of catchment type.

No individuals or schools have been named in this study. All participants were willing to contribute to the study and gave their permission for the analysis and release of findings freely and with the approval of head teachers.

Some reservations must be expressed regarding the validity of results gained by interactions between student teachers and serving teachers. It may have been the case that not all participants were willing to give full, open and honest replies to questions that appeared to probe their professional commitment to, and understanding of the curriculum. The overall responses by co-ordinators to the questionnaire were mixed. Attitudes varied from enthusiasm to wariness. This was especially the case where questions related to development issues and personal viewpoints. This may have been because co-ordinators were not at ease talking about these issues with student teachers. The nature and form of the professional relationship between student teachers on placement and serving teachers is one which continually exercises the minds of those who oversee Partnership arrangements.

There is further uncertainty in the acts of administration of the questionnaires. It is the case that the verbal gaining of data has advantages in terms of personal contact and some assurance of gaining responses. Negative factors however, accrue from the responses to questions where serving teachers may ask “What do you mean by.....” In these situations the student teachers who administered these acts of data gathering may be called upon to elaborate on questions and potentially change the depth, direction and quality of responses, thus diminishing consistency and validity.

Whilst the schools were not specifically a random sample as they were defined by the links to the university through Partnership status, the opportunity sample included schools with pupil intakes from a variety of catchment areas. Catchment classifications were based upon more than 50% of children being derived from local residential backgrounds of urban, suburban and rural types. Four schools were of the emerging “car-dependent” type with the majority children having a journey origin a considerable distance from the setting of the school itself.

The aims of the project were directed to gain a clarification and understanding of:

- The degree of integration or separateness of Design & Technology with regard to other curriculum subjects.
- Teachers’ views of design activity across the wider curriculum.
- The identification and location of design activity beyond Design and Technology-as-a-subject.
- The substitution of practical activities in place of design challenges, whereby for example mass-produced craft leads to the “production” of similar artefact outcomes.

These issues formed the basis of the questions employed in the verbally administered questionnaires and the same data collection devices used by student teachers for purposes of self-assessment.

The Partnership schools in the study

The schools were classified by the students in terms of their catchment category as shown in Figure 1. Figure 2 provides an indication of school size via the numbers of classes per year group. Rural schools were the most frequently occurring school type, and parallel year groups of 2 to 3 were the most common.

In response to the data from the questionnaires and the issues raised in subsequent analysis, the following aspects of Design and Technology in relation to the evolving cross curricular primary landscape will now be discussed.

Do schools “model possibilities” across the wider curriculum?

Through the verbally-guided questionnaire, information was sought as to whether design and technology

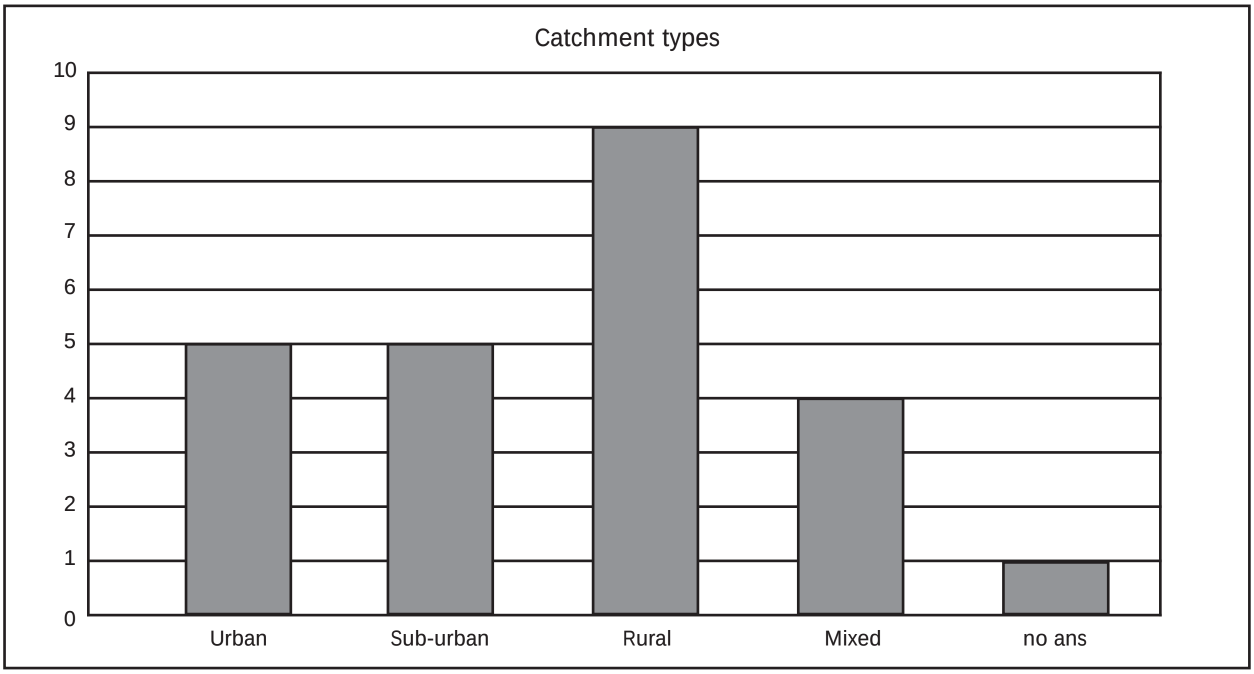

Figure 1. Catchment types of schools in the Partnership sample

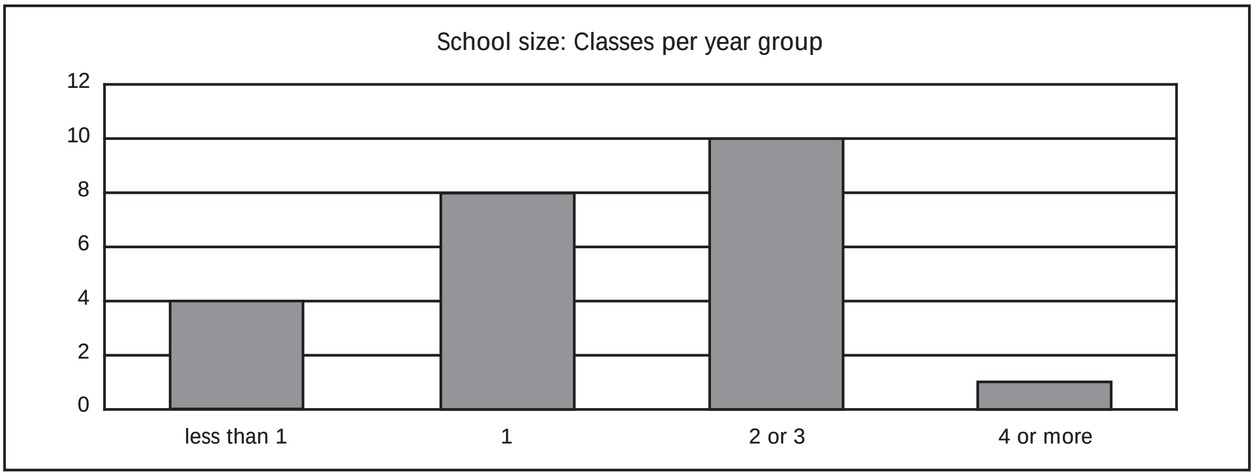

Figure 2. School sizes as expressed by parallel classes per year group

co-ordinators were able to identify opportunities for design activity – the modelling of possibilities – beyond their nominated subject boundary. Were they able to identify some of the generic modelling-based capabilities that would cross subject boundaries in other subject areas?

Figure 3 provides a view on the scope of subject/activity areas identified. Art, science and the humanities were seen to provide the most frequent platforms that serving teachers identified as being appropriate for expressing design-based activity.

Scope for development in the wider curriculum

There is already some limited evidence that cross curricular links are being forged across the wider scope of primary activity (Davies, 2000). The evidence from the sample of Partnership schools certainly suggested that design and technology was linked to other curriculum areas as well as being taught as a distinct subject. Art was seen as being able to deliver design skills and an appreciation of spatial awareness. Science was seen to overlap with core ideas concerning design and technology and mechanism and the use of electrical devices. Scientific principles could be portrayed through the production of technological artefacts.

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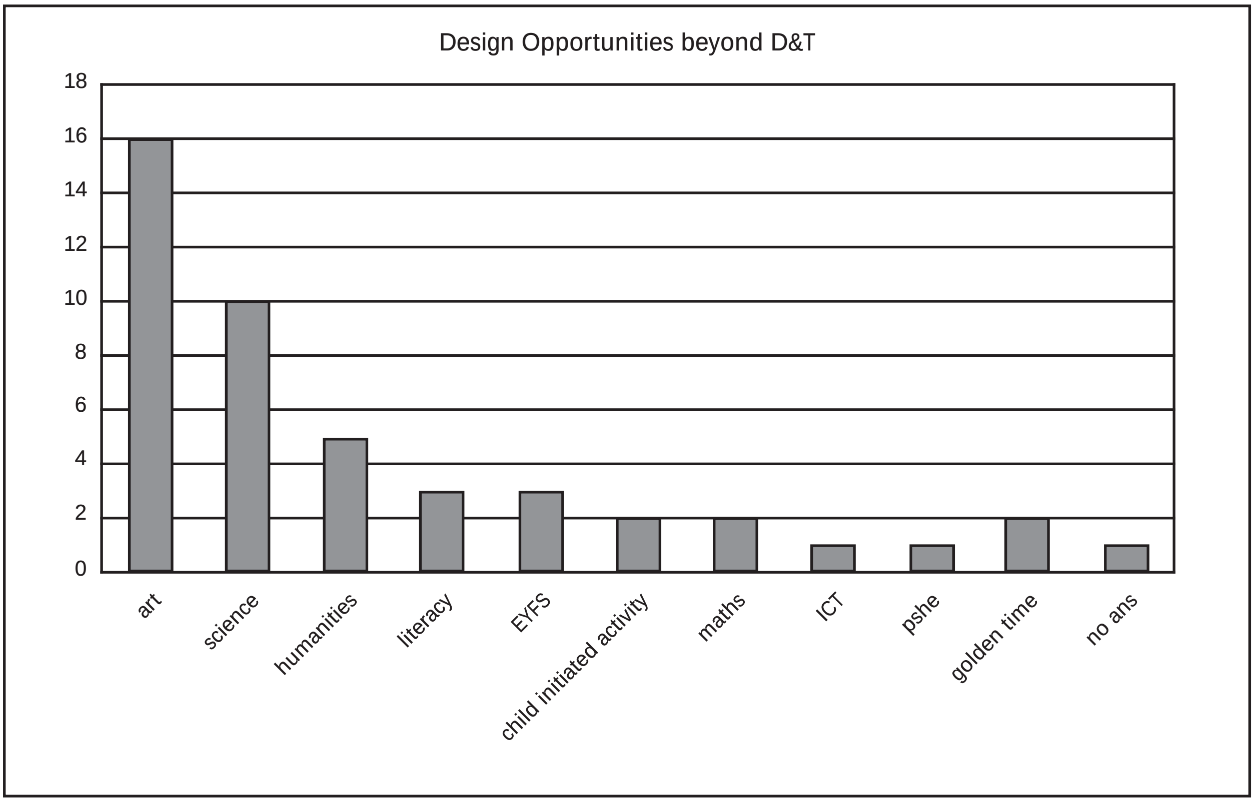

Figure 3. Design opportunities beyond Design and Technology

Perhaps the most concerning area in which Design and Technology ideas are being seen as having cross curricular potential lies in the notion of "evaluation". There was evidence that the evaluations of evidence for scientific encounters (hypotheses linked to observations) and evaluations for technological purposes (a product or process successfully meeting specified criteria) were becoming conflated.

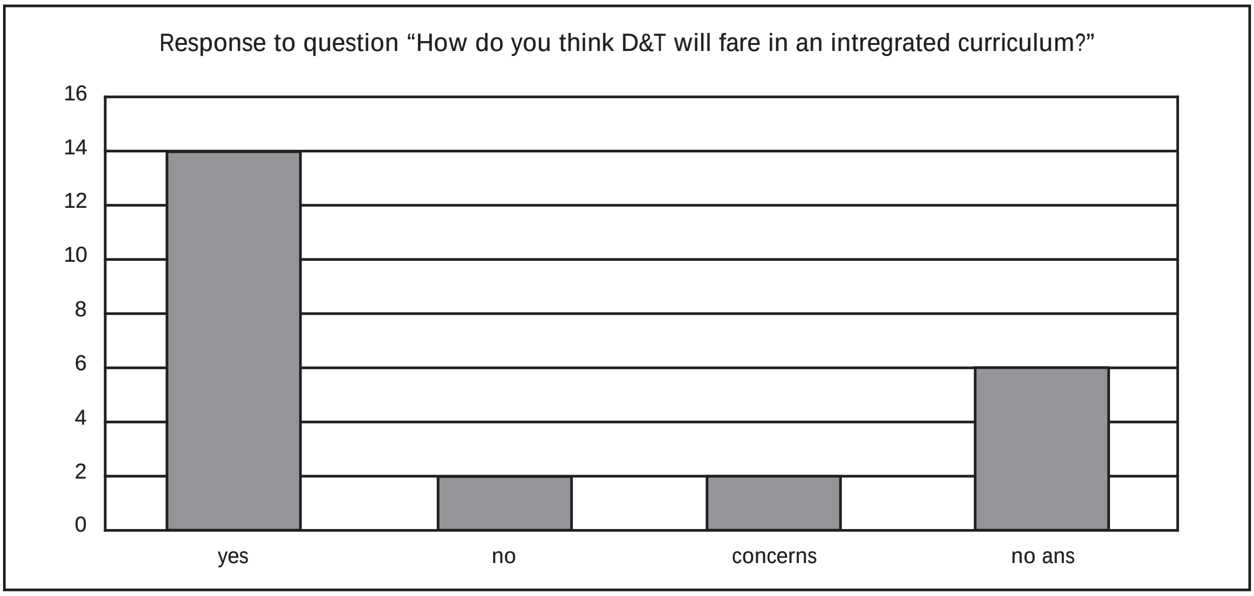

Figure 4. How would Design and Technology fare in a curriculum of total integration?

There was some evidence that the term “engineering” as encompassed in descriptors such as “paper engineering” was becoming linked to science. These misunderstandings were as common amongst serving teachers as they were amongst the student teachers. It can be strongly argued that the whole philosophical basis of science is founded on questions and ways of understanding the world and how it is seen to work (Hope, 2006). This contrasts with what I have termed the “Five Ms” of technological behaviour which result in responses to human needs and wants to control surroundings through the manufacture of products and the devising of processes (Layton, 1993).

Twelve out of the twenty four serving teacher respondents had a positive view on the ways that subjects could be linked together. Two schools were just starting to move in this direction. Eighteen of the twenty four schools responded to a question concerning the wider development of Design and Technology in their school. Of these, seven specifically mentioned cross curricular approaches. As can be seen in Figure 4, it is the case that most schools believed that Design and Technology would fare well in a totally integrated curriculum.

Expressions of integrated work in Design and Technology

Figure 5 is a representation of examples of the types of integrated work that the sample of serving teachers in Partnership schools identified. Many teachers specified theme-based activity platforms to support design based work. They included food, moving things, pop-up books and puppets. Activity embracing “sunglasses” may be more limiting. In classrooms this is often the serial manufacture of artefacts. It also attracts the dangers of children using these implements as solar filters.

The production of modelled forms from historical contexts is even more problematic. Titles such as “The Greeks” or “Ancient Egyptians” occupy theme and topic placements alongside “The Tudors” and “The Victorians”. In some cases, as in the examination of say, the water-lifting shadoof or some actual Victorian implement to facilitate food preparation, then children would be able to engage with the solutions to technological problems of the past. In National Curriculum Design and Technology terms these would, to an extent, fulfil the role of Investigating and Disassembling Existing Artefacts (IDEAS) and provide contexts for the gaining of a range of skills via focused practical tasks (FTPs). However, if children simply represent “looks like” artefacts from the past as part of Designing and Making Assignments (DMAs), then they may fall short in terms of the richness of technological experiences that so many other contexts may provide. Both “looks like” and “works like” representations are valuable as ways of exploring space-filling and motion. Representations of say, “looks like” Tudor houses will not fully engage children in the modelling of possibilities. As Davies and Howe (2003) have noted, it is the case that “To be creative, children need support to see the further potential in the familiar.” (p. 82). They should not familiarise themselves simply with solutions of the past.

What are the children learning?

One of the great misrepresentations of Design and Technology in schools is that it is simply seen as “making things”. The five key attributes of technological

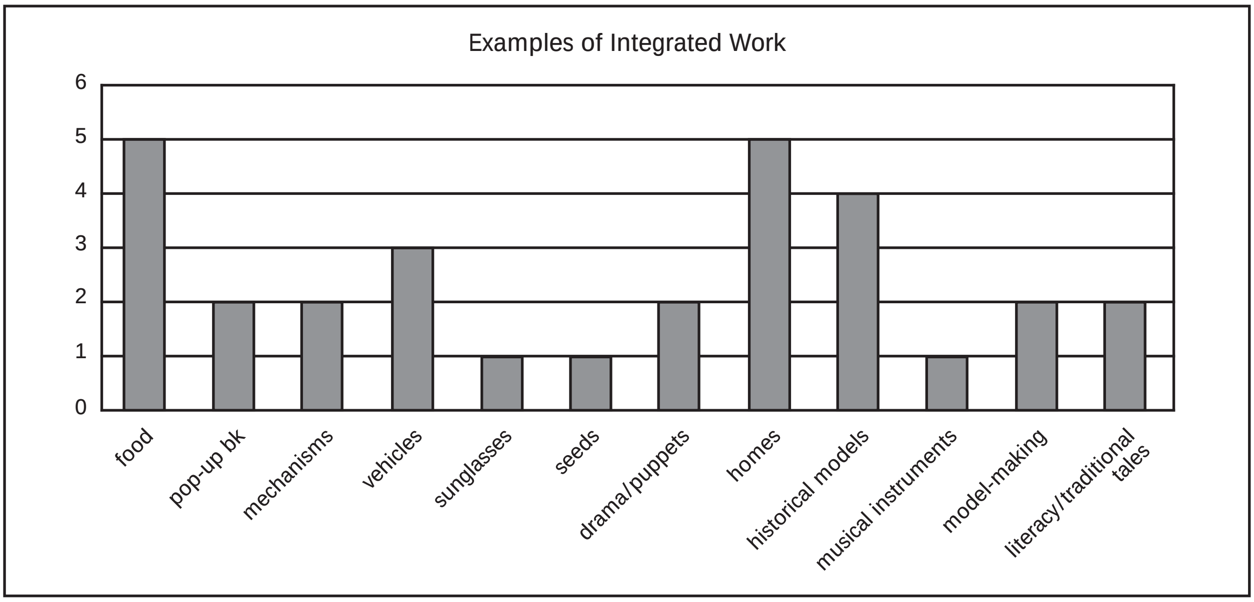

Figure 5. Examples of Integrated Work

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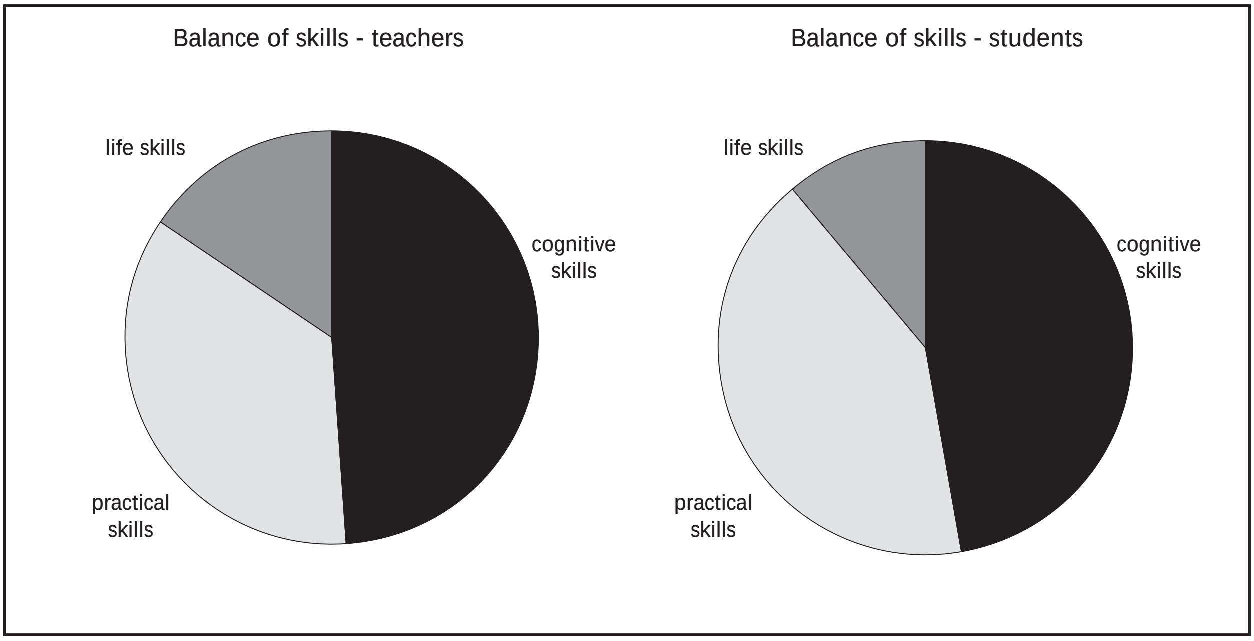

Figure 6. Teacher and student teacher representations of the balance of skills in three defined areas

endeavour – Making, Modelling, Mending, Modifying and Manipulating – have higher cognitive, social and sensory-motor demands than the simple assembling of materials. It is unfortunate therefore that in some school settings it appears to be the case that seemingly any opportunity presented for "making things" is attributable to the design and technology classification. It ticks the right curriculum box.

It was therefore pertinent to ask respondents what children might lose if Design and Technology as both a subject and area of activity was simply "airbrushed" from the curriculum. In response to the open question on what might be "lost" therefore, the respondents – both teachers and student teachers – produced a list of terms that they felt to be significant. This was a type of deficit modelling devised in order to show the significance of a feature if no longer present.

The teacher and student teacher responses were analysed and rendered into three categorical skill areas. These serve to collect skills into those of cognitive , practical (sensory-motor) and social or "life skills" types. The results are shown in Figure 6.

Figure 6 summarises the *relative value* of cognitive activity, to practical activity, to life skills for the teachers and student teachers. The social or "life skills" category was readily identified by serving primary teachers who understood the value of teamwork and self confidence. Teachers included these terms in their overall understanding of designing and making. This is testament to their commitment and understanding of these components as they are enacted in the wider curriculum.

NOTE: charts 6-8 represent relative values, not numerical absolutes.

It is to be noted that both the student teachers and serving teachers in the sample of Partnership schools were seen to place a higher value on the cognitive skills attached to Design and Technology when compared to practical and life skills. The practical "making things" side of technological activity was seen as valuable support for the development of thinking. This has both positive and negative connotations. The elevation of thought goes hand-in-hand with human progress itself. It is a desirable attribute. However, the downside of this emphasis and belief is also a threat to Design and Technology. It is what Medway (1992) has described as the "academicisation" of practical activities. These are only valued as vehicles for higher level thinking and their yield for traits such as modelling, evaluating and communicating. This trend runs deeper. Witness the decline in the manufacturing capacity in Western economies. Someone else, somewhere else makes they things we want. We think about making things, and somebody else does it.

The following figures 7 and 8 show the serving teachers' and student teachers' answers to the question "What are most important things children learn in design and technology?"

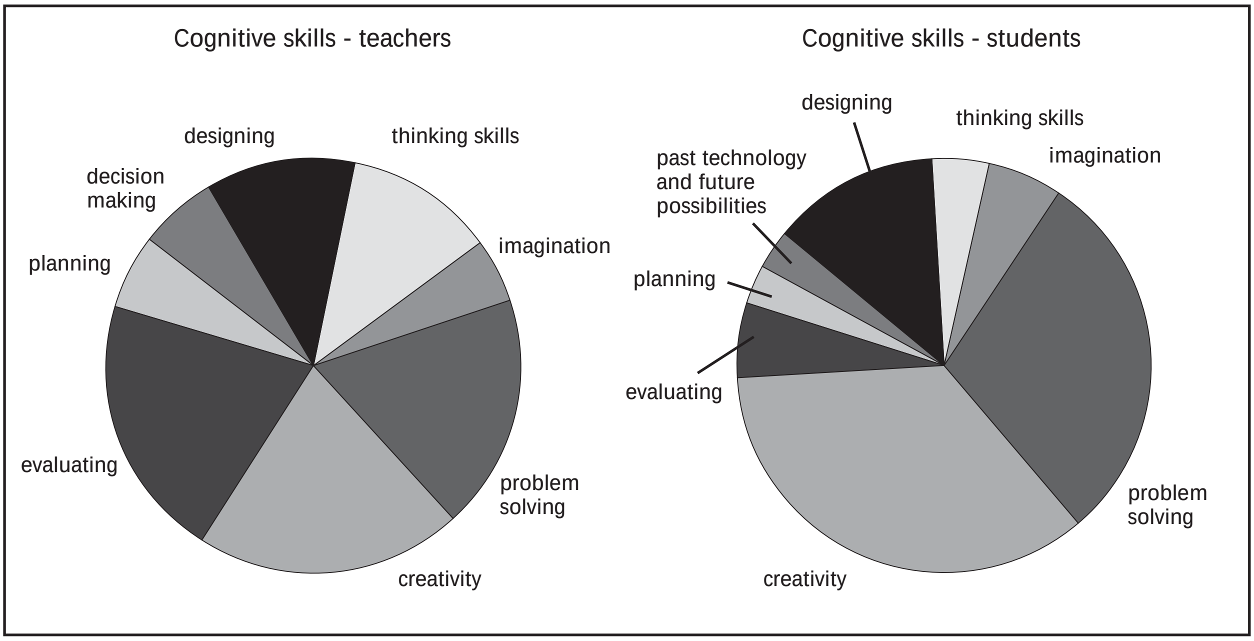

Figure 7. Cognitive skills

sub-divided into cognitive and practical skills.
In Figure 7 there is a disparity of view between that of student teachers and serving teachers in respect of terms such as “problem-solving” and “creativity”. For student teachers these have become convenient receptacles for modern, popular terminology which may be attached to progressive, “new curriculum” schooling. Serving teachers on the other hand appear to have more discrimination. They have given more weight to specific skills including thinking, planning and decision-making. It is possible that in response to the question, the student teachers have simply accumulated multiple skills under the problem solving heading and have as yet to more finely resolve the subtle attributes that underlie Design and Technology activity.

In terms of the teaching of student teachers, this presents challenges. It is clear that these popular terms will need to be unpicked and re-examined. Just because student teachers use these terms does not mean they fully understand the wider implications of say, creative learning or teaching.

Practical skills are considered in Figure 8. Serving teachers’ viewpoints reflected the ways that they recognised and managed making-type tasks in classrooms. Thus safe working practice was a recurrent theme. This aspect figured less prominently in the eyes of student teachers who saw that skill acquisition was important in giving children the opportunity to experiment with materials and ways of fixing and joining. Such a view tends to elevate the importance of process over product outcomes. Student teachers were seemingly less aware of the overarching limitations of the time available for designing and making and had less understanding than serving teachers of the importance, to children, of product outcomes such that artefacts are often transported to the home and are markers of children’s achievement.

This variation of views on the product-process continuum conceals some very positive aspects of student teacher beliefs. It was the case that it was felt at times that giving children more opportunities to take ownership of tasks through more direct engagement and experimentation would actually lead to better, more diverse product comes. Student teachers were critical of the mass-production events that can occur in primary classrooms with the “output” of similar (or indeed, identical) items such as cards for special occasions. Student teachers were often unaware of the time that individualised, diversified forms of construction acts may require.

What did the student teachers learn about design and technology in primary schools?

The foremost outcome of the research project concerned the student teachers themselves who were engaged in data collection. They were able to ask serious and penetrating questions about the nature of design and technology activity in Partnership schools. As a result, the proto-leadership role of student teachers in this area of

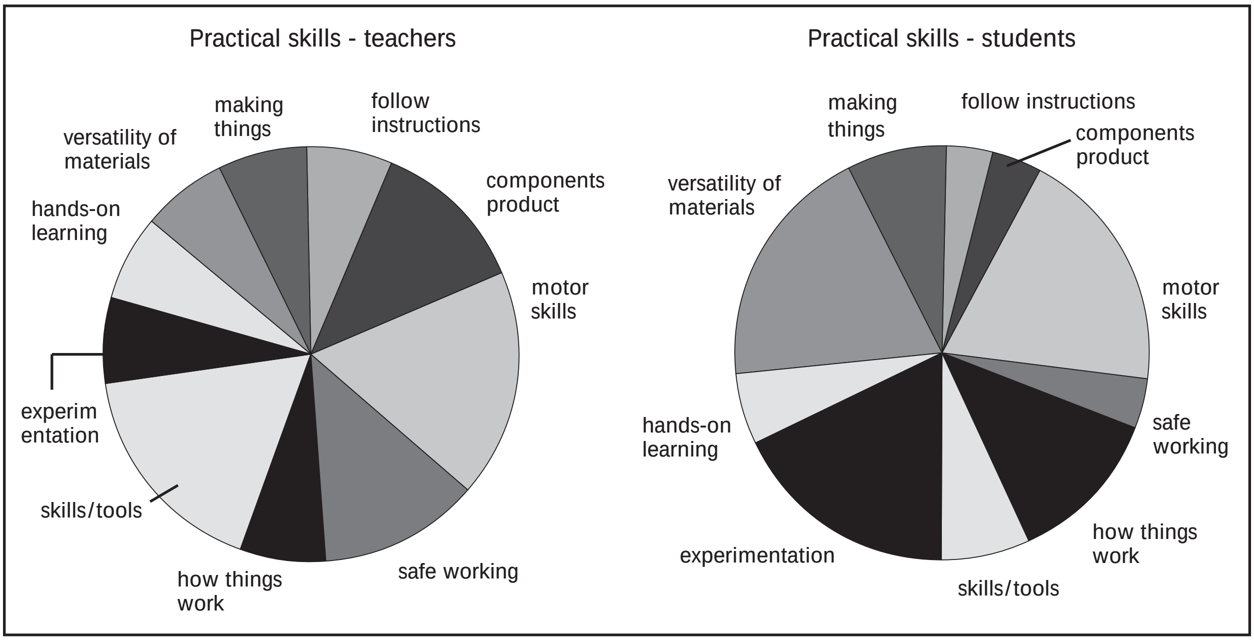

Figure 8. Practical Skills

the curriculum was developed and enhanced. The student teachers were able to take a common research instrument directly into schools and gain data for themselves. They had a positive impact on the life of schools and enabled the profile of design and technology to rise in an agenda dominated by talk of literacy and numeracy.

Student teacher placements in schools also had a further effect. This was a deepening sense of engagement with curriculum matters through the agency of the self questioning and analysis of positions that had to be undertaken when discussing powerful ideas with school co-ordinators for Design and Technology. From this elevated platform of questions, ideas, uncertainties and challenges, the student teachers were able to build a new view of their subject specialism.

Post placement, the student teachers disclosed some of the following key ideas with their tutors in seminar sessions. They had fresh views on:

- The value of creative learning linked to creative teaching.
- The time constraints in classrooms which constrict the nature of activity and outcomes for children engaged in designing and making acts.
- The negative and positive side of having adult assistance in classrooms whereby they may elevate language use and the role of questions, or dominate aspects of making by suggesting final solutions to problems so that children can “achieve” all they need to in the set time span of a lesson.
- The development of an understanding that artefacts are often built from sub-functional components. Components that contribute to the functionality of a whole are in reality like sub-concepts that lead to the understanding of complex operations.

Some conclusions

The findings expressed in this account are incomplete and the subject of ongoing development. They summarise those aspects which are of current interest at a time of curriculum flux. The initial use of the survey instrument was successful in terms of gaining an impression of the current state of curriculum play in the Partnership schools and provided some feedback on the nature of Design and Technology activities across the curriculum.

Survey evidence suggested that the sample of serving teachers were able to identify instances in which design opportunities could extend beyond the Design and Technology as a subject. They also believed that Design and Technology would fare well in a totally integrated curriculum. It is clear that schools are moving to a wider curriculum and that some teachers are considering the design process in non-Design and Technology-as-a-subject settings.

There is, in a modified form, a return to the openness of the pre-National Curriculum “freedoms” as teachers feel able to deviate from set-piece activities, often specified in the QCA Schemes of Work (1998) and used as the default planning tool.

The survey instrument had limitations. Where student teachers were called upon by teachers to explain what they thought some of the questions meant is an obvious place for the generation of fresh interpretations and inconsistency.

Future plans for the project are aimed at gaining more detailed information from a small selection of schools. This will enable future research actions to present elements of case studies so that classroom practice and curriculum planning can be analysed and understood. Such case study evidence will then be more widely shared.

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