Design & technology
For the next generation

TEP's Nick Baldwin and Dr David Barlex from the Nuffield Programme have headed up this two-year writing project. From a list of international contributors and authors, this is seen as the must have book and is the latest publication for all D&T teachers. Ideal for those at any stage in their careers to revitalise thinking and re-establishing the position of and for D&T.

TEP are delighted to reprint in part, their chapter on:

Developing your own curriculum

This is about establishing you as a teacher and four key conditions need to be met for design & technology teaching to be successful.
Firstly, the teacher should have the **expectation** that pupils will be capable. This means that it will be perfectly acceptable for pupils to make decisions and take action based on those decisions. In some cases the actions will require teacher approval but in many cases they will be autonomous.

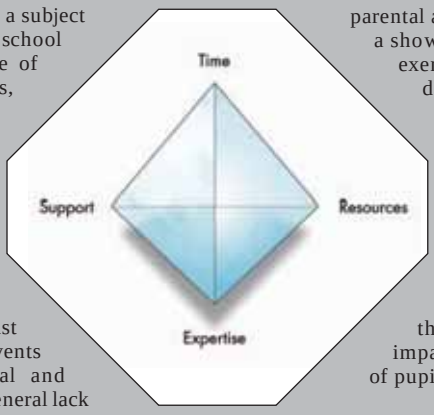
Secondly, the teacher needs to facilitate **pupil capability** by organising and maintaining an appropriate environment. This means that pupils will have open access to materials, components, tools and equipment. In most cases they will be able to collect what they need, as they need it, use it and return it. In some cases particularly scarce resources may need to be booked in advance. But it is essential that decisions, once taken, can be acted upon if pupils are not to become dispirited and de-motivated.

Thirdly, the teacher will need to provide the **resources** for capability by teaching the technical knowledge and understanding, aesthetics, design strategies, making and manufacturing skill and values needed for successful designing and making.

Fourthly, the teacher should maintain the **motivation** for capability through insight into pupils' motivations ensuring that activities are relevant, urgent, important and attractive.

Only if these conditions are established in your classroom will you be in a strong position to suggest changes to your school's established curriculum.

Four features need to be in place for a subject to maintain a robust position in the school curriculum. These are effective use of time, availability of resources, development of expertise and accessing professional support.
They can be represented as occupying the vertices of tetrahedron as shown above. Diagram If any of these vertices fails then the tetrahedron will instantly collapse. The lack of any one of these features seriously weakens a school subject and whilst this might not cause failure it prevents the subject fulfilling its potential and meeting legitimate aspirations. A general lack of engagement with the features can contribute to the lingering demise of a subject.



Effective use of time

In the school timetable it is well worth considering how the time is distributed. Many secondary schools adopt a highly fragmented use of time. The unit of planning, e.g. a 30 or 40 minute lesson, becomes the building block and it is rare for pupils in the 11-16 age group to experience on a regular basis any more than a double block of units. Many schools run activity weeks at the end of the summer term and at the end of year 9, unfortunately often after curriculum options are already selected.

Availability of resources

A wide range of 'intellectual' resources is available from Nuffield Design & Technology, TEP, the Design & Technology Association and the Qualifications and Curriculum Authority. They all provide examples of schemes of work, pupil activities and high quality information relevant to design & technology. In some cases these resources are available free of charge. However design & technology requires significant *capital funding* to set up and maintain the tools, equipment and working environment needed for pupils to tackle designing and making. Similarly, it is important to have access to a significant *consumable budget* to provide pupils with the materials and components they need to model and make their design ideas. In a nutshell, resourcing design & technology is an expensive affair: staffing, rooming, resources, class sizes and preferential timetabling all create pressure to reform or conform to wider school norms. Governors and senior managers need to be convinced that the 'expense' is worthwhile.

Marketing the subject and its imperatives internally within the school is crucial (and externally to garner parental and local industrial support). Providing a showcase of pupil experience and work exemplars or adopting a governor into departments is an ideal strategy. Poor examination performance although only one indicator of success means a department that is likely to find their expenditure strongly scrutinised. It is also important for you and your colleagues to move the senior management team beyond the examination performance criteria and share with them your vision for the subject and its impact on the self esteem and aspirations of pupils whatever their career intention.

Continued overleaf

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Continued

Development of expertise

Design & Technology in the world outside school is a rapidly expanding field. New and emerging technologies are becoming part of everyday life at an ever-increasing rate. The breadth and depth of subject matter means that where possible. it makes sense to plan student and pupil experiences so that knowledge can be accessed and skills acquired on a *just-in-time rather than a just-in-case basis*. Creating a virtual learning environment for the department or providing layers of resource for students to 'drill down' into is sensible and requires them to be empowered as autonomous learners.

Accessing professional support

Local SETPOINT and the Science Learning Centre are charged with supporting *STEM* (science, technology, engineering and mathematics) activities in the curriculum so it is well worth staying in regular contact. Often risk-taking new ideas and curriculum projects can best start in after school clubs and extracurricular activities.

Articulating your vision for the subject

Curriculum development should not be a random process or knee jerk response to the latest fashionable notion (often seen as a product or outcome focused on popular student appeal yet, missing the point). Any curriculum development of worth requires underpinning by specific and clearly articulated drivers. To discern these drivers you will need to explore your fundamental beliefs about design & technology and why it makes an important contribution to the curriculum. Without this underpinning the development is likely to be flawed.
You may feel that design & technology is best justified by appeals to its role in the *general education* for all pupils whatever eventual career path they choose. You might frame this as the role that designing plays in cognitive development. On the other hand, you may believe that it is the appeal to its *vocational* potential that lie at the root of its worth. You may consider that the role design & technology can play in education for *sustainable development* is sufficient to justify its place in the curriculum and that this should be the main thrust of its educational effort. You may believe that design & technology provides pupils with the capacity for *active citizenship* - designing and making in response to community issues. The important thing is that you should believe something and that this provides a rationale for the developments you undertake with colleagues, senior management and students.

Engaging with the team

Developing a curriculum in response to national imperatives in the context of the requirement of local conditions (your school and its facilities, the needs of the pupils, nature of the catchment area and the employment possibilities in the region) is a challenging endeavour. You will need to be highly creative to be successful.
A department composed of disparate individuals, who do not work collaboratively are unlikely to have the same impact of a department where the teachers work as a team. Cross-collaboration and working across lines of learning with other departments often pays dividends. This can help understanding between departments and help reinforce pupils' learning and have great advantages where a timetable time is tight or under threat.

Identifying areas of development

In deciding which area or aspect of the design & technology curriculum to develop, you will have to take into account the current curriculum offering and any prevailing development plans that may be in place.
Once you have established yourself as a competent and confident teacher you will almost certainly be asked to carry out particular development tasks. It is likely that you will need to show effectiveness here before being given the freedom to develop areas of your own choosing. It is worth considering which areas of design & technology education might be worth developing. There is no shortage of possibilities:

You might be interested in the *place of making* within design & technology, having gained much satisfaction yourself from making. So what curriculum development might you do in this area? There is an interesting relationship between making with hand and hand-controlled machine tools and using computer assisted manufacture. This could be explored through curriculum development that monitored the way pupils made progress in these two areas.

Alternatively, you might be interested in the *place of designing* within design & technology, in which case developing ways to enhance pupil's designing skills would be an appropriate area of development. You could take this further by trying to explore the effect of enhanced designing skills on performance elsewhere in the curriculum.

Understanding how things work or *technical understanding* is likely to be important. Hence developing the technical aspect of the designing and making assignments carried out would be a useful piece of development. Understanding the influence of *technology on society* (and vice versa) may be under represented in your curriculum. The relationship of design & technology with other subjects might be useful. An exploration of the utility of other subjects in different designing and making assignments would make fascinating reading and might lead to enhanced *cross-curricular* activity. Alternatively, new and emerging technologies are interesting and deserve introduction into the design & technology curriculum. Developing accessible accounts of such technologies with suggested ways of engaging pupils would be useful curriculum development, which would maintain and modernise your school curriculum.

TEP has previously engaged in an extensive study in 2001 on *pupil attitudes to technology*. Curriculum development to look at ways of presenting designing and making assignments so that they are appealing to both sexes, yet confront conventional gender stereotypical responses, would be a particularly interesting piece of development.

Aligning teacher interests with ways to improve the curriculum is an important strategy to enable us all to respond professionally to the challenge of curriculum development. Design & technology is, in many ways, unique and teachers can be opportunist and take advantage of emerging contexts and themes, both local and national. This will enable them to refresh their repertoire as an ongoing activity and as a distinct management process of the subject.

Technology Enhancement Programme

TEP

Becoming a reflective and effective practitioner

You can think of curriculum development as the creation of new professional knowledge. In 1998 David Hargreaves wrote a very useful short booklet about this "The role of teachers in the knowledge society". He breaks the process down into the following sequence of five activities:

1. Generating ideas
This involves a mix of learning by doing, sharing experience, dialogue and networking.

2. Supporting ideas
New ideas need to be welcomed and respected. Good ideas are often fragile and need protection, hence being cynical is highly counterproductive.

3. Selecting ideas
Not all ideas can be fully developed. Some will need to be abandoned or postponed so that those selected can be implemented. This will inevitably lead to disappointment for those whose ideas are not pursued and it is important that they do not lose face.

4. Developing ideas into knowledge and practice
It is essential that the new knowledge is robust and lead to practice that is effective. It is not always easy to see immediately whether practice is effective. New practice may appear ineffective simply because it is new and unfamiliar with both teachers and students being unsure how to respond. So giving new practice time to prove itself will be important. Once new practice is validated it should lead to the abandonment of old practices that cannot be validated.

5. Disseminating knowledge and practice
Once such knowledge and practices are validated, it is important that it is made accessible to other teachers through internal networks. This will not happen by chance. It will be important to develop channels of communications by which the outcomes of knowledge creation are widely distributed, for it is unlikely that such channels already exist.

The impact on your work will be seen mainly in your own classroom, but other colleagues in your department or teaching the same year or key stage, could benefit from your learning. It is important that you disseminate the results of your successful curriculum development activities more widely than your own school or college too. TEP's website, this journal (Engineering News and Views) and other publications are an ideal launch pad for sharing ideas with a wider audience.

The Design and Technology Association provides several different opportunities for this. You can describe your activities in the following publications: "D&T Practice" which includes articles highlighting the practical aspects of design & technology teaching, including case studies of good practice and resources used; "Designing" which is a large format, highly visual publication that celebrates the design activities of schools, universities and professional designers; "Design and Technology Education: An International Journal" which publishes high quality research, scholarly and review papers relating to design & technology education. You could also present your work at the Annual Design & Technology Association Conference.

Workforce reform is critical to our subject and ideally should start from within. This chapter and many in the book are at the heart of that process through reflective thinking and practice.

You can order the book by photocopying the order form opposite and of course you can find out much more by visiting www.dandt-thebook.com

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