



Nick Baldwin

Nick Baldwin is director of TEP, based at Middlesex University.

A Loughborough graduate, he has a wide breadth of school management experience and is a Marconi trainer and visiting lecturer supporting ITE programmes and CPD across the UK. He devised the Millennium Schools Project, while principal research fellow at the University of Warwick. Nick manages various training and research projects across the UK and edits "News and Views". His responsibilities include engineering, electronics education and broadening and securing industry-education partnerships.



David Barlex

Dr. David Barlex is a senior lecturer in education at Brunel University in England, director of the Nuffield Design & Technology Project and cross-appointed as an adjunct assistant professor at Queen's University, Ontario, Canada. He is an acknowledged leader in design & technology education, curriculum design and curriculum materials development.

David's research activity stems from his conviction that there should be a dynamic and synergistic relationship between curriculum development and academic research.

Developing your own curriculum

Nick Baldwin and David Barlex

This chapter will explore the processes by which a newly qualified teacher can make a contribution to the design & technology curriculum. It is in six parts. First the chapter will consider the classroom conditions a teacher must create if his or her teaching is to be successful. Second we will explore four key features that determine the success of a subject in the curriculum. Third we will investigate how a newly qualified teacher might develop and articulate their vision for the subject. Fourth we will consider the importance of working with colleagues as part of the design & technology team in a school. Fifth we will discuss the areas in which you might make a contribution to developing the curriculum. Finally we will consider how you can become a reflective and effective practitioner through curriculum development.

Establishing yourself as a teacher

There are four conditions that a teacher needs to meet if his or her teaching of design & technology is 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.

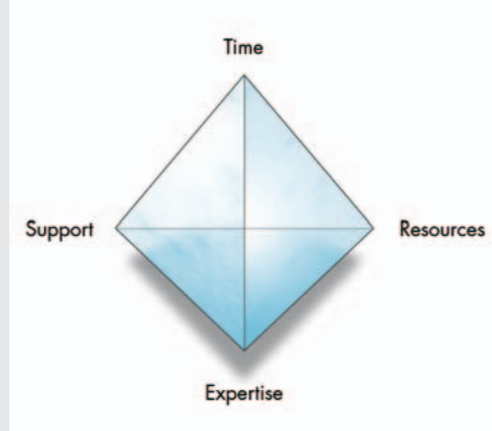
Thirdly the teacher will need to provide the resources for capability by teaching the technical knowledge and understanding, aesthetics, design strategies, making and manufacturing skill and values needed for successful designing and making.

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



01 02

01 A busy classroom scene.
02 The four key features tetrahedron.



03

03 Margaret Lynn, a primary head teacher who is enthusiastic about immersion education.



Once these conditions are established in your classroom you will be in a strong position to suggest changes to your school's established curriculum. Meeting these conditions will give you credibility with both pupils and fellow colleagues. This credibility is a pre-requisite to your ideas being given serious consideration.



To what extent do you think that the conditions for success are realistic? What are the pros and cons for each condition? What action could you take to turn the cons into pros?

Understanding four key features

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. If any of these vertices fails then the tetrahedron will instantly collapse. This analogy of sudden structural collapse with the fate of a subject in the school curriculum is perhaps not entirely valid but the lack of any one of these features seriously weakens a school subject and whilst this might not cause sudden catastrophic failure

it will prevent 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

It is of course important that a subject has a reasonable amount of time in the school timetable but it is well worth considering how this 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. This is not the situation in many primary schools where head teachers are organising immersive experiences for pupils that last two or three whole days in succession. Margaret Lynn, a head teacher of a primary school in Formby is convinced that this is a powerful way forward. In 2001 she wrote:
'I decided that a radical approach was needed; one in which the children and their teachers had enough time to become intensely involved in designing and making and to have this experience often enough for the children to make progress. So I chose to suspend the timetable for 3 consecutive days each term and dedicate those days to design & technology. From the first 3 days we learned three important lessons; avoid being over ambitious, target parent help where it is most needed, take care to ensure all resources are in place. The second 3 day event went very much as planned with the children eagerly

anticipating more designing and making. Staff took the third 3 day event in their stride and it was particularly pleasing to see that the children had made significant progress over the year; drawings of design intentions were matching made outcomes, manual dexterity had improved, constructive evaluation of design decisions was becoming the norm.'

It is undoubtedly easier for a primary school to adopt an immersive approach to teaching a subject than it is a secondary school. But it is important that secondary schools give serious thought to how this might be achieved. Many secondary schools run activity weeks at the end of the summer term in which practically based subjects flourish. It requires an imaginative approach to organising time to transfer this to the mainstream curriculum.

Availability of resources

There is now a wide range of 'intellectual' resources available to support design & technology. Curriculum development projects such as Nuffield Design & Technology and TEP, the Design & Technology Association and the Qualifications and Curriculum Authority 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 so all schools can access these at relatively little expense. 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 expenditure 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. Governors and senior managers will need to be convinced that the expense is worthwhile. Marketing the subject and its imperatives internally with the school is crucial. Providing a showcase of pupil experience and work exemplars or adopting a governor into departments is an ideal strategy. Examination performance is one indicator of success and a department that performs poorly here 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.

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. Who would have dreamed ten years ago that the laser cutter, thermochromic materials and the PIC chip would be a part of many schools design & technology provision? Approaches to designing and the assessment of designing

are also developing. The e-scape project (2007) is currently exploring ways of using digital technology in both these areas. And educational research is developing new insights into the way we learn. Recently Steve Higgins, Viv Baumfield and Elaine Hall published a fascinating report entitled “Learning Skills and the development of learning capabilities”. It will be important for you and other members of the design & technology department to maintain and extend your expertise in areas that are changing. Individually you cannot be experts in all fields but collectively you can build and maintain a portfolio of expertise that keeps your department at the forefront of developments. 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.

Accessing professional support

Collaborating with and learning from others in your department is an important part of your professional life. However you are part of a wider professional community and it is important that you and your colleagues access the collective wisdom of this wider community. A first step here is to join the professional association for design & technology teachers, the Design & Technology Association. Through its hard copy publications and website it keeps its members informed of developments and the opportunities

for professional development. It is also important to work with local networks relevant to design & technology. Your local SETPOINT and 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 ideas and curriculum projects can start in after school clubs and extracurricular activities. This allows the teacher to grow and trial new ideas at low risk.



Consider each of the four key features and list ways in which your department deals with these matters. Discuss your list with colleagues with a view of developing a considered and agreed agenda for change.

Articulating your vision for the subject

Curriculum development should not be a random process of knee jerk response to the latest fashionable notion. 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

04 05 06 07

04 What drives your passion for design & technology?
07 Read other chapters in this reader to help you find out.



underpinning the development is likely to be flawed and even if worthwhile liable to ‘run out of steam’ before fruition. You will find it useful to read the chapter on implicit beliefs and pedagogy by Wendy Dow (pages 252 - 265) in this reader.

There are a number of different aspects of the subject that might fire your imagination and act as drivers to fuel your vision for the subject. Of course the drivers that inspire you may not be those that enthuse your colleagues. They are not necessarily mutually exclusive although some may make for uneasy bedfellows!

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 appeals 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. Remember the words of St John in the book of Revelation: *‘I know thy works, that thou art neither cold nor hot: I would thou wert cold or hot. So then because thou art lukewarm, and neither cold nor hot, I will spew thee out of my mouth.’* (Revelation 3:15-27.)

You can use many of the chapters in this reader to help you discover exactly what it is that drives your passion for design & technology. It could be James Pitt and Margarita Pavlova’s chapter on education for sustainability, Moshe Barak’s piece on problem-solving, Frank Banks and Gwyneth Owen-Jackson’s consideration of making. And of course what drives you is subject to change as you develop in the profession and discuss issues with other teachers. Using collegiality for professional development underpins much of Steve Keir’s chapter on the politics of the technology curriculum.



Discuss with others in your department what it is about design & technology that makes it so special. Is there consensus? If so how is this harnessed? Or is there a wide variation of views? And if so how do they play out in informing any development that is taking place?

08 09

08 Yrjo Engestrom, celebrated developer of activity theory.

09 Vera John-Steiner, celebrated author of "Creative Collaboration".



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 and you will need to be highly creative to be successful. Of course you cannot be successful working on your own. A design & technology department composed of disparate individuals, who do not work collaboratively, whatever their individual brilliance, are unlikely to make the impact of a department where the teachers work as a team. Cross-collaboration and working across lines of learning with other departments will often pay dividends. This can help understanding between departments and help reinforce pupils' learning. This can have great advantages where timetable time is tight.

'Knotworking' is an interesting means of creative collaboration in response to the problems involved in curriculum development. It was developed by the Finnish researcher Yrjo Engestrom, Professor of Adult Education and Director of the Center for Activity Theory and Developmental Work Research at University of Helsinki. 'Knotworking' involves solving urgent tasks where the combinations of people and the contents of the tasks are likely to change. Decision-making in such situations is distributed, as there is no central

authority in charge. The members of the group convened to tackle the problem are chosen on the basis of the experience in relation to the nature of the problem. In the case of a design & technology department such a group might consist of a mix of junior and senior members of teaching staff, plus ancillary staff. In such a group it will be important to put aside issues of status and position and concentrate on the task in hand, with each person making a contribution according to their relevant expertise. This may be an unusual activity, but the potential for professional growth of those involved is large and the impact on the ability of staff to collaborate in future will be high.

Vera John-Steiner is the Presidential Professor of Linguistics & Education at the University of New Mexico in Albuquerque. Vera has written at length about the issues facing those who wish to work across and within disciplines in her book "Creative Collaboration".

She argues that it will require different sorts of partnership but they will all thrive on dialogue, risk-taking and a shared vision. Such successful collaboration always involves trust and this has to be earned by those working together. Without trust it is not possible to reveal and overcome the insecurities and uncertainties that underpin all creative endeavours. Working with colleagues in this way requires those involved take the bold step of becoming dependent on one another. This dependence is not a sign of weakness, but of strength; a dignified

interdependence through which those working together have mutual respect and can forge achievements far beyond their individual, isolated capacities. As a new teacher becoming part of 'knotworking' groups and other associations within the design & technology department are an essential part of your early professional growth.

?

To what extent does collaboration with others already take place in your design & technology department?

If there is a tradition of successful collaboration try to identify the mechanisms that make it successful. If there is little collaboration try to identify the blockers that are preventing it.

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. Here are some examples:

- 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 tool and using computer assisted manufacture. This could be explored through curriculum development that monitored the way pupils made progress in these two different but related ways of making.
- 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.
- You might really enjoy your own ability to understand how things work, your technical understanding, and want to enthuse pupils in this area. Hence developing the technical aspect

of the designing and making assignments carried out in your school would be an intriguing and useful piece of development.

- You might find that the understanding of the influence of technology on society (and vice versa) to be under represented in your school curriculum and want to redress the balance. Developing a suite of resources that could be used by yourself and other colleagues related to this issue, and which do not consume too much curriculum time would be a challenging and worthwhile endeavour.
- You may be intrigued by the relationship of design & technology with other subjects, especially the extent to which why, how and when an idea from another subject (its utility) might be useful. An exploration of the utility of other subjects in different designing and making assignments would make a fascinating reading and might lead to enhanced cross-curricular activity.
- You might find new and emerging technologies fascinating and want to introduce them into the design & technology curriculum. Developing accessible accounts of such technologies with suggested ways of engaging pupils would be useful curriculum development which maintained the modernity of your school curriculum.
- You might find the different responses of boys and girls to design & technology

intriguing. In which case some curriculum development to 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.

It all depends on what you are interested in plus the current and intended state of the design & technology curriculum. Aligning your interests with ways to improve the curriculum will be an important strategy to enabling you 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 teachers to refresh their repertoire as an ongoing activity and as a distinct management process of the subject.

GI

Discuss with colleagues what you and they might want to be the focus of curriculum development. Find out if there is any relationship between these interests and current concerns within the design & technology curriculum. Use these findings to develop proposals for curriculum development.

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 trustworthy and leads 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. And if new practice is ultimately found to be wanting then it must be adapted so that it becomes practice that is effective. If this is found impossible then it should be abandoned.

5. Disseminating knowledge and practice

It is likely that new knowledge and practices will occur initially in parts of the design & technology department, rather than across the whole. Once such knowledge and practices are validated it is important that they are 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.

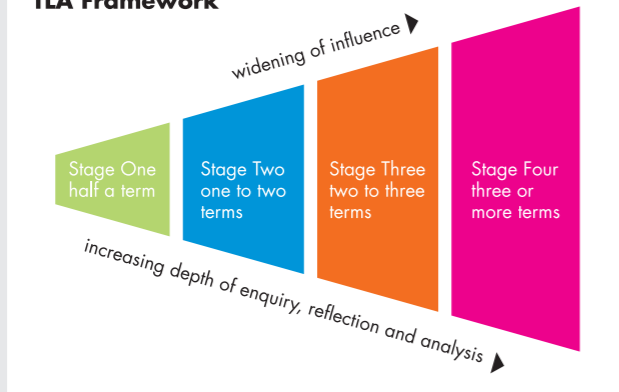
If you can tackle curriculum development in your school using this model you will find that the result is extremely robust.

Underlying Hargreaves’ approach to curriculum development is the powerful idea of the teacher as a reflective practitioner, someone who thinks about what they are doing and why, ponders the effectiveness of their actions and changes what they do in the light of their thoughts. The General Teaching Council has taken the idea of the reflective practitioner and embedded it in the Teacher Learning Academy. This is a national

10

10 TLA framework.
(From Stage one booklet, Teacher Learning Academy, General Teaching Council for England, 2006.)

TLA Framework



11 12 13

11 "D&T Practice".
12 "Designing".
13 "Design and Technology Education: An International Journal".



system for teacher learning and offers teachers the opportunity to develop their professional abilities throughout their teaching career. There are four stages in this approach to professional development, shown above. Each stage of the framework differs progressively in terms of the:

- depth of enquiry, reflection and analysis;
- timescale;
- sphere of influence;
- presentation requirements.

Stage one provides an ideal opportunity for you to begin the professional development that should continue throughout your career. The requirements are as follows:

Depth: You will give a descriptive account of your learning;

Timescale: The project should take no more than half a term;

Sphere of influence: 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;

Presentation: Learning plan (written); Learning journal (any media; if written no more than 1500 words).

Activities typical of stage one include the following:

- observing another teacher, considering what you have learnt from this and adapting your own practice as a result;
- finding out more about a new initiative or teaching and learning strategy and

exploring ways in which it might benefit your class or school;

- attending a training day/seminar/workshop, identifying which skills you want to build on or acquire as a result and taking steps to do this;
- exploring an area of subject knowledge with which you are less familiar, introducing it into your teaching repertoire and evaluating its impact on your practice.

It is important that you disseminate the results of your successful curriculum development activities more widely than your own school. TEP's website, journal and other publications are an ideal launch pad for sharing ideas with a wide audience. The Design and Technology Association provides several different opportunities for this also. 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 can present your work as a poster session or a paper at the Annual Design & Technology Association Conference.



How realistic do you think Hargreave's approach to curriculum development is? Compare it with the way curriculum development is carried out in your department and discuss your findings with colleagues.

Gershenfeld, N. (2007). "Fab: The coming revolution on your desktop - from personal computers to personal fabrication" paperback edition. New York: Basic Books.

Gershenfeld, N. (2000). "When things start to think". New York: Henry Holt and Company.

Greenfield, S. (2004). "Tomorrow's people". London: Penguin.

Jackson, M. (2002). "What's happening to Home: Balancing work, life and refuge in the information age". Notre Dame IN: Sorin Books.

Kurzweil, R. (2005). "The Singularity is near". New York: Viking.

Mitchell, W. J. (2003). "Me++ The cyborg self and the networked city". Cambridge Massachusetts: Massachusetts Institute of Technology Press.

References

Design & Technology Association: www.data.org.uk

e-scape: http://www.qca.org.uk/downloads/qca-05-1513_creativity-in-dt_web.pdf Accessed March 3, 2007.

Engstrom, Y. and knot working: <http://www.edu.helsinki.fi/activity/pages/research/newforms/>

Hargreaves, D. (1998). "The role of teachers in the knowledge society". London: Demos.

Higgs, S., Baumfield, V. & Hall, E. (2007). "Learning skills and the development of learning capabilities". A report from the EPPI-Centre, Social Science Research Unit, Institute of Education, University of London. Available at <http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=1851>.

John-Steiner, V. (2006). "Creative collaboration" paperback edition. New York: Oxford University Press.

Lyn, M. 2001 - Nuffield Primary D&T News item. Available at <http://www.primarydandt.org/news/?type=archive&pageNo=5>, accessed on 03.03.07.

Nuffield Design & Technology: www.secondarydandt.org

Qualifications and Curriculum Authority: www.qca.org.uk

Science Learning Centres: www.sciencelearningcentres.org.uk

SETNET: www.setnet.org.uk

TEP: www.tep.org.uk