7. IMPACT OF RESEARCH AND PROFESSIONAL DEVELOPMENT INITIATIVES ON INITIAL TEACHER EDUCATION IN DESIGN & TECHNOLOGY AT ROEHAMPTON UNIVERSITY IN ENGLAND

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Abstract
This paper describes the impact of two research and development projects and one professional development programme on the one-year post-graduate secondary school design & technology initial teacher education course at Roehampton University. By considering the impact in terms of Mode 2 research and the development of intellectual capital it will demonstrate that curriculum development in teacher education can be informed by research and professional development and that this has the potential to be proactive in informing the direction in which new entrants to the profession develop the subject.

Background
The route into teaching design and technology (in secondary schools in England is increasingly through a one year postgraduate certificate of education (PGCE) where students already have a design & technology relevant undergraduate degree. However, there is considerable evidence that those entering these courses have different backgrounds and experiences of designing (Lewis, 1995, 1996: Rutland 1996, 1997: Tufnell, 1997: Ofsted 2003). Ofsted (1998, 2000) has reported consistently since the introduction of D&T into the National Curriculum in England that designing skills lag behind making skills. Ofsted (2002) reported that in 'some schools, there is insufficient attention to the processes of designing, particularly in Key Stage 3 where the experience of pupils aged 11 – 14 years in design & technology is merely a sequence of short focused practical tasks with no opportunity to apply their own ideas in a longer design task'. The tutors at Roehampton University and teachers in partner schools shared these concerns.

Research and development to enhance the teaching of designing
In 2003 the Teacher Development Agency (TDA) awarded the School of Education at Roehampton University a small research and development grant to investigate the effectiveness of deliberate curriculum interventions to enhance trainees ability to teach designing. The investigation took place during the academic year 2003/4. In September 2003 all the 29 PGCE Trainee teachers completed an audit to assess their previous design experience. The data they were asked to provide included their school, further and higher education, work and leisure experiences. Six students were identified with limited design experience. The trainees had relevant degrees and backgrounds for teaching design and technology but 'designing' was not a strong feature. Trainees were engaged with their own response to designing and the teaching of designing by the introduction of three new designing and making activities:
Designing and making a body adornment collection

Designing and making an electrical mask
Designing and making a puppet theatre and puppets for a particular performance
Interviews with the selected trainees were carried out after the first intervention, after the first teaching experience, after the second intervention before the second school experience and after the second teaching experience and third intervention. The tapes were transcribed and analysed for information concerning trainee's experience in teaching designing.
The preliminary results of this research were reported at PATT 14 in 2004 (Barlex & Rutland 2004)
The effect of the interventions were as follows:

a) An increase in trainee's ability to reflect on their own and others' practice with particular reference to the teaching of designing
b) An increase in trainee's confidence and capability to introduce successful design based activities in their final teaching experience as alternatives to established less designerly activities currently taught by the practice schools

In 2004 the TDA awarded the School of Education at Roehampton University a further small research and development grant to extend the investigation to consider the needs of food technology trainees. The investigation took place during the academic year 2004/5 and the preliminary findings were reported at IDATA 2005 (Rutland, Barlex and Jepson 2005).
Trainees were engaged with their own response to food based designing and the teaching of designing with food by the introduction of three new designing and making activities:
Design activity 1 – Pasta sauce product development
Design activity 2 – Baked product development
Design activity 3 - Wrapped/filled product development.
As with the first research and development project the trainees were interviewed and observed on school placement.
The main findings were as follows:

a) The food technology curriculum provided by most partner schools was prescriptive
b) Trainees were able to engage with this in the following ways

- by introducing the designing strategies they had learned
- an increased use of group work
- providing pupils with opportunities for choice

c) Trainees were able to reflect critically on their own and others' practice with particular reference to the teaching of designing

A professional development programme to clarify design decisions
The Electronics in Schools (EiS) programme was funded and supported by DTI and DfES, in two phases. Phase 1, between September 2001 and August 2002, funded seven SETPoints[1] to enable them to provide training, resources and support to teachers and schools. Phase 2, from September 2002 to November 2003, extended the training provision, developed support for teachers back in schools and extended the provision of resources for pupils and schools. The aims of the programme were to excite more pupils about electronics and its applications, to ensure schools and teachers had the resources

and the capability to engage pupils in learning about electronics and its applications and to increase the number of schools and pupils that engage in learning about electronics. Early in 2003 the EiS programme noted it is possible to consider designing a product as making a set of decisions. These decisions can be divided into five broad categories:
Conceptual – the sort of product, what it does
Technical – how it works
Aesthetic – what it looks like
Constructional - how it fits together
Marketing – who its for
Decisions made in one category will affect decisions made in other categories.

This framework can be used to audit the design decisions that pupils are asked to make when they tackle a designing and making assignment. Teachers can also use this audit tool to look at the design decisions made across a sequence of designing and making assignments. This framework and its use as an audit tool were reported at PATT 15 (Barlex 2005) and were known to the team at Roehampton. It was introduced to the trainee teachers during the academic year 2003/2004 in helping them consider the nature of their own designing and that of pupils aged 11 – 14 years.

In an extension of the EIS programme in 2005 one of the university course tutors was introduced to the use of PIC chips through an activity in which pupils could programme the behaviour of a 'cyberpet'. (See http://www.paulgardiner.dsl.pipex.com/EiSS/EiSS.html) The new post graduate course tutor attended a part of this extension programme developed specifically to increase the amount of modern electronics taught in design & technology initial teacher training programmes.

Impact on the ITE curriculum
During the academic year 2003/2004 the first research and development project developed three intervention activities to develop the trainee's ability to teach designing: body adornment design, electric mask design and puppet and puppet theatre design. This enabled the staff at Roehampton to significantly raise the profile of teaching designing and the interventions were seen as so successful that by the academic year 2005/6 they have become established features of the design & technology teacher-education programme for all trainees whatever their subject specialisms.

The design decision framework developed through the EIS programme had an impact on the programme at Roehampton and the curriculum in partner schools. Having been used successfully with secondary trainees during the academic year 2003/2004, the design decision audit tool was incorporated into the training programme for primary trainee teachers in the academic year 2004/2005.

At the end of the academic year 2003/2004 mentors from partner schools discussed the work carried out by the trainees at the end of your review meeting with course tutors at the university. They were interested in and supportive of the emphasis on designing. They were also introduced to the design decision framework. They were particularly

attracted to the way it could be used as a means of auditing designing in the curriculum and one school was so impressed with this approach it has adapted it for use with school pupils aged 11 – 14 years.

During the academic year 2004/5 the second research and development project enabled staff at the Roehampton to focus on the concept of 'designing' in food, a key issue in recent years, and help trainees develop strategies to support their pupils' designing on school experiences. The curriculum intervention tasks developed during the project were fully integrated into the food technology PGCE Design & Technology course in the academic year 2005/6 and are proving to be successful in developing the trainees understanding of designing with food.

During the academic year 2005/2006 PIC chips were introduced to the teacher training course at Roehampton for the first time using the 'cyberpet' approach and plans for the 2006/2007 programme now include a greater emphasis on PIC chips.

Discussion

The influences shaping the curriculum adopted by those involved in initial teacher education are complex. There are statutory requirements for qualified teachers status (QTS), or Standards, as laid down by government agencies. In the case of England this is the Teacher Development Agency (TTA, 1989; TTA 2002) where secondary design & technology trainees are required increasingly to have developed both subject and pedagogy knowledge and skills within one year post graduate courses. There are the subject knowledge requirements of the particular discipline (DATA/TTA, 1995; DATA/TTA, 2003). This poses particular problems for design & technology in that no single degree prepares trainees to teach to the breadth that is required and trainees will be expected by the end of the course to have developed subject knowledge and skills in a first specialist area for the 11-18 age range and a second specialist area for the 11-14 age range. In addition, all trainees, what ever their specialisms, will be expected to have gained the subject competences required for 'designing'.

In addition to the breadth there is also the importance of modernity with regard to technology and the curriculum must ensure as far as possible that trainees will be prepared for a career in which frequent up grading of subject knowledge is essential. There is the pedagogy that is appropriate for the subject and in the case of design & technology there are, for example, many ways in which pupils can both acquire and demonstrate designing skills. In addition there is the important requirement of health & safety training which is considerable in design & technology. This complex mix of requirements needs to be informed by influences 'outside' the main stream of initial teacher education itself if the initial teacher education curriculum is to develop in order to continue to meet the needs of trainee teachers and the schools that they will enter when they qualify. In the study reported here two 'external' influences have had a significant impact on the initial teacher education curriculum for design & technology at Roehampton University.

The first influence consisted of two research and developments projects and investigated an area of national concern in the design & technology curriculum – the teaching of

designing. In this case this research actually took place by means of curriculum development interventions in the initial teacher training programme at the University accompanied by a monitoring of their effect on the activities taking place during school placements. The data collected indicated that the interventions were successful with regard to trainee's ability to teach designing. The impact of this on the teacher education programme was that the interventions became an established part of the programme and also influenced other design & technology programmes at the University. The second influence consisted of work carried out as part of professional development programmes which then informed elements of the initial teacher education programme. Again this has resulted in the new elements becoming an established part of the programme and extending the repertoire of the department. These new elements also influenced another design & technology programme at the University and mentor from partner schools

This new curriculum, developed through the influence of research and development projects and professional development programmes can be seen in terms of the creation of new professional knowledge or increasing intellectual capital. In the case described here the new professional knowledge, now embedded in the staff and curriculum at Roehampton University, was developed in response to two national requirements within design & technology. First, the importance of teaching designing, an area of acknowledged weakness for many teachers (Ofsted, 1998, 2000, 2002) and second, the need to increase the uptake of electronics within design & technology. Changes were made to the curriculum in response to these requirements and seen to be useful in practice, to result in improvement to the extent that the changes had effects beyond the programme in which they were introduced. This activity has been called mode 2 research (Gibbons et al 1994) and its dissemination at Roehampton and to partner schools was through informal communication networks, another feature of Mode 2 research. David Hargreaves, the Chief Executive of the Qualification and Curriculum Authority in England has argued that "…knowledge creation and dissemination in education must now move into Mode 2: teacher centred knowledge creation through partnerships." (Hargreaves 1998) In this case the teachers were lecturers at a University engaged in initial teacher education and the partnerships were through collaboration with researchers and those engaged in professional development.

It is important to ask to what extent it is reasonable to expect, or possible, for new entrants to the profession to make a significant contribution to the curriculum development that takes place in their first or second appointments? Observations on school placement and comments from trainees in interviews suggest that many schools have a fixed design & technology curriculum undergoing little change. Expecting newly qualified teachers to challenge this status quo may be considered inappropriate but if issues such as improving the teaching of designing are to be confronted then it is possible that newly qualified teachers will have many useful approaches especially if such issues have formed a significant part of their initial training.

It is clear that a newly developed initial teacher education programme as described in this paper can prepare new entrants to the profession to make a contribution to curriculum development, to create new professional knowledge. However, for this knowledge to be

created, those working in a school must encourage, welcome and respect new ideas. Good ideas – especially when they come from new or more junior colleagues – are fragile and may well need protection. An atmosphere of cynicism kills knowledge creation. (Hargreaves 1998) This puts an onus on established members of the profession to provide support and encouragement.

Two particular features of intellectual capital can be seen as particularly important in developing new approaches to any area of the curriculum. These are attitude capital and intellectual agility (Kelly, 2004). A predisposition to exploring new ideas and formulating a constructively critical view of the benefits that they might bring can be seen as a facet of intellectual capital that might be needed initially in those wishing to improve the teaching of designing within design & technology. Intellectual agility, the ability to innovate and change practice, to think outside the box about problems and come up with novel solutions will clearly play an important role in developing new design & technology curricula which places more emphasis on designing. These features were necessary for the staff at Roehampton to make and justify the changes to the initial teacher education curriculum and will be required by teachers in schools developing new curricula.

This paper raises the important further question “Is the approach to curriculum development in design & technology piloted at Roehampton University, a generally applicable model for curriculum development in initial teacher education?”

Notes

1 SETPoint
Currently the primary function of SETPOINTs is to serve as single, authoritative sources of information for teachers about what local and national STEM (science, technology, engineering & mathematics) materials and activities are available to enrich their teaching, and to offer both advice and assistance in delivering these activities to schools, in particular using the Science and Engineering Ambassadors (SEAs) as the interface with young people

Viewed at http://www.setnet.org.uk on 12.03.06

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