Designing in food technology – a curriculum intervention strategy in a one year design & technology postgraduate teacher training course

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Abstract
This study builds on previous work (Barlex and Rutland, 2004) exploring the effectiveness of a deliberate curriculum intervention strategy aimed at enhancing the design ability and design teaching skills of trainee teachers on a one year PGCE Design & Technology course. In this new study the focus is on the design ability and design teaching skills of food technology trainees. A parallel study was carried out at another institution and this will be reported in a future publication.

The trainee's initial design ability in food technology was gauged in two ways; using an audit tool and evidence provided by the design portfolio produced during the first food technology design activity for all trainees on the course. The development of food technology design ability was then gauged using evidence from the design portfolios produced during two additional food design activities. The study includes two sets of interviews with a sample of food technology trainees following the food design activities and a final interview at the end of the research project.

The ability to teach designing with food and its development across the one year course was gauged using data collected through classroom observation; trainee's teaching practice file and analysis of interviews with the sample of food technology trainees at the end of each teaching experience.

The study will report preliminary findings from data collected September 2004 – December 2004 concerning the development of design ability within food technology and the development of the ability to teach designing with food technology for trainees at a single institution.

Keywords: *ITE, postgraduate, secondary, designing, food technology, curriculum intervention*

Background to the study

Since the introduction of design and technology (D&T) into the National Curriculum in England in 1990 inspection findings have reported consistently that designing skills lag behind making skills. A government funded Teacher Training Agency (TTA) research and development grant in 2003-2004 provided an opportunity for the researchers to carry out an intervention study to engage with this situation with regard to trainee teachers. As a result of the intervention trainees developed insights into the requirements of teaching designing and were able to use these insights in developing effective practice. Initially, the trainees were concerned about deviating from the school's scheme of work and noted the limited extent to which pupils aged 11- 14 and 14-16 years were engaged in designing in the prevailing D&T curriculum. By the second practice they were confident enough to negotiate and implement their own approaches to teaching designing and make significant improvements to the curriculum offered by the school (Barlex and Rutland 2004). In the course of the study it emerged that the trainees teaching food technology experienced difficulty and expressed concern over designing with food. This finding has resonance with studies investigating the position of food technology within the context of D&T and problems associated with the movement from the traditional, domestic focus of food courses to industrially based food product development (Rutland, 1997, 1999, 2001).

The importance of design decisions

In the English *Design and Technology National Curriculum* (DfEE and QCA, 1999) pupils are required to tackle designing and making assignments (DMAs). In these assignments pupils are expected to generate and develop design ideas and then make a prototype product based on those design ideas, which can be evaluated against the performance criteria the design was intended to meet. An important first step in understanding the demand of a particular DMA is to audit the range of design decisions that are likely to be made by pupils

tackling the assignment. The audit tool used in the first TTA study consisted of five key areas of design decision that can be represented visually as a pentagon with each area of design decision connected to each other area (Figure 1a). The five design decisions are conceptual (what it does), technical (how it works), aesthetic (what it looks like), constructional (how it fits together) and marketing (who it is for) (Barlex and Rutland, 2004).

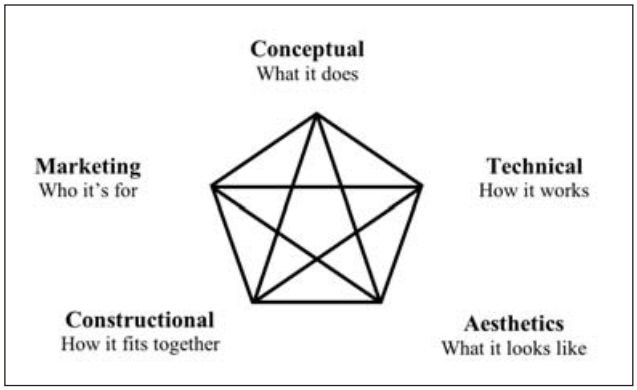

Figure 1a One way of representing the areas of design decision that pupils may need to make when tackling a DMA

However, in the research project reported in this paper the focus area of D&T is food technology, and there was a need to reconsider the terminology used in the five key areas of design decisions. Following discussions between tutors and trainees the same framework for design decisions was used as for the previous research project, but the language to describe the five areas was changed to be more relevant for food technology (Figure 1b).

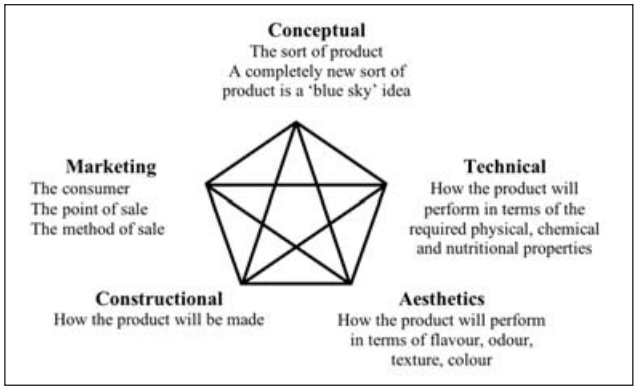

Fig 1b Design decisions described for food technology

The descriptors have been clarified with particular relevance to the design decisions that are made in food product development. It is important to note that the interaction of the key areas is even more significant in food technology than in other focus areas. The aesthetic qualities of a food product will be highly dependent on both how it is made and the way in which the ingredients interact according to their chemical and physical properties.

As with other focus areas of D&T, it is usually the teacher who identifies the sort of product the pupils will be designing and making, making it very difficult for pupils to engage in 'blue sky' or 'big creativity' (Boden, 1990, 1994) conceptual design. However, even if the type of product is identified for the pupils by the teacher, there are still many opportunities for making design decisions and make small changes (small creativity). For example, when considering the designing and making of a cook chilled 'pasta sauce' food product, although the teacher has specified the nature of the product there is still a wide range of design decisions that can be made by the pupil acting as a food product designer. The pupil can identify the particular market or likely consumers and in response to this identify appropriate sensory characteristics. A range of design decisions can be achieved through the choice of ingredients, an understanding of the ways they interact both in the final product and the variety of 'making' processes available. The pupils can further adapt the design decisions made so far in response to the nutritional requirements for different target groups.

Method

Identifying six trainees to study in greater depth. In September 2004 fifteen PGCE trainee teachers at Roehampton, with food technology as either a first or second specialism, completed an audit to collect data on their school, further and higher education, work and leisure experiences. Six trainees were identified, three with food as a first specialism (1st) and three that had chosen food technology as a second specialism (2nd) and this data is summarised in Table 1.

The interventions

The first design activity in September 2004 was a food product development activity 'Pasta Sauce' and it involved all the trainees working in groups. In the second design activity in October 2004 the fifteen food technology specialist trainees worked individually on a 'Creative foods' project over three half-day sessions to develop a design brief and design and make 'a baked food product'. The third design activity took place in January 2005 and required the

Table 1 The experience of the six food technology trainees

	School Qualifications & experiences	FE Qualifications & experiences	HE Qualifications & experiences	Work experience	Leisure experience
Trainee A (female) (1st)	GCSE Home Economics	A Level Home Economics	BA Home Economics	Senior Researcher Good Housekeeping Institute	Making wedding cakes
Trainee B (female) (1st)	GCSE Design and Technology (Food Technology)	HND International Hospitality Management	BA International Hospitality Management - Product Development	Large food retail supermarket outlet	
Trainee C (female) (1st)	GCSE Food technology	'Taster' course for teaching food technology in secondary schools at university	BSc Nutrition and Health	Worked in dietetics department at local hospital	Food preparation for the family
Trainee D (male) (2nd)	GCSE Art and Design	GNVQ Design and Technology. Restaurants	BA 3D Model making	Graphic design consultant	Food preparation at home
Trainee E (female) (2nd)	A Level Art and Design	National Diploma - Fashion and Clothing	HND Textiles BA Textiles and surface decoration	Design industry: graphic designer	Make bridesmaid dresses. Event cards
Trainee F (female) (2nd)	GCSE Home Economics	B Tec Photography City & Guilds Graphic Design	BA Graphic Design	Media technician in schools	Photography Food preparation

same trainees to work in groups to develop a 'Wrapped filled' product development project.

All thirty PGCE trainees took part in the one-day Pasta Sauce Project in the first two weeks of the course with the aim of producing a pasta sauce based product that could be sold in a chosen retail outlet to an identified customer group. At the beginning of the day the trainees were introduced to the concept of food technology and reminded of the design decision pentagon they had used previously in their body adornment project based on materials technology. They discussed the similarities and differences that might be found in food technology and were given a group product analysis task of pasta based products to widen their knowledge of the brief that they had been set. They were introduced to sensory analysis, or 'taste testing' activities, using attribute analysis exploring flavour, odour, texture and colour. They also used the PIES approach for categorising people's needs – physical, intellectual, emotional, and social needs.

After a coffee break focused practical tasks were used to help the trainees acquire knowledge of a possible solution. Each group was given four small samples of a prepared basic tomato sauce and asked to select additional ingredients from a range including spices, herbs, cheese, vegetables, lentils, cooked ham and tuna fish. Using Nuffield Chooser charts (www.secondarydandt.org/resources) to guide them, they explored the development of flavour, odour, texture and colour in the sample sauces (Figure 2a). In the afternoon each group of trainees decided to further develop one of their four sample sauces from their focused practical tasks and identified a theme and a target customer group for the food product. They were reminded that, although there was insufficient time that day to use image, mood and stimulus boards as in their body adornment project these could be used very successfully in food technology. Each group was expected to produce a jar label or rough advert as a poster or storyboard. The trainees were asked to write a short reflective piece about the extent to which they felt able to make design decisions affecting the nature of their food products and the usefulness of the design strategies they had used.

As the trainees did not know each other at this stage of the course, the make up of the working groups was by chance. It was found that the range of food products produced, though all originally based on a simple tomato sauce and pasta, were varied and addressed the needs of a wide range of target markets. The requirement to experiment before writing their design brief appeared to open up the trainee's thinking. Group 1 contained five trainees and their theme was a healthy 'Trufood' range for young professionals. The theme for group 2, with six

trainees including trainee A and B, was a 'cook chill' product packaged in three separate plastic pockets for young people on the move. The theme for Group 3 of five trainees' was an authentic Italian 'Pasta Perfecta' for the professional middle class (Figure 2b). Group 4 of four trainees, including trainee C, focused on an Italian theme of 'Dolce pasta' sold with a bottle of wine for professional couples. Group 5, with five trainees, including trainees E and F, had a theme of 'Lloyd Grossman' with the product sold in a glass bottle for a target market of high-income earners. Finally, the theme for Group 6 of five trainees, including trainee D, was a 'Fresco Sauce' with chunky vegetables for a target market of vegetarians.

Figure 2a Trainees develop different flavours, odours, textures and colours from a starter sauce

Figure 2b 'Pasta Perfecta' – a product developed for the professional middle class

Fifteen food technology trainees took part in the second design activity. In session one the trainees developed their knowledge and skills through some focused practical tasks on ranking, preference sensory analysis activities and an investigation of the structure of foods. They were introduced to the design brief and given 'starter' recipes of basic methods of food products e.g. biscuits, scones, pastry. They were asked to brainstorm their initial ideas and produce a mood board of possible themes. In session two they chose a 'basic' recipe and develop a range of products from their initial ideas and themes, for example children's party (Figure 3a), Christmas party, a Garden centre, Halloween and an Animal Farm. A computer nutritional analysis programme was used to assess the nutritional content and for their last session they finalised their brief and produced a range of products further modified from the last session (Figure 3b). These were analysed against their brief and they discussed the range of products they could, with extra time, develop and reflected on the design decisions they had made against the pentagon of design decisions.

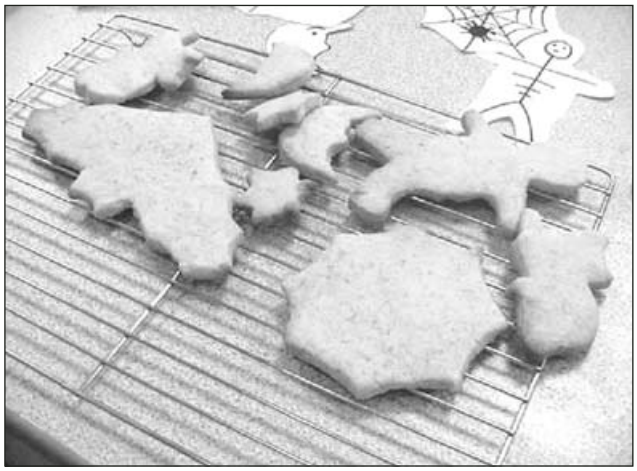

Figure 3a Biscuits for a children's party

Each of the six trainees was interviewed individually after the food projects, which were semi-structured, tape-recorded and transcribed. The focus of the interviews was for each of the trainees to identify similar project activities in their past and for them to reflect on the completed activities.

During the first block school practice each of the six trainees were observed teaching a lesson by their tutor, one of the researchers, a common practice for the PGCE course. All the schools were comprehensive and the range of lessons observed was broad with all, except one, at Key Stage 3 (11-14 years), again a common practice for the first teaching practice. The actual lesson seen depended on the range of lessons being taught by the trainee on an agreed day when visits were being made to other trainees at local schools.

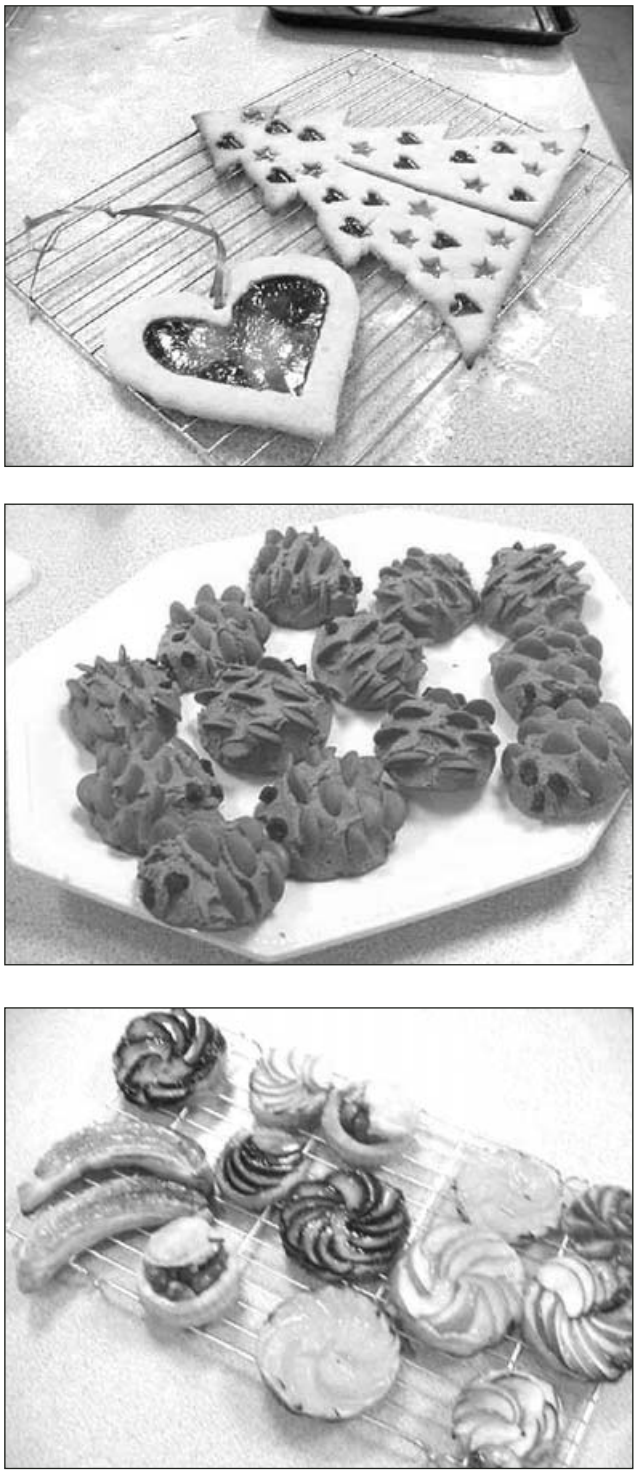

Figure 3b Products developed in response to individual briefs

All the six trainees were interviewed when they returned to the university after their teaching block practice. They were asked to describe other design-based activities they had taught during their school practice in terms of how successful they were, and what had given them the confidence to carryout the activities. They were asked what they felt were the barriers to design based activities in food technology and what might help them in their next practice. The findings have been grouped for each trainee.

Results

Findings from the interviews following the first two food DMAs

Trainee's own school experience with regard to designing and making with food was limited and described as simply 'making what we were told to make', with design activity being restricted 'to trying different recipes' (Trainees B and D). This contrasts strongly with the range of focused practical tasks supporting the designing and making assignment the trainees had experienced during the intervention activities. Trainees with a wider design experience than those who had food as their first specialism (Trainees D, E and F), were more positive about the use of mood and image boards in the designing and making assignment. They valued the design strategies they had used in other focus areas of D&T and appeared to be more able to transfer them to food technology. The use of 'star' diagrams to develop a 'profile' of food products was not considered useful by any trainees, but they liked the strategies used in the intervention activities. Trainee C had used these strategies at university, but they were new for Trainees A and B. It was generally thought that 'starter' recipes provided a foundation to generate ideas (Trainee B, D and F) and Trainee B commented, ' you have got to use them in food- otherwise it does not bear thinking about what you might end up with the pupils'. Trainee A was concerned that pupils needed even more guidance and Trainee F had decided to use a book to stimulate her thinking.

Findings from classroom observation

This observation took place during the first teaching practice where it was found that the student's teaching followed closely the school's scheme of work. Where pupils were tackling a designing and making assignment, there was considerable emphasis on traditional making skills with the sequence of activity structured through worksheets and designing was largely allowing the pupils very limited choice with 'extra' ingredients. Generally, the lessons emphasised pupils following recipes they had been given with little variation. The Year 9 class with Trainee C was designing a 'Healthy Wraps' hand held product to make the next lesson. The product analysis session was teacher led, and they were asked to sketch their product, showing lost opportunities for hands-on experiences with food for the pupils and little

discussion on design criteria such as conceptual, aesthetic, and marketing. Construction was the key criteria addressed. Trainee A's Year 8 class was exploring in groups a range of foods against technical design criteria such as the impact of nutrition and physical properties and marketing on the consumer. Each group of pupils feedback their findings to the rest of the class.

As in the first study, the students were reluctant to make changes to the schemes of work operated by the schools but were aware of the fragmented nature of the pupil's experience in terms of design conceived as a sequence of 'connected' activities that informed each other.

Findings from the interviews after school teaching experience

The trainees' experiences had shown that pupils were not generally engaged in designing in food technology. They had found schools 'quite rigid - they don't think outside the box' (Trainee E) and 'the pupils went straight to the final choice' (Trainee B). All the trainees were concerned about deviating from the school's scheme of work but were developing the confidence to attempt to enhance the design dimensions of the designing and making assignments they taught by a range of strategies, for example:

- Brainstorming and questionnaires to identify and generate design ideas.
- A wider range of sensory analysis strategies other than 'star' diagrams.
- Product analysis of existing products to generate ideas and develop knowledge.
- Encouraging pupils to try out different types of food products to develop.
- Group work.
- Pupils working in teams on a small project.

All students were now thinking critically about the role of designing in food technology and ways in which their personal practice could support pupils when designing in the classroom.

Discussion

A key finding was that the two of food technology specialists (Trainees A and B) with a strong traditional food background relying on recipes and the direct teaching of skills, were at first less able to appreciate the value of the designing strategies they had been shown. This was not so for Trainee C who had not done a craft based food course at school and had come through a science route into a nutrition and health degree. Trainees with a first specialism in other areas of D&T appeared to more readily transfer their understanding of designing to food technology, but their level of skills and knowledge in food technology required greater attention.

An interesting issue is the extent to which design skills are transferable across focus areas. McCormick (2004) has argued that learning is highly context dependent. Hence a pupil having learned a design skill in one focus area might not necessarily be able to use it in another focus area. Within the Nuffield Design & Technology curriculum materials (Barlex 1996) design skills are categorised as strategies some of which are considered to be generic and used across focus areas whilst others are specific for a particular focus area. A strategy such as attribute analysis can be used effectively in considering alternative design solutions for products from different focus areas including food products. (See Figure 4 for an example of food product development using attribute analysis) Strategies to develop a particular flavour or texture for a food product 'design idea' will be focus area specific. The use of food as a medium with which to design as well as make is relatively new in the curriculum so it is not surprising that trainee teachers in food technology who have limited previous experience of design, found difficulty with the use of both generic and focus area specific design strategies. The ease with which trainees with previous experience of design were able to both use and appreciate the strategies is perhaps an indication that their transferability is possible but dependent on a 'designerly' mind set.

Size	Shape	Taste	Texture	Image	Product
Hand held	Finger	Sweet	Crunchy	Everyday	
Bigger	Finger	Sweet	Crunchy	Everyday	
Smaller	Cube	Sweet	Crunchy	Everyday	
Hand held	Egg	Very sweet	Gooey	Special	

Figure 4 From KitKat to Creme Egg by Attribute Analysis

An important development for food technology teachers will be the establishing of an agreed vocabulary to describe the design decisions that pupils will make when designing and making with food and a clarification of the design strategies, both generic and focus area specific, they need to make these decisions successfully. Examples from the Nuffield Design nad Technology food technology materials are given in Figures 5 and 6

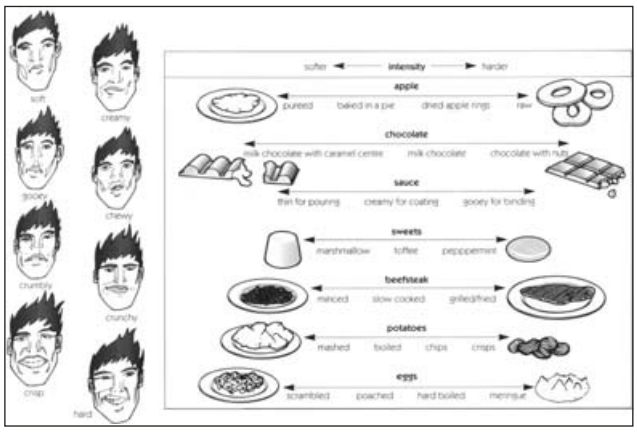

Figure 5 The vocabulary needed to describe texture

Ingredient	Mechanical treatments	Chemical treatments	Cooking methods
meat	pound slice cut mince	use marinades to tenderize	casseroling for tough cuts roasting for joints grilling for thin slices frying for mince
fish	slice cut	use marinades to tenderize	poaching frying grilling
cheese	slice grate		suitable for melting or mixing into fillings
eggs	whisking egg whites gives foam		scrambling poaching boiling frying
fruit	slice chop purée	use pectin to produce jams	boiling baking
vegetables	slice chop grate purée		boiling baking steaming casseroling
sugar			boiling sugar solutions first gives syrups and finally caramel

Figure 6 A texture chooser chart showing how the treatment of ingredients can be used to achieve the desired texture

The prescriptive nature of the food technology curriculum experienced by the trainees is disappointing although not unexpected and it was noted by Parker (2003) when he reflected on his own school inspection experience. However, it is encouraging to note that by the end of the school practice the trainees were acknowledging the importance of introducing the designing strategies they had learnt into their pupil's coursework and they recognised the importance of group work and the need to encourage choice. Despite concerns by the trainees not to cause disruption in their placement schools, their confidence had risen by the end of the first term and they were able to reflect and begin to introduce new approaches when designing in food technology.

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