Putting the Rigour and Knowledge Base into Classroom Activities with Pride and Confidence

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The public and professional arena is currently awash with comments highlighting the difficulties being experienced by teachers as they endeavour to implement the Statutory Orders for technology. These comments emphasise the need to identify:

- the knowledge which is required to underpin technology;
- the skills and understanding of materials which must be taught before pupils can design;
- the links between PoS and ATs;
- progression;
- assessment procedures which inform the learner and the teacher;
- assessment records which are manageable and meaningful.

The review of the Order which is currently being undertaken has been directed to address some of these issues. Nevertheless, the present Order remains in place for the next two years and teachers have no choice except to continue to interpret the ambiguities of it.

Shropshire's Technology Advisory Service has from the outset of NC Technology been helping teachers interpret the document and develop the team approach which is crucial to meet the challenge of the Orders. For the past year we have been working closely with schools on the issues listed above.

In teasing out the components of learning we considered the skills, knowledge processes, concepts and values which are implicit in the Order. We shared a belief that learning is much more than an application of routine skills: it is the promotion of conceptual development which holds the key to developing pupils as independent learners. Such an analysis also takes one to the heart of the progression debate.

The discussion which has been generated has been productive in helping to establish among members of a technology team a shared understanding of individual specialisms. In many cases it transpired that words such as 'skills' had been used by colleagues to mean different things. Little wonder that misunderstandings and tensions had arisen which got in the way of progress.

Technology teams in individual schools were anxious to develop assessment procedures and systems for recording pupils' attainments.

Before this could be achieved it was necessary to analyse:

- the concepts that were being, or should be taught at KS3;
- the knowledge which was necessary to develop that conceptual understanding;
- the context which would provide the relevance of such learning;
- the skills which would be experienced;
- the processes in which pupils needed to develop competence;
- the opportunities for pupils to reach specific levels within ATs;
- coverage of PoS.

Perhaps the most difficult task was the first one. Teachers found themselves treading comparatively new ground. Everyone thought they had a gut instinct about a knowledge base which provided an entitlement for pupils within their subject specialism but found it a more complex task to compile an explicit statement which clearly identified the broad concepts which were being developed within a unit of work.

Concepts help us to:

a. classify reality to make it more manageable;

b. make sense of things which happen;

c. make links between things which have happened.

In contrast rote learning places severe demands upon the memory and doesn't help the learner to operate in an unfamiliar situation.

Carrying out the analysis was a rigorous and challenging experience. As you consider, for example, what it is you are trying to get at when you talk about obesity and food choices, you begin to define a hierarchy of ideas. So it was we were able to draw up an overview of the 'key concepts' which are targeted with D&T capability. (See fig.1).

Figure 2 illustrates how the strand of stored energy can be approached using food as a material.

Just as when developing D&T capability one can often most profitably begin with an evaluation of an existing product so we found that to begin by looking carefully at what pupils had achieved in Year 8 provided a

CONCEPTUAL FRAMEWORK WITHIN D/T CAPABILITY

FITNESS FOR PURPOSE

Using resources and materials in an appropriate manner to create the desired effect. Matching materials and equipment to need

MATERIALS

- Origins/sources
- Properties
- Joining
- Grouping

EQUIPMENT

Production is a system of inputs, making and outcomes

People can specialise and use specialist tools and equipment

COST/CHOICE

Resources imply priorities and choice. Care is needed to avoid waste.
Wealth creation is important but there are legitimate motives other than profit.
Consumers are influenced and can be influenced.

QUALITY CONTROL

Quality of outcome is important. Goods, services and all aspects of life vary in quality.
Accuracy is needed in communication, presentation and implementation.

ENERGY

CONSERVATION

Energy is neither lost nor created. It is merely transferred from one form to another.
Management of energy. Use of energy to operate machines which do work for people.

COST

There is always a cost to using energy. The kinds and extent of costs will vary.
Value judgements impinge.

STORED

Energy is available in certain stored forms known as fuels.

TRANSFER

Energy can be transferred from one place to another, usefully or otherwise.
Heat lost through a building, electricity along wires.
Controlling/managing change using energy. Chemical/physical changes.

SAFETY

HYGIENE

Special care must be taken when handling materials to ensure safe production.

WORK ROUTINE

Choice and decisions are involved in matching materials and equipment to need.
Large tasks can be broken up into separate tasks.
Production is a system of inputs, making and outcomes.

QUALITY CONTROL

Quality of outcome is important. Goods, services and all aspects of life vary in quality.
Accuracy is needed in communication, presentation and implementation.

2D INTO 3D

STRUCTURES

A structure can occur naturally or be made.
It carries and supports a load and may, in addition, enclose a space and protect whatever is within the space.
Materials and components can be joined together in a variety of ways which affects their properties and potential use.

MECHANISMS

Are found in all aspects of human activity.
They are used to make work easier by controlling movement and force.
They have an input and output, can change the direction in which a force acts, can change the size of a force and can change the place where the force acts.

SYSTEMS

Involve the interaction of people and/or materials in some organised way.

GRAPHIC COMMUNICATION

Involves the visual expression and recording in both two and three dimensions.
It is used
(a) to aid the development of solutions to design problems e.g. observational drawing and recording, sketch developments and mock ups.
(b) to communicate the final solution e.g. sequence drawings, production drawings, packaging proto types and presentation formats.

Figure 1

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CONCEPT

STORED ENERGY - ENERGY IS AVAILABLE IN CERTAIN STORED FORMS KNOWN AS FUELS
FOOD AS A FUEL FOR LIVING THINGS/HUMANS

HIERARCHY OF CONCEPTS

(a) energy value of foods can be measured
(b) different groups of foods contribute differing amounts of energy
(c) individuals require different amounts of energy
(d) to maintain an ideal body weight a state of energy balance is required

CONTEXT/SITUATION

Pupils progress through projects set in context.

An overweight teenager is anxious to lose 1 stone Differentiated tasks which could be used.

Produce a package of material which will provide motivation, practical help and guidance in their choice of food

Produce a days menu's which will reduce calorie intake but help to persuade the dieter that they do not have to go hungry or have minute portions

Produce a recipe leaflet which promotes the use of rice/bulghur wheat/pasta.....in a weight reducing diet

As above but focus upon:

breakfasts; mid-week meals; packed lunches; healthier snacks; budget meals which the rest of the family can eat; a range of dishes which a school canteen could incorporate into its menu....

VALUES

Consumer

Shopping psychology, advertising, the 'Green Lobby', response of food manufacturers, packaging and marketing e.g. sugar adverts, 'Are you a Flora Man?'. Creative with the truth versus lying and the ability to make informed decisions. Food labelling, contradictions e.g. organic low fat yogurt in a plastic pot.

Social food trends

Nutritional guidelines, peer group influences on food choices, religion, lifestyle - snacks, quick meals, takeaways, tuck shops.

Moral

Use of animal oils in fats/cheeses, vegetarian v carnivorous, use of land for cereal/meat production.

Aesthetic

Quality of life affected by enhancement and enjoyment of food, weight reduction /energy balance promotes healthier lifestyle.

CONCEPT RELATED KNOWLEDGE

Energy value of foods can be measured

Definitions of k/cals / Kj, use of a bomb calorimeter to calculate the energy value of foods, food tables, food labels.

Different groups of food contribute differing amounts of energy

Nutrients which contribute to energy stored in the body i.e. carbohydrates, fats, proteins, (alcohol)
Nutritional composition of foods, any one food usually contains more than one nutrient. Proportions of carbohydrate, fat and protein in foods related to energy values.

Individuals require different amounts of energy

Factors which influence needs of individuals and groups of individuals - age, sex, state of health, amount of activity, body size, degree of exercise. Energy requirements of toddlers, infants, young children, teenagers, adults(sedentary, moderately active, very active), elderly.

To maintain an ideal body weight a state of energy balance is required

High and low energy value foods - correlation between fat, carbohydrate and sugar content in relation to water content. Energy input versus energy output, activities related to rate of energy use, role of exercise, basal metabolic rate. Weight reduction (further concept of a diet/weight reducing diet). Recipe modification and development in relation to an understanding of a range of food commodities, their chemical properties which affect their physical properties and their applications within food technology. Which fat do you use to spread in a weight reducing diet? Why can you not use a low fat spread for baking and frying?

SKILLS

Basic food preparation focussing upon peeling, slicing and dicing of vegetables/fruit to create a range of interesting salads.

Estimating size and shape.

Grilling and microwaving as methods of cooking to reduce fat intake.

The use of the oven for casseroling.

Methods of preparing and cooking rice, pasta, bulghur wheat and other cereals to use in salads.

The development of psychomotor skills in the manipulation of food commodities, effective use of tools and equipment to produce the desired results.

Presentation and serving of food to create interest.

Figure 2

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purposeful starting point for an analysis. It emphasised the need to make the time for teachers to reflect.

Without fail teachers began to draw similar conclusions:

- the closed nature of some of the tasks had reduced the opportunities for pupils to reach beyond the lower level of the Statements of Attainment;
- there was evidence of AT3, which led into considerations of quality, but often little evidence of AT1 and AT2, with AT4 being quite shallow.

While considerable feelings of guilt and inadequacy were experienced by teachers in pursuing the analysis, the process of reflection paid dividends. Teams were able to see the ground which they had covered in making sense of something together which until then had meant different things to all people, and then to take the next step.

A variety of approaches have been taken in different schools. Rather than re-invent the wheel, the LEA's model of contractual curriculum support has enabled members of the Technology Advisory Team to disseminate work across the Authority. The agenda for our curriculum support in schools is the result of advisory team planning for assessment at KS3. We are finding that the materials produced within one school can be used as the starting point for further development in another school. Acknowledgement at each stage provides much needed ownership and builds upon the high level of partnership and co-operation among Shropshire schools.

There are some of the areas of development which have been pursued:

- *A 'student-speak' version for each of the Attainment Target which is being used to introduce negotiated assessment at KS3.* To help students to target what they need to focus upon to improve their attainment the simple technique of using bold typeface to highlight the new skills or processes which are required has been used. This also highlights the progression in competencies.
- a range of stranding analyses which have promoted not only a familiarity with the document itself but also a deeper and shared understanding of the confusing terminology within the Order. Student-speak versions have been compiled.
- *pairs of teachers, from mixed specialism, planning units of work together is proving to be a particularly effective method of professional development which effects change and builds self-esteem.* As a CDT teacher leads a lesson developing drawing skills and perspective, the home economics specialist is learning alongside pupils and is able to make reference to such learning in later lessons. Consolidation and reinforcement is promoted as opposed to senseless repetition. A healthy blurring of specialist boundaries is being developed in a manageable manner. Most importantly, teachers begin to gain an insight into the curriculum as it is experienced by the pupil.
- *APU materials are being used as the starting point for developing design sheets or teaching strategies which help pupils to move their ideas forward;(1)*
- methods of recording ephemeral evidence are being piloted;
- focusing upon specific learning outcomes in relation to assessment. Questions such as 'What do I want to assess?, How might I know that a pupil can do this?' and 'How can I provide the opportunities for them to show me that they can do this?' are being asked.

We are seeing a heartening growth in teacher confidence accompanied by a corresponding rise in the level of the educational debate. The process is helping to put the issues in perspective. It is slow work when all deadlines are short — but a salutary reminder of the old adage: if you find yourself in a hole, stop digging and have a 'bit of a think'. Technology teams digging furiously in the hole at the moment might take heart from our experience of the benefits of resting on the shovel and agreeing what we're digging for.

References

Kimbel, R. et. al. (1991).'The Assessment of performance in Design and Technology'. SEAC

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