Tales from the River Bank — The Aquatech Project

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The Aquatech Project represented a partnership between schools, LEAs industry and higher education with ten schools, fifty teachers and over 1200 pupils eventually taking part. The project was planned in four stages; a launch day, residential planning weekends, school based work and a final exhibition. This article presents case studies from three schools, two secondary technology departments and one science department, who took part in the Aquatech Project. All three schools used a local natural resource, the River Thames, as a starting point for their investigations but proceeded in quite different ways. Some of the curriculum issues they faced are described.

The project was suggested by a firm of marine engineers with a view to stimulating young peoples' interest in water science and technology. They took their idea to the London Boroughs of Greenwich and Tower Hamlets and the London Institute of Education who agreed to become partners in the venture. In order to attract the most important partners, the schools, a launch day was planned at the first stage of the project. Guest speakers from marine industries were invited to speak about their work and suggest ways in which teachers could follow up their themes in the classroom. Speakers included a commercial diver, a BP tanker captain and an occeanographer. Ten schools subsequently signed up for the project, five primary and five secondary, from Greenwich, Tower Hamlets, Bexley and Essex LEAs.

The schools' brief was wide: any choice of project with a 'watery' theme to be carried out during the academic year 1990/91. They were also asked to keep a log, designed by the Institute team, to record the various stages of the project. One focus of the Institute's research was to record how schools used different learning activities, including those set in real life contexts, to extend the theme of 'water'. Schools were offered support from three sources; industry and community contacts, LEA advisers and the Institute team. Representatives from all three sources took part in the planning and school based stages of the project and co-ordinated the final exhibition. The main financial commitment of the project went towards the running of residential weekends for teachers and for the preparation and mounting of the final exhibition. In addition, each school was given a small grant towards expenses incurred over and above normal curriculum activities.

Residential weekends were held for all participating teachers early on in the project, to allow departments to undertake detailed planning such as defining a project theme, planning introductory stimulus sessions, grouping of pupils and likely resource requirements. The weekends were also a good opportunity to swap ideas and experience with colleagues from other schools. Discussion between primary and secondary groups about pupils' progression was particularly useful and levels of attainment inevitably cropped up more than once. Because of its coincidence with the publication of the National Curriculum Technology Order, several schools decided to use Aquatech as a 'trial theme' on which to base the innovative implementation of the new subject. In particular, secondary departments of up to ten teachers used the opportunity of meeting outside school to explore the issue of how their individual specialist knowledge could be best

used in the framework of National Curriculum Technology. Volunteer 'experts' were also invited to the weekends to inform teachers on specific aspects of their chosen projects. These included civil engineers (digging the Channel Tunnel and constructing the Thames Barrier) a photographer (taking photographs underwater) and an oil rig engineer (life on a North Sea oil rig).

The three schools described in this article decided to use a local feature, the River Thames, as a starting point for Aquatech. Two of these, Abbey Wood and Plumstead Manor, in the borough of Greenwich, carried out the Aquatech Project in their newly formed technology faculties with Year 7 pupils. In both schools, visits and visitors were employed as a stimulus for pupils and teachers at the start of the project.

☐ Getting started — visits and visitors

Abbey Wood School in Woolwich, South East London is a mixed, eight form entry comprehensive. There are eight members of staff in the Technology faculty, formerly the CDT, home economics, textiles and IT departments. For their Aquatech project, teachers chose the maritime theme of 'going on a long voyage'. The River Thames is visible from the school building and serves as a reminder that this part of London was the starting point for many a long voyage in the past so the pupils had a head start in thinking themselves into the role.

The teachers realised that if they were to use a context remote from most pupils' experience they would need to provide some extra stimulus and background information early on in the project. Through the Aquatech team, a long distance sailor was invited to talk to the pupils about the practical implications of being on a small vessel such as the lack of space for storing food and water and the monotony of long periods away from land, television and newspapers. This led to interesting discussion of how pupils spend their leisure time, what foods they would most miss and which activities might still be possible. Pupils were also shown the specialist clothing used for warmth and safety such as thermal underwear, reflective patches on outer garments, velcro fastenings and a safety harness for working in rough weather. Video clips from the Whitbread Round the World yacht race showed such garments 'in action' and added some atmosphere to the talk.

Another visitor, a policeman from Thames Division, provided a more local context and spoke about using the river safely, describing some possible consequences if you didn't! To further 'set the scene' early on in the project and to give pupils as varied a selection of information to draw upon as possible, teachers organised a day visit to the National Maritime Museum in nearby Greenwich. Pupils were briefed beforehand about what to look out for and record. The museum exhibits allowed pupils to compare the amount of space and facilities on historic and modern sailing craft. Back at school pupils selected and interpreted the information gathered from the visit and visitors for their project files. This provided useful evidence for AT1 as well as a permanent record of the project

The second school, Plumstead Manor, is a comprehensive girls' school with 8 form entry. Technology is taught by nine teachers from business studies, home economics, CDT textiles and IT. One reason they decided to join the project was to use Aquatech as a confidence builder for themselves, exploring through the project how the department could teach technology in a more integrated way. Like Abbey Wood the school is just one mile away from the river but despite this very few of the girls had ever made use of the river itself.

The teachers decided that their Aquatech theme would be 'The River Thames — Past and Present' so at the start of the project a river boat trip was arranged for the whole of Year 7 from the Thames Barrier upstream to Tower Bridge and back. (This experience prompted one teacher to offer an alternative theme title which she recorded in the Aquatech log file; 'How we got 210 pupils there and back!'). Like Abbey Wood, the teachers decided that giving the pupils first hand experience would provide them with a sound starting point for their project. Before going on the trip, pupils were briefed explicitly in terms of AT1 and were asked to consider what needed improving about aspects of the river, its surroundings and the boat trip itself. Indeed the trip prompted many questions from pupils such as 'what do all the other boats on the river actually do?', 'what has the land surrounding the river been used for over the years?', 'is anything being done about pollution of the river?' and 'what would a visitor to London think of the existing facilities?'.

☐ Team organisation and outcomes

After these initial stimulus sessions, teachers put into motion the plans they had made at the residential weekend sessions for focusing pupils down to task definition and planning.

At Abbey Wood, a highly structured approach was used with *the teachers deciding on the kinds of tasks which should be carried out* in each specialist area for 'going on a long

Figure 1: Specialist tasks at Abbey Wood School

Business Studies	planning for sponsorship of the voyage, currency and exchange rates in different ports of call, costing of provisions etc.
Home Economics	producing nutritious meals and snacks from specified preserved ingredients
Graphic Design	designing a pennant for the boat (from pencil sketch to computerised colour print)
Design and Realisation	designing and making containers for provisions
Textiles	designing and making cloth roll up kits for tools or first aid items.

voyage'. This approach allowed teachers to keep a close grip on the knowledge and skills being learnt by the pupils and make resource provision less difficult than if pupils had had complete free choice. Pupils were grouped into teams, with each person designated a specialist area to work in. The specialist tasks were as follows: (see Figure 1 on page 6).

Pupils were permitted to work in their own specialist areas but also to use others and the library and IT room if necessary. In order to keep track of the pupils, teachers devised an identity card system with exact numbers of cards of different colours and symbols to show who was supposed to be where and how many spaces were available in each room. With 200 pupils in two morning sessions of 100 each this system was essential for initial organisation whilst pupils settled into the new approach.

Within specialist areas, tasks were further defined but teachers, rather than giving strict procedures to adhere to as they might have done with a traditional approach to their subject, took on more flexible roles such as: a) *setting standards* where necessary, for example reminding pupils of food safety/hygiene when handling, storing and cooking food, b) *advising* pupils on ordering appropriate resources in sensible quantities for the following week's activities, c) *encouraging* team work in planning and decision making.

In contrast, at Plumstead Manor *each team of pupils was asked to define their own Aquatech brief* using the river trip as a starting point. Pupils were thus given some responsibility for decision making at the project definition stage. They brainstormed their ideas about what the group outcome would be and what task each person would carry out in each of the specialist areas. The brief was then discussed with a teacher until a final set of negotiated tasks was decided upon.

The areas covered were CDT, home economics, IT, textiles and business studies. Pupils remained in these areas for the practical element of the project but reformed at regular intervals to update each other on individual progress and finally to prepare a group display and presentation.

Teachers decided to timetable in these regular feedback sessions *after* the project had begun because they felt that some pupils were losing sight of the original aims of the group brief. Not only did the feedback sessions help the pupils to focus on the task, they also enabled the teachers to track exactly what knowledge and skills were being used by individuals. However, this change of plan raised the issue that *pupil directed activities take time.* Teachers had to then rethink their schedule to allow time for pupils to finish off their practical work *and* their preparation for team briefings in their specialist areas.

Such an open ended approach presented a challenge to teachers because it meant relinquishing some control over the learning situation at the crucial planning stage of a project; any number of tasks and outcomes might be chosen by the pupils and present resourcing difficulties. In practice, although some ideas were unrealistic (such as building a life sized boat!) the group tended to opt for *similar briefs* such as designing a souvenir shop and souvenirs for Tower Bridge (they had been unimpressed with the existing ones) or designing pleasure boats with a special theme for example a disco boat, a health boat.

This narrow interpretation of the original brief by some pupils presented a dilemma for teachers. Whilst the boat trip had served to broaden ideas for many pupils it almost certainly had the opposite effect on others, focusing several groups' ideas onto one or two outcomes (or perhaps it happened that one or two good ideas from some pupils were quickly picked up on by others, a follow-the-leader mentality). On this occasion, teachers allowed pupils to go ahead with their chosen project but it did raise the question for them of whether they should let pupils' decisions run as they are or influence them to some extent to give a bigger variety of outcomes. One way of exerting some influence might be to prepare a wide range of ready made briefs for pupils based on a preparatory visit by teachers. This would widen the range of projects to take advantage of the many possibilities which the visit presented. Given a broad range of briefs to choose from, teams of pupils would retain an element of decision making. Pupils could then develop their own design and technology activities within these briefs.

☐ Science and technology

One aim of the Aquatech Project in the secondary schools was to look at the variety of approaches used in technology departments *and* in science departments. The third school example illustrates some aspects of science AT1, 'Scientific investigation' and suggests opportunities for cross curricular work in science and technology. Science AT1, 'Scientific investigation' has parallels with AT1 in technology. 'Identifying needs and opportunities', as the following extracts from the Science Key Stage 3 programmes of study illustrate:

> *'Activities should be set within pupils' everyday experience and in wider contexts and require the deployment of their investigative skills...'*
>
> *'Activities should encourage the ability to plan and carry out investigations in which pupils: i) ask questions, predict and hypothesise; ii) observe, measure and manipulate variables, iii) interpret their results and evaluate scientific evidence.'*
>
> *'Activities should encourage pupils to appraise critically their investigation and suggest improvements to their methods.'*

George Green's School is a mixed comprehensive at the foot of the Isle of Dogs in East London. Like the teachers of Abbey Wood and Plumstead Manor schools, the science teacher used the River Thames as a starting point for Aquatech. The school directly overlooks the river and this prompted the teacher to plan investigations to do with 'Our River' for Year 7 and 8 pupils in their science lessons.

Using the same reasoning as the technology teachers from Plumstead Manor had employed to meet the requirements of AT1 in technology, he used an introductory lesson to take his Year 7 class on a short walk by the river in order to help them raise questions which could be investigated in their lessons. The pupils became curious as to how fast the river flowed, in

which direction and at what time (the Thames is still tidal at the Isle of Dogs). The class, with the teacher, decided to time a floating object between two points along the river and the pupils set about building boats from junk materials.

Trials of the boats revealed far more science than just the speed of the current. Before launching their boats, pupils had to know the direction and state of the tide and hence learnt a lot about the tidal patterns of the Thames. They helped design their 'experiment' and became aware of the limitations of its reliability as wind strength and exact direction of travel were not taken into account. Some boats fell apart rapidly, pupils not having taken into account the strength of the current, turbulence and wind and the resistance to water of some of the construction materials used. There was much potential for learning technology, through redesigning the boats (artefacts/systems), choosing suitable construction materials, comparing the performance of different hull shapes and improving designs. Understandably, the science teacher felt reluctant to pursue these possibilities and extend too far from science knowledge and skills, not having the time or facilities to do so. The class moved on to more scientific classroom activities such as testing water salinity and identifying microscopic organisms.

A second example was the establishment of a river data base using the 'Grass' data program. Pupils recorded information and updated the data base each week (See Figure 2 below).

The topic of pollution lends itself to many subject areas but for technology, topics on packaging, recycling and improving environments are obvious spin offs. In this instance, the data base was used in science for analysing tidal variations over time. However, such information could be used by several other departments as a valuable source of 'real' data from a local context familiar to pupils. Technology AT5, 'Information Technology', is also met by the construction, updating and retrieval of information from the data base.

The examples highlight some of the issues of common ground between the two subjects. (Raised in 'Project Work at Wyedean School' Wilde and Nettleship, *Design & Technology Teaching*, Vol 24 No 2 1992) Both science and technology AT1 encourage the process of investigating, testing and evaluating. Many concepts included in science ATs 2-4 are appropriate to technology activities such as control technology, uses of materials, environmental awareness and health & nutrition. The activities at George Green's School would have related equally well in technology and in science. Indeed in the Aquatech primary schools, science and technology activities often went 'hand in hand'. As we had expected, most of them carried out the project across all curriculum areas and pupils seemed to transfer science knowledge and skills into a technology context and vice versa with apparent ease and probably not able to tell which was which. This observation suggests that if pupils can do and carry out cross curricular activities at age 5-10, why not age 11 and beyond? Is the ability to transfer knowledge and skills being lost when pupils reach secondary school?

☐ Conclusions

Apart from being an enjoyable diversion from the normal routine, what is the real value of using the locality and visitors as a starting point for classroom projects? Perhaps a major factor is in broadening the scope of new project themes in the eyes of the pupils. Putting projects into a real and local context gives pupils plenty to consider, making their projects better informed. If pupils are to make informed and independent decisions in technology they will need access to a variety of stimulus material and local visits provide a valuable source of information. Of course, the three schools described in this article are in a prime geographical position for projects based on water and voyages which is not the normal situation for most schools. However, it is worth considering other features of the local environment as a stimulus for theme based technology projects. Canals, parks, disused land, museums and galleries, shopping complexes and transport systems are all potential sources of information. They are also a source of officials with expert knowledge for input at any stage of a project. The investigation of natural resources also helps teachers and pupils to realise that classroom activities and schemes do not always translate directly into real life. Large scale features have many special 'properties' which are complex and not easy to replicate in

Figure 2: Extract from 'The River' data collected by pupils

Date	5.3.91	12.3.91	19.3.91
Time	3.00pm	2.35pm	2.40pm
Weather	cold, windy, spitting rain	dullish, fresh breeze	sunny, gentle breeze
Air Temp	12°C	13°C	17°C
Water Temp	10°C	10°C	12°C
Slipway exposed	39.2m	62.6m	15.2m
Current Strength	medium	slow	fast
Current Direction	downstream	slack	upstream
Pollution (flotsam & jetsam)	plank of wood, box, plastic bottle, hat, milk crate, shopping trolley, drink cans	bricks, paper, plastic bottle, plank of wood	branch of tree, polystyrene, bits of wood, plastic bag, paper cups, drink cans

the laboratory or workshop; small containers of water do not behave in the same way as large river channels! A final point to make is that in using real life contexts we are forced to think beyond traditional subject boundaries. Whilst it is of course most important that pupils acquire specialist knowledge and skills, it is equally important that they are given a chance to put their learning into real contexts. If teachers are aware of other departments' programmes of study they will be in a good position to co-ordinate activities where appropriate and provide a greater continuity of delivery for the pupils.

The sponsors of the Aquatech Project were:

London Borough of Greenwich
London Borough of Tower Hamlets
University of London Institute of Education
Goodfellow Associates (marine engineers)
The Society for Underwater Technology
The Institute of Marine Engineers
Enterprise Awareness in Teacher Education (DTI)

The Project Schedule

June 1990: Launch Day
September 1990: Residential weekends
September 1990-March 1991: School based work
June 1991: Final Exhibition

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