Technology Challenge

Abstract

The 1998 MTTA Technology Challenge

The MTTA (The Machine Tool Technologies Association) Technology Challenge featured 37 schools and partner companies working together on manufacturing-based projects throughout the year. Each school teamed up with a local company to work on the Challenge, starting off their projects with industrial visits. The children that took part in the Challenge were aged between 8-11 years, the aim being to excite the younger generation about the opportunities available to them in engineering. MTTA supports the view that it is important to ensure that teachers have the knowledge to further inspire and nurture the children's interest. Teacher training days are organised to assist this, enabling teachers to experience the importance of engineering skills to industry.

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The aims of the project

- With the support of Education and Business Partnerships (EBPs), to link primary schools with machine tool suppliers and user companies.
- To support primary schools in increasing industrial awareness and understanding.
- To promote learning under real conditions in the wider community, and illustrate the importance of manufacturing industry to society through classroom projects.
- To provide practical expert assistance and support for professional development, for primary school teachers in the delivery of the design and technology National Curriculum, Key Stage 2.

The project team

The Partner Company will introduce the school to aspects of manufacturing technology, e.g. in its own or a customer's facilities. A Project Leader from the company will arrange appropriate visits and give technical support and expertise, helping to provide a stimulus for meaningful technology work within the School.

Figure 1: The pupils' work was displayed around the school

The project guidelines

Following visits during which the children observe the elements of designing and making products, the Team discusses and agrees the Project, reflecting aspects of the Partner Company's activity. This should help the children to work independently and as part of the Team, to understanding real world materials, design processes, the use of technology, and the fitness for purpose (i.e. quality) of products.

The school will develop the Project involving cross-curricular activities and the use of computers to include the design and construction of a working powered model, as well as drawings, and written work – poems, log diary of the Project, etc. The Partner Company will assist by arranging follow-up visits as appropriate and possibly making technical aids – components, engineering drawings, etc. – available to the school.

The Project should encompass as many of the following key elements as possible, incorporating them into the model so that the children can demonstrate an understanding of them, in the context of general aspects of design and technology capability.

- gears and gearing
- rotating shafts and bearings
- lifting, lowering and sliding mechanisms
- conveyors
- computer control of individual elements and groups of functions.

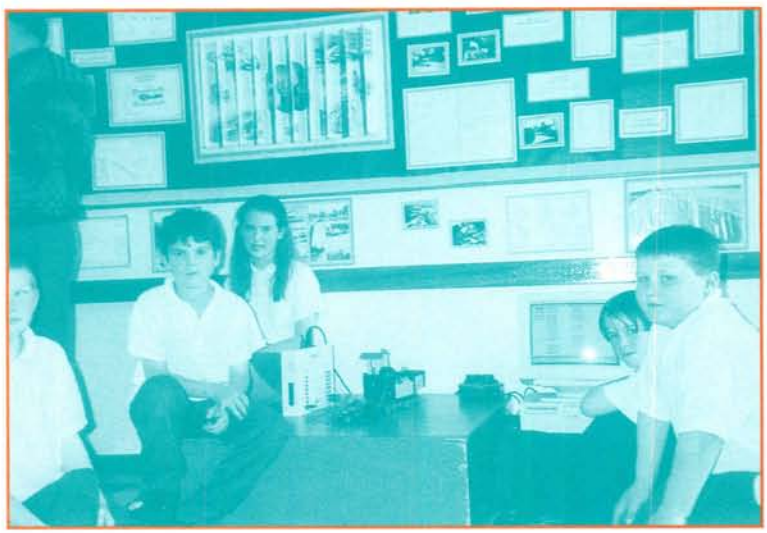
Studley CE Junior School

Studley Junior School is situated in Warwickshire, and has 220 children grouped into eight classes, ranging from Year 3 to Year 6. Judy Bowley, the design and technology co-ordinator, decided to take part in the MTTA challenge as she felt it would give the pupils the opportunity to use kits to build with and learn how to use computer control. The factory visit was eye-opening, and showed the pupils that engineering can be fun.

As part of the challenge, the pupils have to present their project to an audience, using displays and explaining how they developed the project. This helped build on their communication skills and their confidence.

The pupils were asked to build a model of a machine that contained moving parts; used gears/pulleys and used computer control. Drawing inspiration from the road repairs that were being carried out on the road outside

Figure 2: Pupils demonstrating the road planer in action



their school, they chose to develop their own road planer, after watching a similar machine plane the road and prepare the surface to be tarmacked.

As an introduction to the project, the pupils visited a local manufacturer, Kennametal Hertel, to see some of the many different ways in which computers can be applied in industry. They also visited the Gaydon Technology Centre, where they could see how the computerised equipment could be applied to manufacturing – indeed Kennametal employees do exactly the same. Being able to observe computer aided design in use provided a real life application to their lessons. The pupils were shown how to use Logicator (a software package for building, testing and editing control systems for use with a control interface box such as Smart Box) at Gaydon, which they went on to use in the classroom to control their road planer.

Although a team was selected to work on the Challenge, the whole class got involved in the preliminary stages. The project was linked to another ongoing project, which studied the Romans (famous for their road building) and their way of life.

In their own classroom, construction kits were used to help develop ideas. The pupils tried out some of the pre-designed models and linked them to batteries to introduce movement in the models. The SRTs helped reinforce previous skills and experience of working with gears and hydraulics as well as introducing new ideas, e.g. conveyor belts, worm gears, rack and pinion gears.

The next stage was to begin work on the road planer. Further information was gained by writing and phoning relevant companies. Since the project, the school has gained Internet access, so the task would have to be approached differently, probably allowing pupils greater freedom to research their ideas through various media, including books, CD-ROM and the Internet.

The teacher showed enlarged photographs of the 'real' road planer to the class, so that they could examine in detail the key features on the machine. After much classroom discussion, the following features were considered vital:

- the ability to move along the road
- a rotating cutting tool to skim the road surface

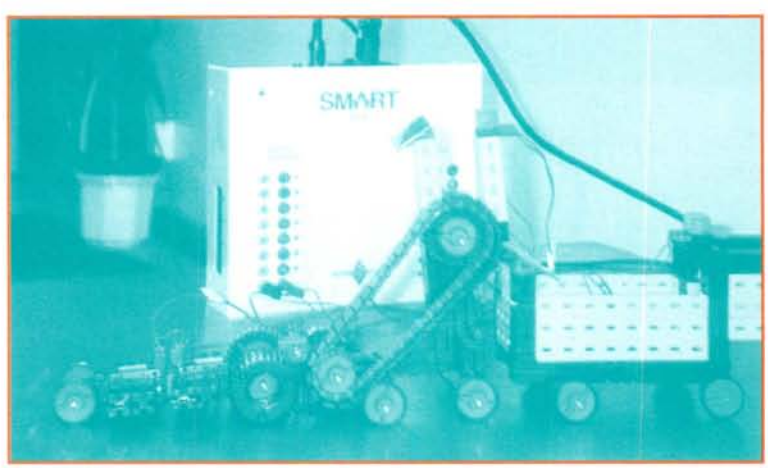


Figure 3: The Road Planer

Figure 4: Programming at St Mary's

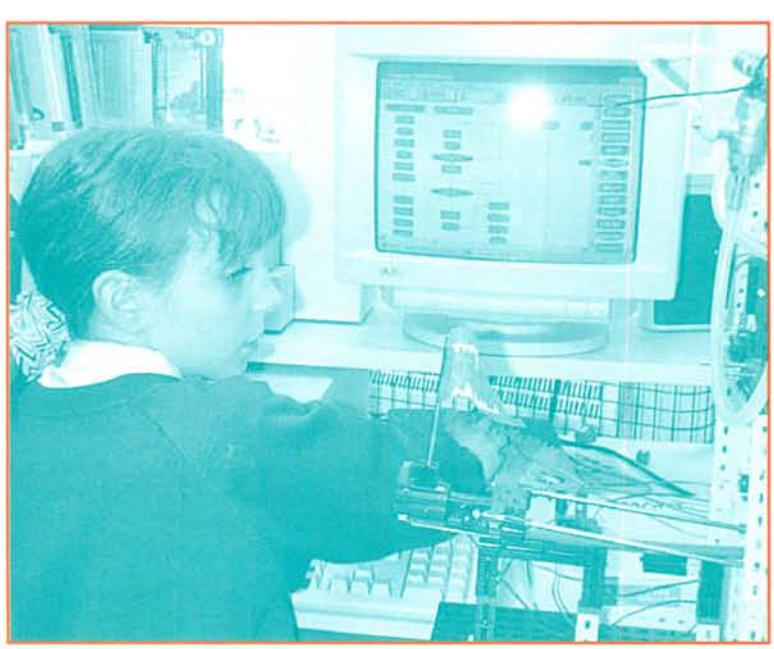


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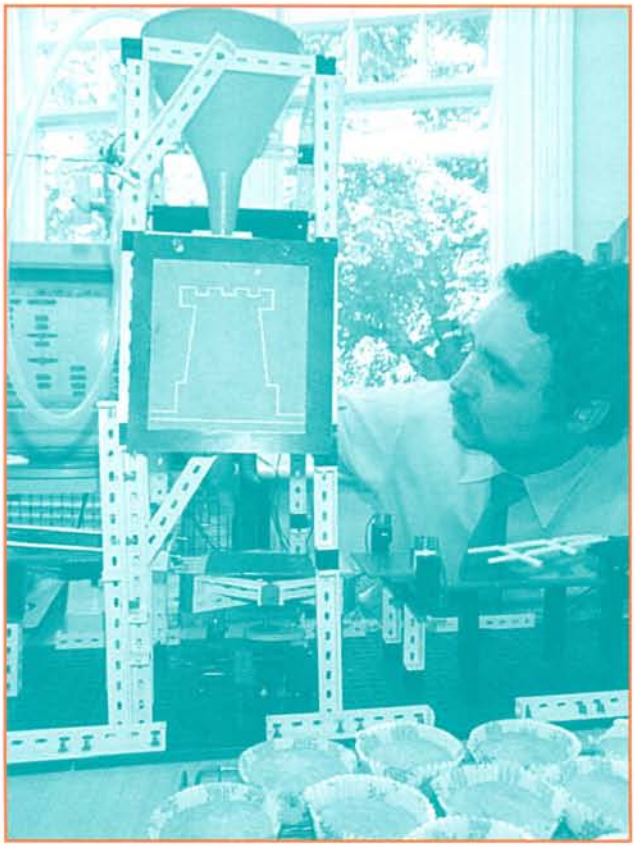
Figure 5: The finished product

Figure 6: The Garrison logo that was iced onto the buns

- a conveyor belt to remove waste material
- a vehicle to collect waste from the conveyor belt.

The pupils practised building their outline models using construction kits (Lego and Fischertechnik). They built the model to make sure that it worked and to resolve any problems before proceeding with work on the computer. Thus if any problems were experienced with the computerised version of the road planer, the pupils could be certain that this was due to a technical problem rather than a design fault in their road planer.



The pupils designed their control system using Logicator software. To help pupils gain familiarity with Logicator, not only did they have a training session at the Gaydon Technology Centre, they also engaged in a series of SRTs thus they developed their skills by practising basic procedures on Logicator, such as moving cars up and down, controlling traffic lights (part of the Logicator programme). Once the pupils were confident they applied the Logicator software to control the model.

The result – outstanding success! Not only did the pupils develop their IT and design and technology skills, but they acquired considerable technical knowledge, extending their vocabulary and communicating skills.

Subsequent to this challenge, DfEE have published the Primary Schemes of Work for Design and Technology and IT, both of which include substantial units of work in the area of control.

St Mary's CE School, Bitteswell, Leicestershire

St Mary's CE school is a small school in rural Leicestershire where the 115 pupils are grouped into four classes. Mr Matthews, the design and technology co-ordinator has used the MTTA Challenge for the past two years as a focus for the pupils' work. He readily admits that it has been a very useful professional development tool for him and in consequence other staff, as well as challenging the older pupils. The brief was to develop a working powered model in partnership with manufacturing industry.

Garrison in Ibstock manufactures a range of machine tool components. They were approached to work with the pupils on their challenge and a visit was subsequently arranged. It was during the visit that the children saw sanding discs being manufactured via a computer-controlled system. The pupils observed how the system brought together the metal base, to which glue was applied and the flat discs positioning them with precision accuracy. Craig, in Year 6 explained how,

> "When we came back we all had ideas, so we voted on them and the bun icing machine was chosen."

Year 5 and Year 6 pupils began modelling ideas and making sketches for future

Figure 7: Operating the machine

reference. One aspect of the work at Garrison that particularly struck the pupils was the organisational system. They tried to replicate this at school by giving different groups of pupils different responsibilities. Subsequently some children took on the role of designers, some manufacturers and others programmers. Emma, a very keen programmer explained:

> "we planned the programme on paper but we had to talk to the others to find out what the machine was going to do. We made flow charts to get the order right and then programmed them in and tried it."

Once the tower was built the pupils began to solve the problem of how to move the buns on and off the icing platform. However the most challenging part was working out how the icing could be pumped onto the buns in the shape of the Garrison logo. The pupils contacted Garrison, inviting employees that they had met before to come to school, see the progress being made and help solve the problem. The solution? A customised peristaltic pump to move the icing along the plastic tubing and through the tiny nozzle, injecting it onto the bun. After much reformulating, the pupils developed an icing recipe to the right consistency, whilst maintaining strict hygiene standards. Cleaning took on a whole new meaning, especially if 'sloppiness' meant the icing nozzle remained blocked!

No sooner had the pupils solved this problem than they experienced the next difficulty – controlling the tower so that the bun moved onto the platform, the nozzle engaged icing the Garrison logo onto the bun and moving the bun off the platform when complete. Emma's skills were in much demand, but it was the team effort that eventually led to success.

The result – a system for icing a company logo onto small buns – much enjoyed by pupils, staff and Garrison employees alike!