CAD/CAM in the Primary School

Abstract
This paper details the success that can be gained from links between primary and secondary schools, particularly concerning CAD/CAM. Brookside Primary School undertook regular visits to their local secondary school to make use of their design and technology equipment and resources. The School reaped plentiful rewards, eventually securing equipment of their own, which would revolutionise the way the School approached primary design and technology.

Graham Claydon

Headteacher, Brookside Primary School, Clitheroe

CURRICULUM

Introduction

Brookside Primary School is situated in the market town of Clitheroe, in the heart of the Ribble Valley. The school was opened in 1975 and now accommodates 238 pupils aged four to 11-years-old. We have close links with our local technology college, Ribblesdale High School. It was as a result of the High School becoming a technology college that I became interested in CAD/CAM. When Ribblesdale gained technology college status they wanted a local primary headteacher to be on their Strategic Management Board. I was lucky enough to be invited to join them and this is where our development started.

Design and technology at Brookside

At Brookside we have always been interested in information and communications technology (ICT) and have always strived to provide the best facilities possible. We have a full network, a ratio of one computer per eight pupils, network printers (mono laser, colour laser, colour wax) and six interactive whiteboards. In addition, all computers are linked to the Internet. Every subject leader tries to incorporate ICT into their subject area and design and technology is no exception. Pupils start at the age of five with control technology, using the Bob the Builder website for their first taste of control. We then use a roamer, roamer software, learn and go, control of a buggy and use of control boxes and circuit boards to make and control models. Linked to this we also have the design elements of design and technology and art. As a consequence, we found that the step to CAD/CAM was, in fact, quite small.

Secondary school visits

We were fortunate enough to be able to take our pupils to Ribblesdale High to use the CAD/CAM facilities for a taster session. At the same time Howard Barratt from Boxford in Halifax, also a member of the Strategic Management Board, invited us to take a small group of pupils to his works to see how primary children could work with CAD/CAM. The pupils found it quite easy to adapt to and most looked at it as if they were using a paint programme. At the end of the day everyone had made a 'real' item that they could take home.

From then on, we continued visiting Ribblesdale on a regular basis. We had the CAD/CAM software at school and could do the design element, but we had to visit Ribblesdale to actually manufacture the items. This was an excellent opportunity, but it was also time-consuming. Then Howard Barratt made us an offer we could not refuse and we now own our own lathe. This has made a tremendous difference. Unfortunately, we are unable to use it as part of our normal timetable due to time constraints. Nevertheless, all Year 6 pupils have the opportunity to use it in an after-school club and we were delighted to find every pupil chose to take up the offer. The pupils realise how control technology is used in real life and understand that it is the vital step from a model to reality. It is the thrill of actually making something that can be used, something similar to the items you can buy in a shop, something often better quality than you can buy.

Making use of the lathe

All the work we have completed previously can be linked to how the lathe works. We then look at the finished products and make comparisons on costs, regarding both materials and time and make decisions on the best product to manufacture from a business point of view. All parents of pupils who have been involved in this work think it is a wonderful opportunity for their child.

From this work, other members of staff have seen how some of the software, in a suitable version, could be used to enhance the work they are already undertaking. We are still liasing with Ribblesdale and hopefully we will still have our taster sessions in other areas of CAD/CAM. We also need to ensure that the areas we cover do not encroach into the secondary phase work, the aim is to give pupils a good grounding which will help them in their future work.

We have found that both boys and girls are equally keen to use the lathe and that some of the less academic pupils perform extremely well with CAD/CAM. As a school we think it is a wonderful opportunity to add a new dimension to our design and technology curriculum. If it gives pupils an added interest and helps them to look forward to the modern day opportunities, then it is certainly most worthwhile.

The children's point of view

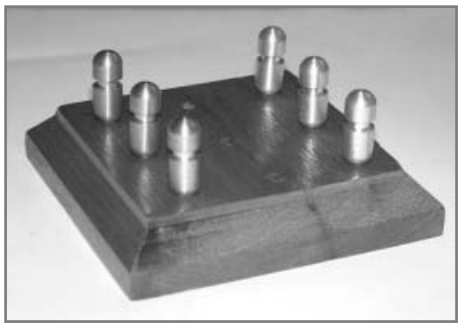
My name is Michael and I am 11-years-old. For the last six weeks we have been working

on a project to make a tic-tac-toe game. We had to design our figures on the computer using the Boxford lathe software. My game needed six pieces, three made in brass and three in aluminium. I also had to make a base from a piece of beech. This needed sanding, drilling and varnishing. The game pieces were made on the lathe. The lathe used a variety of tools very accurately in the manufacture of the pieces. Each piece took about three minutes to make and once they had been completed I had to file the end of the piece as it had a small point left when it was parted from the billet. I really enjoyed this project because not only do you design the piece, you actually make it. I like the fact that each game is unique and is entirely your idea.

My name is Josh. I am 11-years-old and in Year 6. During the last half term I have been designing and making metal games pieces. Eventually we will have the game tic-tac-toe. We started by designing our pieces on the CAD/CAM programme and then progressed to making them on the lathe. We also made a base for the game from a piece of beech. This had to be sanded and marked where we wanted the holes drilled. The board was then varnished to give it a shiny finish. I thought the project was interesting and fun and probably, for most children of eight years of age or older, would be a useful way of introducing them to engineering. I would definitely like the chance to use the lathe again.

My name is Katie, I am 10-years-old and I am in Year 6 at Brookside School. During the last half term I have been making figures for the tic-tac-toe game on the lathe. We designed the pieces and then made three in aluminium and three in brass. Next we made a base in beech that we sanded, drilled and varnished. It needed several layers of varnish. I think the lathe technology is very interesting as it has the design work and the control that we do in our design and technology lessons. My favourite part is when you have designed your piece and you can then get it as a 3D image on the screen that you can flip round. I really enjoy using the lathe and look forward to using them when I go to high school.

I am 11-years-old. My name is Robert. I have enjoyed making the models. I think using a machine to make models speeds up the whole process. You don't have to do any work (apart from the designing) and making a model out of metal is fun. I have learned how to sand, drill and varnish wood. I now see how factories manufacture models really fast. This is the best way to design.



An example of a small game made by a Year 6 pupil.

My name is Abigail. I'm in Year 6 and I'm 11-years-old. I have been making a game called tic-tac-toe. At first we started to design our game pieces. Then next we made them using brass and aluminium. It was really interesting how the lathe cut the metal quickly and before you know it the game piece is finished. You have to make three in aluminium and three in brass. You also have to make a base. The game is like noughts and crosses. I think it is very interesting and helps me understand about engineering. We do designing in our technology lessons and about controlling things using Omega and Control Station. We learn to design and control things like doorbells, alarms and traffic lights. The lathe is about design and control as well and I can't wait until I go to secondary school because they have lots of these machines.

My name is Emma and I am 11 years of age. For these last six weeks I have been working on a project about making a tic-tac-toe game. First, on the school's computers, me and the rest of the group designed our models. Three made of brass and three made of aluminium. Next came the sanding of the bases. When the base was smooth all round, we drilled holes in the bases so the figures could be placed in the base. Once most of the activity had been done, all we needed to do was to brush two thin coats of varnish on our bases, one coat at a time. We left the first one to dry for quite a while and then the second coat was brushed on. When we were making the figures, we designed our model on the computer. Once we were content with our designs, we gave information to the computer. The computer applied this information to the lathe. The lathe has accuracy of up to one hundredth of a millimetre. Each carefully manufactured piece had a short stub at the end of the figure, which had to be delicately rubbed off with a file. I really enjoyed this project and would most definitely do it again.