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Figure 1: Building bridges with construction kits



Abstract

Design and technology is a practical subject which involves children in designing, making and evaluating products and systems. We aim, at Herdley Bank, through its practical nature to involve children in developing their own personal skills and knowledge of a wide range of concepts, materials, equipment and techniques. We also emphasise that our design and technology involves the children drawing from other curriculum areas, particularly from science, maths and art.

As a small rural first school (aged 5-9 years), with only 32 children on roll, the children and curriculum are organised in order that all children have access to a wide, stimulating and exciting curriculum. Through all our design and technology planning we try to ensure that the children have experience in all areas of knowledge and understanding and that they develop skills and abilities as they progress through school, revisiting areas so as to become familiar with and gain a clear understanding in the design and technology process.

Introduction

The children follow a two year cycle of topics in both key stages (Key Stage 2 encompasses only Years 3 and 4). These topics include planning for the development of the children's:

- ability to design, plan, make and evaluate
- familiarity with, and understanding of, the properties of a range of materials
- skills in using a range of tools and techniques
- understanding of a range of products, mechanisms and applications
- health and safety
- the correct use of technical vocabulary.

Due to mixed age and ability groups, opportunities have been identified and used to encourage design and technology to link with other curriculum activities. For example, 'Building Bridges' is part of this term's science / geography focused topic 'Rivers'. This is invaluable when encouraging the children to think about the effects of technology on the environment, particularly, in this context, on the local environment.

At all times the children are encouraged to examine and discuss designs of objects and the materials of which they are made. They are given opportunities to handle and use a wide range of materials and tools, developing their knowledge and understanding of these through practical design and making activities.

Above all else, the children show great enthusiasm in design and technology, always keen to share their ideas and thoughts with their teacher, peers or other adults. They are confident in their approach to design and technology, able to give and take constructive criticism in all situations.

OFSTED evaluation

After all our hard work in developing design and technology throughout the school, we were pleased that OFSTED recognised the quality of our work.

OFSTED inspected Herdley Bank in October 1998 and observed 'Building Bridges' during the inspection. Their judgements underline the progress being made in design and technology in school, "Pupils in Key Stage 1 make satisfactory progress and in Key Stage 2 their progress is good." Design and technology is commended throughout the school. In Key Stage 1, it is reported that the children use their plans "effectively to guide them," and the children's skills are developed through using a range of different tools. A "good understanding of the design process" is highlighted in Key Stage 2, underlining the children's ability to "follow through a careful planning process using well structured worksheets" and how the children "draw three-dimensional plans effectively". The report

Bridges - Design and Planning Sheet

Name: Laura Taylor + Sarah **Date:** Wednesday 7th October

Tools I will need:
I will need 2 triangles ^{best} because of wood ^{wide} 20 cm long. And another piece of wood 30 cm long. ^{And some glue}

Dimensions of bridge: Our bridge is going to be 10 cm high. Our bridge is going to be 30 cm wide. 9 cm ^{Foot}

Sketch of my design:

What will I need to do:
I need 8 pillars to hold the top up. And 4 to keep the ramps up. I ^{poke} off wood 30 cm long and the ramps are 30 cm long. The triangles are to make strong joints. I need a saw, glue, and triangles.

How successful was my design:
My design was quite successful because it is strong enough to hold Freddie tractor but it keeps falling on the ramps. So I'm going to stick some cardboard over them. There is a gap. I am really pleased with my bridge.

1. Glue 4 legs to one side of the bridge. Stick triangles
2. Glue 4 legs on the other side of the bridge. Stick on triangles
3. Glue the top on and make it strong with the triangles

Bridges - Design and Planning Sheet

Name: Ben + Jordan **Date:** 7.10.98

Tools I will need:
Saw glue ruler scissors pencil

Dimensions of bridge: 30 cm wide 15 cm tall

Sketch of my design:

What will I need to do:
We need to get a saw and some glue to build my bridge. We need 12 bits of wood for the pillars. We need 4 bits of wood for the top. The top bit has to be 30 cm long. It has to be 15 cm high. I need 12 triangles.

- ① I will make the pillars next using 6 x 15 cm lengths and 6 x 6 cm lengths. I need to strengthen the corners.

How successful was my design:
Our bridge was strong and the tractor went across safely. We would like to modify our design and add ramps - we hadn't thought about those.

Figure 2: Planning sheets

commends the children and how they “evaluate their designs as they make artefacts and are confident to modify their ideas in the light of practical difficulties”. Also highlighted, the “good range of skills ... clear individual guidance ... measure accurately ... appropriate techniques”.

The children’s attitudes are reported as “good throughout the school” underlining their “enthusiasm”. The inspectors experienced the children helping each other to solve problems “the children work well together and use each other’s ideas to improve their constructions ... they are interested in each other’s efforts and appreciate different interpretations of the tasks.” The collaboration and sharing of ideas, materials and tools was commended.

Teaching is reported as “good” in both key stages commenting on the children being “well-organised”. Praise is given for the “very clear formats” provided in Key Stage 2 ensuring that the children work through the design process “effectively” also highlighting that tasks have a “clear purpose”.

In conclusion, OFSTED reports that design and technology has improved since the last inspection and standards are now “higher” by the time the children leave Herdley Bank.

Information technology technician, Haydon Bridge pyramid

Herdley Bank is part of the Haydon Bridge Pyramid, consisting of 19 First, Middle and High schools, ranging from the smallest First school with 8 pupils to the High school with over 700 students, in West Northumberland. This is a positive partnership in which all schools “work and learn together”.

Bridges - Design and Planning Sheet

Name: Ali sha Dixon **Date:** 7.10.98

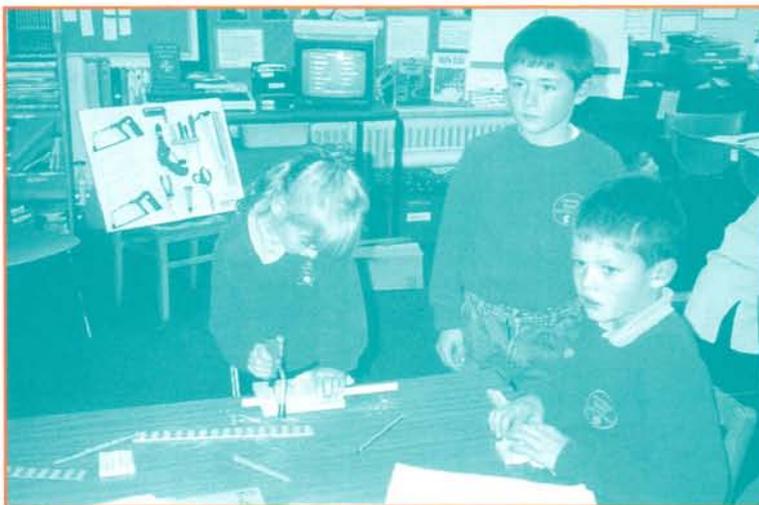
Tools I will need:
saw card clamp glue ruler

Dimensions of bridge:
30 cm long 10 cm high

Sketch of my design:

What will I need to do:
get 9 bits of wood. 8 sticky wood 6 x 4 an at a cha doaked we will saw the wood to one the reject sis so we can use one Bridge.

How successful was my design:
It held the tractor with all nothing but we would like to add a ramp so the tractor will go off easily.



Figures 3 & 4: The children working together

Due to past and more recent initiatives in IT, the Northumberland ICT Initiative (Capital Challenge and the National Grid for Learning) there is a huge range of IT equipment in the schools, both hardware and software, and many staff, experienced and inexperienced, to work with. Our schools are also scattered throughout the large rural area. And of course, there are the children of this community, aged between four and eighteen. These are the young people we are committed to inspiring, hence we needed to aim to develop our commitment. We needed to invest in expertise to aid both teachers' and pupils' knowledge and skills. Hence the appointment of Pyramid IT Technician (Curriculum Support). Financial commitment, of course, was also an issue. However, spreading the cost between the schools to employ a technician on a one year contract was acceptable and viable, having the advantage of no long-term financial commitment and also giving the Pyramid time to evaluate / modify the situation after one year.

Primarily, the role of the technician is to ensure the Pyramid's IT equipment (curriculum

related) is maintained in an operational condition.

Thus, Mr Les Cooper was appointed as the technician. He is currently studying for a HND Computing Course at Carlisle College (University of Northumbria). He is based at Haydon Bridge High School and works during school hours, including staff development days. Mr Cooper's hours are flexible and he often works after school and during holidays in order to fulfil his contracted hours but more importantly to ensure that he gives his own very personal and efficient service.

Mr Cooper has only been in the post for one term and already the benefits are being reaped by all schools in the Pyramid. His efficient routine has meant that he has been able to service all schools' needs either small or large, offering very sound and practical advice. Schools may only wait hours or a couple of days at maximum for a call to be answered and dealt with. This is a vast improvement on the limited service offered centrally by the LEA, due to lack of significant resourcing or funding.

Already, a significant number of major problems and many minor difficulties have been overcome with the help of the technician. He is most definitely a major boost for the Pyramid's IT capability in teaching and learning, an invaluable IT resource.

In our recent OFSTED inspection at Herdley Bank, the inspection team were able to meet Mr Cooper when he came into school to offer advice on software. The team were most impressed by the Pyramid initiative but more importantly by Mr Cooper himself. They reported "Funding is used very efficiently to employ a very good Information Technology Technician in conjunction with the local Pyramid of schools. This ensures that resources are well maintained and contributes to the development of staff. There has been improvement in IT since the last inspection and there is a clear focus on developing pupils' IT skills."

This has been a great initiative not only for Herdley Bank but for the whole Pyramid. We all look forward to utilising such a valuable resource in the future. With the expertise and skills of someone such as Mr Cooper, staff and children can only move forwards in their IT capability, ensuring an improved IT literate community in the West of Northumberland.

Building bridges by class 2

The following is just one example of a design and make assignment which illustrates the points made in the OFSTED report.

The Key Stage 2 children in Class 2 at Herdley Bank (six Year 3s and six Year 4s) followed a cross-curricular topic on 'Rivers' during the Autumn term 1998. The topic had a science and geography focus, in particular, the local river, the South Tyne, its habitats and route. The project also included a design, make and evaluate activity, planned over six one hour sessions.

Design and make assignment

Build a bridge for the model village made by Class 1. Your bridge needs to be no shorter than 30cm and no higher than 20cm. Your bridge needs to be able to carry a toy tractor safely across the River South Tyne on the model. You can use centimetre square wood, card, toolboard and a small amount of PVA glue.

Groupings

The children often work in different groups. Due to the small numbers, the children are often paired with a younger/older child, e.g. a Year 3 pupil with a Year 4. This encourages full and active participation for all children, irrespective of ability or gender. Hence, six pairs of designers went into action.

Designing the bridges

In their pairs the children began to explore the given task. A lot of discussion took place and some children sought further details from the children in Class 1 to clarify the exact requirements of the bridge. The children had also investigated building a bridge with construction kits and had dealt with some design faults prior to this activity. Each pair used a planning sheet during this stage of the task, i.e. they had to identify the materials and tools they would require throughout the task and draw a three dimensional diagram of their bridge. The children had prior knowledge of using triangulation to reinforce corners of structures and had used this technique to make a picture frame. Hence, the children needed to take this process into consideration in their designs. This was a successful stage in the activity, the pairs quickly and confidently identifying the correct skills and properties required in their individual designs. The children were encouraged to discuss their designs throughout the planning stage, examining possible problems and developing successful ideas.

Each pair produced a good and workable planning sheet, enabling them to go on to build their design.

Building the bridges

The children, following their planning sheets, collected the materials and tools required and began the building stage of the activity. They

worked effectively in their pairs, quickly developing systems to organise their work and ensure good use of time, e.g. one child measuring lengths of wood whilst the other began measuring right angled triangles on card. The children worked confidently and safely with the tools, often the more skilled child in the pair aiding the weaker partner, not simply taking over but guiding their partner when sawing for example. The children are encouraged at all times to respect and care for their working environment, selecting and using, storing and returning their own materials and equipment tidily, safely and with regard to economy to use.

The pairs continued to discuss their work as the designs developed. They were confident to highlight any problems which arose, often seeking advice from other pairs or the adults in the room. Also, they were enthusiastic to share successful strategies with the other pairs. Hence, a very collaborative and positive working environment was extremely evident.

The children continued to refer to their planning, but also to the initial task set out, e.g. were their bridges wide enough for the tractor, was the bridge the right length, etc. Adaptations were made and designs modified.

Evaluating the bridges

Finally, the bridges were complete and the children were keen to test their bridges. The importance of evaluation of any task is made very clear to the children in all areas of the curriculum, hence they were aware of the great value of this stage in the activity with the finished bridges. Throughout the activity, the children were encouraged to talk through their designs and very ably discussed design weaknesses and successes. The overwhelming success of the activity was proved by the children themselves in their testing. Every pair was satisfied with their final product, but without encouragement, they could identify adaptations which would improve their design and thus enable the children in Class 1 to use their bridges effectively and safely.

Conclusion

The children's skills and understanding were reinforced throughout this design and technology activity. Their enthusiastic and confident approach enabled them to work collaboratively, effectively and purposefully. Above all else, the children gained a great deal of satisfaction from the task and are very keen to begin the next!