

Louise Freeman

Sussex Road C P
School, Tonbridge

Abstract

This case study looks at a reception year's first major design and technology project of producing emergency vehicles. This was linked to an on-going topic, setting the context. The project began with a visit from the local fire service, which sparked an initial excitement into the project. The groups were limited to 2/3 pupils in each, due to space restrictions. This paper considers the aims and achievements of this project.

'Design and technology can be defined as the purposeful use of knowledge, skills and physical resources to create products that meet a perceived need or opportunity.' (DATA, 1996)

It is common knowledge in the world of the primary school that young children thrive on 'hands on' practical experiences. Through a meaningful framework, design and technology can develop important, everyday skills, concepts and attitudes. It enables them to 'experiment with, control, and change the relationship they have with their environment'. (The Design Council, 1991) Although only a foundation subject in the National Curriculum, design and technology is very much a cross-curricular subject.

'The practical experiences that design and technology provides are also rich in opportunities for children to develop basic skills such as numeracy, literacy and ICT.' (DATA, 1998)

Through constant discussion about their work, children can build up an articulate vocabulary and strengthen confidence when speaking in front of others. Design and technology also provides opportunities to develop scientific skills and knowledge through projects using mechanisms and electrical control for example. Shape, measurement and weight also play an important role in design and technology. Knowledge of safety and hygiene is a crucial part of everyday life which children experience through the projects that they do.

Within the National Curriculum, design and technology is divided into two attainment targets:

1. designing
2. making.

Through these attainment targets a range of activities need to be provided to enable children to develop the necessary skills and knowledge required. These activities can be put into three categories:

Focused practical tasks

Through the teaching of focused lessons, important skills can be taught, to provide children with the background knowledge needed in order to proceed with their design and make activity. These could include learning how to use specific tools, how to wire up a simple electrical circuit or how to join fabrics together.

Investigative, disassembly and evaluative activities

Through these activities, children need to be given the chance to observe or take apart end products which are relevant to their particular project. For example, if the children were being asked to complete a design and make assignment on toys, they would need opportunities to disassemble old and new toys to develop a better understanding of the mechanisms involved. From drawings and annotations, children can begin to understand the criteria used in the design of that particular toy, thus developing their own criteria ideas.

Design and make assignments

The design and make element of the children's projects will make up the majority of their work unit. Children need to be given time to plan and set their own criteria while designing. Their designs may be created in either 2D or 3D representations. After finishing their project, children must take time to reflect on what they have done and whether they have fulfilled the criteria they set. If not, teachers need to encourage the children to evaluate why things didn't work and discuss how they can improve their design in the future.

Emergency vehicles project

As our design and technology schemes of work stand at present, there are no set units of work for reception. Being an early years teacher and keen to input some of my new found knowledge into my own class, I decided to incorporate an existing activity in with our current topic of *People who Help us*. Original long-term plans included a junk modelling activity. I decided to make this into a full-blown design and technology project related to the emergency vehicles used by our local police, paramedic and fire fighter services. Linking the project to our on-going topic allowed the children to work in a context which was meaningful to them and one which they were already excited about.

Project criteria

As this was the reception children's first major project, I decided it was best to set the criteria. I decided to limit the criteria to two requirements:

1. the emergency vehicle could be easily identified by correct usage of colour
2. the emergency vehicle could move freely when pushed.

Learning objectives

- To increase knowledge and understanding of emergency vehicles.
- To develop an awareness and understanding of simple mechanisms.
- To develop and use simple technological vocabulary.
- To develop cutting and joining skills.
- To develop evaluation skills.

Cross-curricular links

Through the design and technology project of emergency vehicles, there are numerous links to other curriculum areas. Apart from the obvious continuation of developing the children's knowledge and understanding of their local services and community, the children also developed their linguistic skills through discussions on design criteria, identifying problems and evaluating the end product. Number conservation and the mathematical concept of shape and space also played a part in the design and make process. The children also appreciated the importance of matching the correct colours to their chosen vehicle to create a clear representation of what they were making. Personal and social skills were enhanced as well, through the need to share resources and space. The children took it upon themselves to help each other cut and join their models if difficulties arose.

Use of space

Due to a fairly small classroom, the use of space was quite a considered factor. The only real available space for creative activities is a small, sectioned off wet area. Putting in a table top as a work base meant that movement in the area was fairly limited. Because of this and in light of the children's age, I limited the area to 2/3 children at a time. This, however, meant that the making part of the project took a lot longer than originally planned.

Resources

- Reclaimed materials – cereal boxes, yogurt pots, egg cartons etc.
- Pritt (glue) sticks.
- PVA glue.
- Sellotape.
- Masking tape.
- Paper clips.
- Dowel rods.
- Wooden wheels (variety of sizes).
- Scissors.



Tools

- Vice.
- Junior hacksaw.
- File.

Differentiation

Within the class there is a wide diversity of skills and confidence when it comes to creative activities. I was pleased to see that some of my more able children took on the project with much enthusiasm and required very little encouragement to explore their own ideas and experiment with different joining techniques. Some of my younger and less able children found the prospect of 'try by yourself first' fairly unnerving. Being a reception teacher, I regularly come across the all too well meaning parent who has a tendency to 'do' the activity for the child. When being faced with a more challenging, explorative activity therefore, some children lacked the confidence to 'dig in and get going', even though resources were easily accessible and

Figure 1: Using the Tactic construction kit.



Figure 2: Making emergency vehicles.

suggestions on how to get started were given. Therefore, the level of teacher intervention differed greatly depending on confidence and levels of fine motor skills during the making process. For example, although I felt an adult needed to cut the dowel rods to make the axles, many of the children managed to screw the wheels on by themselves and fix the axles to their vehicles. Those children whose fine motor skills are not very well developed yet found this too difficult to do and therefore needed a lot more adult help. However, all of the children were able to make decisions on what they were going to make. If some children erred on the side of caution when making their model, not one lacked confidence when it came to painting it. They all had clear ideas about the colours they needed and painted with care and enthusiasm and very little help from an adult.

Differentiation was provided in this activity by:

- level of teacher intervention
- teaching strategies and language used
- outcome of the end model.

Investigative, disassembly and evaluative activities

Fire engine visit

Prior to the design and technology project and as part of the reception children's topic of *People who Help us*, the children received a visit from the local fire service. As part of this visit the fire fighters brought along their appliance for the children to have a ride in and sound the siren. The children became very excited about the visit and enjoyed investigating the fire engine. This sparked their initial interest in drawing, talking about and making fire engines out of the Mobilo construction kit. As a result of this visit and the obvious interest of the children, I decided to convert our existing junk modelling activity into creating moving vehicles related to emergency vehicles.

Toys

Once I had decided on the nature of the design and technology project, the children were asked to bring in toy emergency vehicles from home. The children brought a variety of police cars, ambulances and fire engines for us to look at as a whole class, in a group and individually. At this point I introduced some of the vocabulary I wanted the children to begin using such as axle and chassis. We also discussed the necessary 'extras' they might want to include on their model such as a ladder if they were making a fire engine and a siren.

Focused practical tasks

Construction kits

'Building with construction equipment can enable a child to understand how the component parts of a structure begin to relate to each other in space...' (The Design Council, 1991)

To develop the children's understanding of the mechanical control of axles and wheels, I planned a building task using the large Tactic construction kit. The children were allowed to use an area outside the classroom and with an adult initially and then independently, were given opportunities to build vehicles using wheels and axles. At first they were given some design/plan sheets which set out step by step guides on the construction of specific vehicles. Then the children were given the opportunity to experiment and create their own design. The children found this activity challenging but very rewarding. During this activity the majority of the children had a good understanding of what they were building and why. Some of the children had begun to use some simple vocabulary relating to their structures.



Figure 3: Screwing the wheels on.

Design and make activity

The design process

The designing process followed two formats:

1. discussion about proposed model.
2. design drawings.

All of the children took part in talking about their ideas, the type of vehicle they were going to make, the extras they were going to put on it and the colours they needed to paint it. Every child, regardless of ability, was able to discuss their proposed design, although some children had a better understanding of how they were going to start. For my more able children, they were given the task of drawing their idea of what their model would look like. From their previous sessions which allowed the children to investigate and disassemble toys visually, they had a clear picture in their heads of what their models would look like and the extra features on it.

'At the early stages of developing capability, children should be able to:

generate and develop ideas through talking about what their designs have to do, handling materials and where appropriate, drawing.' (QCA, 1998)

The messy part!

Before the children began the making of their design, they were reminded of the two criteria I was setting:

1. the emergency vehicle could be easily identified by correct usage of colour
2. the emergency vehicle could move freely when pushed.

The actual making part of their project was split into sections. Firstly, all of the children built the main body of their models including adding axles and wheels, as well as extra decoration such as a siren, headlights and ladders. This process took about one and a half weeks to complete as the children were only working 2/3 at a time due to lack of work space and the importance of adult supervision. Once all of the models were created, the children began the painting process. This is an area which all of the children felt comfortable with as experimentation with paint is a regular activity within the early years curriculum.

Being the main bulk of the project, this was the area in which most of the problems or setbacks occurred. One initial problem I didn't foresee encountering was the hesitancy of some of the children to explore and try things out for themselves. Although many of the children couldn't wait to get themselves messy, a few took a lot of prompting and guidance to get them started. Although the children had used the materials and resources before in a variety of activities, many of the hesitant ones are used to a lot of well meaning parental guidance at home (as mentioned previously) and have not yet been encouraged to be independent and take risks with what they do. Although I have been trying hard to gradually wean them out of this mode, new activities in which they have to make choices for themselves is still a little too daunting. Other areas the children found quite difficult was using some of the resources such as the sellotape and scissors. Although I demonstrated to the children a useful technique for cutting the sellotape and stopping it sticking together, the children

Figure 4: Serious painting...



found this very tricky, especially those with poorer fine motor skills. A sellotape dispenser would have been a useful thing to have at this point, but unfortunately I couldn't find one! Many of the children also find it difficult to use scissors with skill at this age, again due to undeveloped fine motor skills.

Teacher intervention

The level of teacher intervention in this activity depended mainly on the level of fine motor skills and confidence a child possessed. Areas which needed the most support were helping with cutting and sticking and putting the wheels on the axles. As stated previously, I felt due to the children's ages and the development of their fine motor skills, it would be safer for me to cut the dowel rods to make into the axles. However, I left the rest of the making process up to the children if they were happy to give it a go and had good motor skills. Many of the children found it difficult to screw the wheels onto the axles as they were not strong enough to apply pressure. I suggested to the children that they use a file to widen the hole in the wheels. The dowel rods then slipped on much more easily.

Assessment

I considered there to be two aspects to this area:

- the on-going assessment of the children to check they were on task and had a good understanding of what they were doing
- the assessment of the project as a whole.

Through continual discussions with the children about their work, I was able to gain a good understanding of the skills and

knowledge the children were developing, the technological vocabulary they were using and whether they had clear ideas of the next step in the design and make process. After the children had made the main body of their models, they tested them to see if they fulfilled the criteria of the vehicle being able to move freely once pushed.

During the project I also continually assessed the suitability of the activity, whether it was building on their existing knowledge and whether the new concepts being introduced were in a meaningful context to the children. It was also important to monitor how well my more able children were being stretched.

Evaluation

'With the very young child particularly ... it is only through describing and discussing their ideas, their intentions, their actions and their feelings about their work that they are able to clarify their thoughts and for coherent conclusions about the activities in which they have been engaged.' (The Design Council, 1991)

The children were asked to evaluate their models twice during the project, initially after they had built the main body of the model, to see if they achieved the first criteria and their vehicles moved freely. They were then asked to assess whether they had fulfilled the second criteria after they had painted their model. Most of the children had successfully managed to achieve the first criteria. Only one or two models weren't able to move freely and this was largely due to the placing of masking tape/sellotape too close to the axles and was

easily modified. All of the children were encouraged to talk freely about the project, what they enjoyed the most, whether they felt it had been successful and if there were any problems, how they overcame them.

For my more able children, I set them the task of writing down some evaluation ideas on paper. There were four headings:

- it looked like this
- something I did
- what I enjoyed the most
- what I would change.

The children found the first three sections fairly easy to complete, but the last section was particularly challenging. I feel this is partly due to the lack of problem solving experiences the children have encountered pre-school. Although they were able to identify things that weren't working, the children found it difficult to suggest ways forward, and as a result, found it hard to put forward changes that could be made or explain why or how those changes would improve their model.

Conclusion

Considering this was the children's first major project and my first attempt at setting out a design and technology unit of work correctly, I felt it was particularly successful and had achieved the learning objectives I had set. I feel I had set the level of the work accurately to the children's existing skills and had provided them with new skills and developed the level of understanding they had, of simple mechanical structures. The children also demonstrated an increased knowledge and usage of relevant vocabulary. All of the children were very proud of their models after they had finished them and couldn't wait to take them home to show their parents. They all commented on how much fun they had had and with this in mind, I feel much more confident to not only teach design and technology within my own class, but also throughout the school.



References

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Figure 5: ...and lots of concentration.