# Come Fly with Me: Notes on Primary School Technology

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**An episode**
The spontaneity of ideas for which young children are well known brings many a precious moment in scientific investigations. For this reason I record an episode of learning first, then I shall discuss how a class of eight and nine year olds embarked on a project about 'Flight'.

A group of ten children, six girls and four boys were set the task of making our plastic lemonade bottle airship 'fly'.

My contibution was to provide the prototype body, pose the initial question, then stand back and see what they came up with to solve the problem.

The group had spent two mornings observing a mounted pigeon wing, some feathers (with a microscope), and a pigeon skeleton.

They had modelled a feather; built a model wing with real feathers, glue and plastic straws, and folded and flown paper aeroplanes.

Later, the children were inspired by a visit from the Norwich Puppet Theatre in which origami was used to great effect, a bird being modelled for use in the play. The children were intrigued and attempted to make origami birds themselves, folding the paper so that the wings moved in the right way.

In the words of the old adage, chance favours the prepared mind, but for me, the greatest excitement of all came from what I had thought would be one of our less exciting adventures.

An earlier group had been frustrated in their experiment by the well known 'balloon rocket' when after a few 'blows up' the balloon burst!

This group had modified the balloon by attaching the straws in the way shown in Figure 1 before 'flying' it along the string which we had fixed across the classroom . . . I have to admit this experiment provided an inspired use of the mass of lemonade bottles which littered my study. My idea was that we prevent the balloon from bursting by enclosing it in the lemonade bottle, blowing it up, then letting it go so that the expelled air would force the airship along the track . . . (so much for a lifetime of science education!)

Efforts to blow up the balloon failed miserably, in spite of the valiant efforts of all the children, but especially those of Matthew. Here was a physics problem of seemingly insoluble dimensions in a restricted and meaningful context for the children.

Having been asked the question, 'Why won't the balloon blow up?' their ideas came fast and furious. They understood that they were blowing air from their lungs into it, and that the bottle already contained air . . . but why was the little bottle of air stopping the 'bigger amount of breath?'

Elizabeth suggested that if we could get plasticine inside the balloon, this would make it weigh heavier so that it would push the air in the bottle away, and so the balloon would 'go up'.

James took over (a not unusual situation with boys, the girls often generate the ideas). He patiently introduced bits of plasticine into the balloon, but then had the greatest difficulty in introducing the balloon into the bottle . . . They still could not manage to inflate the balloon!

'Maybe the plasticine won't work because it's in little pieces', said Paul.

So they 'lumped' it together by squeezing the balloon . . . still frustration! Matthew, a thoughtful but quiet pupil, said we could blow it up by using a straw. Brady dashed off to another classroom where 'the little ones' had milk, to get some straws. Brady was always the one to produce what was needed.

James tried again and again, others took over, but to no avail.

Matthew: 'It's because the air leaks from the side of the straw!' So he taped it firmly into the neck of the balloon, but only a very limited 'blow up' resulted.

'I know', said Ailsa, 'we could make a bundle of straws and push it into the neck of the balloon, then seal them in with sellotape'.

Matthew, who had a red face occasioned by his exertions, was elected as Chief Blower. The balloon inflated a bit more this time, but they had not solved the problem to their satisfaction in spite of the cheers! The argument and ideas continued to flow, the excitement of the children was infectious, and at that point I had to leave . . . they did not even notice my going!

I wondered if they would come to a conclusion before my visit next week? Incidentally, I had not thought this experiment would have proved such a problem, but did not come up with an answer until the following day.

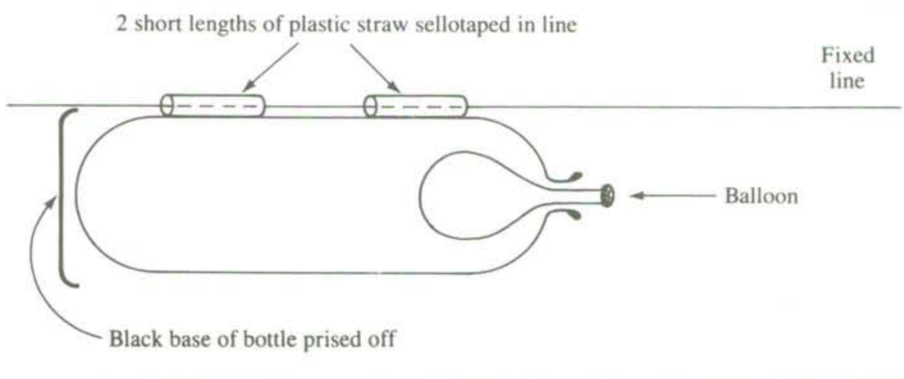
The solution should be to let the air out of the bottle in some way . . . it would have been so easy to tell them, but how glad I was that I had not intruded! Here was a truly scientific/technological problem-solving situation from a simple beginning.

The children hypothesised, predicted outcomes, indulged in explanations, but above all, learnt the very valuable lesson of patient perserverance and co-operation.

One regret was that the 'ideas girl' had become partially excluded by the 'action boys', save for Michael, who thought contributing ideas, remained quietly in the background at 'doing' time on this occasion.

Who says 'girls think, boys do' beware of stereotyping! Though certain individuals are mentioned by name, all the children contributed in an animated way to the solution of the problems, the social skills improving, but learning to co-operate being the most important outcome of all. (Previously Matthew had hogged all the materials on his table when his group was asked to produce a model wing).

*Figure 1: The Model Airship*

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What an experience for the children and their teacher?

**Organising the problem-solving situations**

The class had been organised into groups which took turns for a three to four week priod to experiment for a whole morning, a fifth group was located in another class.

The overall objective of the project was to gain an insight into how children would evolve strategies for problem-solving in a technological context. The report just given was of the experiment undertaken by the penultimate group of ten children.

Their class teacher organised the other group activities whilst the chosen group experimented. I make no apologies for this organisation, it is impossible to gain such experience in a whole class situation since the teacher has to be constantly acting as a 'lab technician' when the children demand materials so 'the enabling questions' can rarely be posed. Recipe 'closed science' often seems to be the result of a class science lesson; there is little scope for spontaneity.

The ideas were started by the ancillary teacher (me) who insisted that the children always set down with pencil and paper and 'designed' things before they were allowed to 'do things'.

This in itself is a valuable exercise, committing thoughts to paper through drawing. The inevitable 'I can't draw' came up, but with encouragement, it was amazing how proficient the children became at 'engineering drawing' though one must hasten to add, not what our secondary colleagues would regard as such. The reservation rarely occurred more than once with a particular child. Every group was given its own unique experience though they might be repeated with different groups.

The work was concluded with the whole class reporting, group by group, what they had found out. A spokesperson was chosen for each group . . . though others managed to have their say.

And finally, we all flew our lemonade bottle airship together on a line across the whole length of the mobile classroom.

I hope this convinces you that technology in the primary school is inexpensive, possible for both pupils and teacher alike, and can add a unique dimension to children's learning, *ie Design, Build, Test.*

It really does not need microcomputers or expensive commercial kits. These are useful extensions rather than essential materials.

If you feel you've heard it before, I agree, it was called primary science. Technology for me is not materials, accurate us of forbidding tools and 'write it up', it's about chldren thinking on their feet about *design, taking decisions, and doing it.*

What have the children achieved in scientific/technological terms?

**Skills/Strategies**

1. Accurate observation/looking carefully, drawing.
2. Predicting outcomes/Can you think/guess what might happen if?
3. Identifying a problem/ *What* might we do here?
4. Making decisions/*How* might we do it?
5. *Designing* a solution — individual/group discussion. Drawing.
6. *Building a device*/Doing it! Use of simple tools.
7. *Testing* to *see* if it works/*How* can we find out? *Why* do this? A 'fair test'.
8. Manipulation of simple tools and materials . . . paper, card, plastic, wood, foil, sellotape, glue, Pritstick, colouring tools, scissors, craft knife (incidentally, the girls were far superior to the boys in their use of tools. Much more accurate cutters).

And what have they learnt socially?

1. To wait their turn in discussion and in test situations.
2. To work on co-operative ventures.
3. To reject 'poor' efforts, theirs or other people's, and to select the best.
4. To take failure in their stride and start again.
5. To take pride in persevering with a job and in the result however 'humble'.
6. To try things out for themselves at home.
7. Patience when following verbal instructions.
8. To enjoy technology.
9. The need for safe practice.

And have yet again been an inspiration to their teachers. Success is a powerful motivator and moral booster. Have a go . . . I'm sure you'll enjoy it too.

P.S. They practised their basic skills in a relevant context for them.

**Some avenues explored in our theme — 'Flying Things'**

*Group 1*

Four boys and two girls. Starting point: a walk to gather seeds.

*Technology starters:*
*What* is a seed?
*Why* can some seeds fly?
Can you *design* a good flying seed using only card and plasticine?
*What* parts does it need?
*How* are you going to make seeds?
*Whose flies* the best and *why?*

*Other areas:*
Building models.
Germination experiments (not done).
Chart of seed types (made by children).
Chart of flying words (suggested by children).
Looking at a 'helicopter' tree seed and watching it fly (the tree was a sycamore).
Designing and flying a paper helicopter.
A *squeezy* bottle water rocket.

I suspect that they enjoyed it best when the end of the water rocket burst and soaked the teacher?

*Group 2*

Ten children, four girls and six boys. Starting point: A toy card boomerang.

*Technology:*
Getting it to fly.
Can you make a better one?
Design your own.

*Other areas:*
Drawing and design.
A running line rocket (see Aerial models)
What was a boomerang used for?
How was it used?
Who used it?
A discussion abut Aborigines . . . story written about a hunting trip.
Would Airway routes from Australia . . . a quiz game using an atlas.

*Group 3*

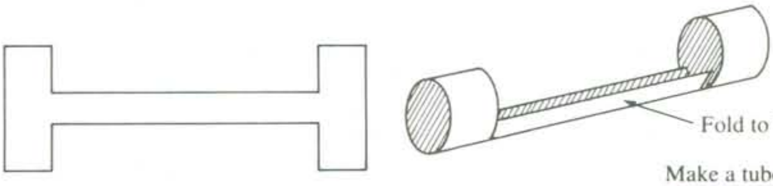
Five children, two boys and three girls. Starting point: a real boomerang, borrowed from Newcastle Polytechnic Museum.

*Technology:*
*Why* was it this shape?
*Can you* make one as good in another shape?
*How* would you use it?
*Why does* it have a kangaroo carving on it?
*Design* and make a balsa boomerang (used balsa, glue and pins, and craft knives)
*Whose flies* the furthest?
*Can you get it* to come back? (Wendy solved this)
Old and new aeroplane shapes. Why are these different? Slow/fast fliers.
*Designing* a plane, not from a plan (shapes made in plasticine and they looked down on them).
Make and fly a cardboard plane.
*Which flew* best?
*What* did 'best' mean?
Could they suggest *why?*
Modify your design to improve performance. One of the boys made a gull winged plane which did remarkable aerobatics.

*Group 4*
Ten children, four boys and six girls.
Starting point: Birds as flying machines — looking at a feather, a wing, a bird skeleton.

*Technology:*
*Why* do birds have feathers?
*Are* they the same?
*Why* is the feather disrupted if we stroke it the wrong way? So *what* holds them together?
*How* are feathers arranged on a wing?
*Why* is this arrangement best?
Make a model feather from card and a straw.
Name the kinds and parts of a feather.
Wing bones, *why* are they arranged as they are?
(X ray photo . . . from Newcastle Polytechnic Library)
Make a model wing using real feathers, and straws to simulate bones.

*Figure 2: The Incredible Flying Tube*




*Other areas:*
Design a wing.
An origami bird.
The incredible flying tube (thick paper). Figure 2.

A paper plane (to my surprise, they did not know how to make one) and, best of all, the lemonade bottle airship!

*Group 5*
Two girls and seven boys (in progress).
Starting point: out Spaceship crashed on an unknown planet.

*Technology:*
*What* is needed on a spaceship?
*What* does a space rocket look like?
*What* does a planet's surface look like?

*What would we need to survive?*
A moon map was used to assist imagination.

*Other areas:*
We need to go from the crash point to the Sea of Happiness . . . plot your route (draw a map). It's a long way, so *how* are we going to get there?

This is where the space vehicle will be designed and built. Hope to use control technology. Looking at rocks and fossils (these were real specimens but they had to *use their imagination* to attribute them to an unknown planet).

**Sources of ideas**
Phillips Picture Atlas — world airway routes.
Schools Council (1978) Teaching Primary Science Project: Aerial Models. Macdonald.
Standing Conference on Schools' Science & Technology (1984). Science and Technology in the Primary School, SCSST.
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Dedicated to the children of Classes 1 and 2, Broadway East First School, Newcastle upon Tyne, whose enthusiasm was so infectious, and whose ideas were so ingenious.