Where are they now? Following up a Successful Primary Technology Project

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Abstract

Is it worthwhile giving extra time and attention to modelling with construction sets as part of the primary technology curriculum? Are there any long term effects of such a strategy? What do the pupils themselves think about it in retrospect?

In this study, pupils involved in a primary research project on the effective use of construction sets were revisited at the end of secondary schooling. Their GCSE results were examined and their progress compared with that of their peers. Their memories and opinions about their own technological progress were collected and analysed and several commonly held views emerged. The insights provided by both strands of this study may be useful in structuring and managing the teaching of technology through primary and secondary schooling.

Introduction

It is rare to be able to follow up children in later years who have previously been studied in a primary research project. Only after sufficient time has passed is it possible to investigate whether there have been any lasting effects beyond the primary phase. The Primary Technology Project was set up in 1988, just before the advent of the National Curriculum, to explore the role of construction sets in primary technology. The study began in a first school as a year group of pupils was entering its reception class and then followed them as they moved year by year through first and middle school. It ended in the summer of 1995 as the pupils prepared to move into secondary schooling.

The project gave these pupils frequent exposure to a wide range of construction sets over the whole seven years of their primary schooling (Brown, C.A., 1995a). It used an action research strategy to make the most of the construction sets available each year, developing guidelines for their use in partnership with their teachers. Eventually these guidelines provided a progressive list of suggested activities for the use of construction sites in every year of primary schooling.

The results of applying this progressively structured approach were encouraging. Throughout their primary years the pupils made steady improvements in their achievements and attitudes toward this part of their technology curriculum (Brown, C.A., 1995b). They became increasingly competent at putting its concepts into practise and gradually more confident in working with a wide range of different construction materials. Both girls and boys became more creative, modifying designs and developing models from their own ideas. By the time they reached Year 7 they were able to make stable, mechanical, electrical and electronically controlled models and were comfortable with the process of finding solutions to problems through model making.

The follow-up study

Ideally it would have been best to follow the pupils' progress year by year as they passed through secondary school, but this was not possible. In the summer of 1999, however, a brief opportunity arose to catch up with some of them. Inevitably, there had been some dispersal by that time, but 23 of the 62 primary project pupils were still traceable. With the help and cooperation of their secondary school's technology department it would be possible to gain information about their achievements and to try to find out something about attitudes toward technology as they sat their GCSE examinations and prepared to move on to tertiary education and the world of work.

Information was obtained from two different sources: school records and interviews with pupils. The school records listed the pupils' option choices, their estimated GCSE results and the grades they finally achieved in their technology option. The interviews, conducted with a sample of project pupils, offered an opportunity to supplement those GCSE facts with their feelings and opinions. They were young adults, hardly recognisable after four years at the local high school and their

Figure 1: The GCSE records.

Option choices

Technology option	Electrical	Food	Resistant Materials	Graphics	Textiles
Project pupils	4	11	5	1	2
As percentage	17.4	48	21.7	4.5	8.7
Non-project pupils	14	39	17	11	14
As percentage	14.7	41.1	17.9	11.6	14.7

primary school years might have seemed rather remote. Nevertheless, of the 23 pupils traced, 11 of them were willing and able to give up some free time in the midst of their examinations to explore their memories of the Primary Technology Project and their subsequent experiences.

Non-project pupils were those in the same year group who had not attended the primary school involved in the Primary Technology Project.

When the option choices made by the project pupils were compared with non-project pupils, it could be seen that proportionally fewer project pupils had chosen textiles and graphics and slightly more of them had chosen resistant materials, electronics and food technology options (Figure 1).

Although neither of the following tables are statistically significant, they continue to support a tendency for the project pupils as a group to differ slightly from their peers (Figure 2).

The teacher's estimates of the likely GCSE grades for the project pupils showed that as a group they were expected to do slightly worse than non-project pupils. When the actual GCSE technology grades were available later in the summer, however, a similar analysis showed that the project pupils had in fact done slightly better than the non-project pupils (Figure 3).

Finally, the grades achieved were analysed according to option and gender and again, although no statistical conclusions are possible, the results suggest that their positive primary experience may have had some influence. A higher percentage of project girls achieved better grades than non-project girls in the resistant materials option which closely relates to the primary work with construction sets. The project boys had also done better than non-project boys in the closely related electrical technology and resistant materials options.

Figure 2: Estimated grades.

Teacher's estimations	Grade A-C	Grade D-U
Number of project pupils	6	17
Percentage of project pupils	26	74
Number of non-project pupils	28	67
Percentage of non-project pupils	29.5	70.5

(Total number of pupils recorded: 118)

Figure 3: Grades achieved.

	Grade A-C	Grade D-U
Number of project pupils (actual grades)	9	13
Percentage of project pupils	40.9	59.1
Number of non-project pupils (actual grades)	31	51
Percentage of non-project pupils	37	63

(Total number of pupils recorded: 104)

Figure 4a: Girls' grades by subject.

	Project girls group		Non-project girls group	
Grades	A-C	D-U	A-C	D-U
Electrical technology	-	-	2	-
No. as a percentage	-	-	3.8	-
Food technology	3	7	10	21
No. as a percentage	23.1	53.8	19.2	40.4
Resistant materials	-	1	-	3
No. as a percentage	-	7.7	-	5.8
Graphics	-	-	1	2
No. as a percentage	-	-	1.9	3.8
Textiles	1	1	7	6
No. as a percentage	7.7	7.7	13.5	11.5
Total pupils	4	9	20	32
No. in group	13		52	

The interviews

The opportunity to add pupils' personal recollections to the raw data of their GCSE technology results was invaluable. It made possible an exploration of their attitudes toward technology in the past, present and future. These interviews were conducted in a private room where some pupils were interviewed alone. Others preferred to come in together, although individual responses were recorded for every pupil.

The structured interview encouraged them to look back and remember their work with construction sets at primary school. They were also asked how they felt their interest in technology had developed through secondary school. Then looking back again they gave their opinion on the persistence and value of primary experience with construction sets. Finally, they explored how they felt about the new technologies they might meet in the future (Figure 5).

The pupils' responses

Pupils' answers to each of the questions were clustered to detect any common patterns emerging from their responses.

Figure 4b: Boys' grades by subject.

	Project girls group		Non-project girls group	
Grades	A-C	D-U	A-C	D-U
Electrical technology	4	-	8	4
No. as a percentage	44	-	20.5	10.3
Food technology	-	1	-	6
No. as a percentage	-	11	-	15.4
Resistant materials	1	2	-	6
No. as a percentage	11	22	-	15.4
Graphics	-	1	3	3
No. as a percentage	-	11	7.7	7.7
Textiles	-	-	-	-
No. as a percentage	-	-	-	-
Total pupils	5	4	11	19
No. in group	9		30	

Figure 5: Structured interview.

1) What do you remember making in design and technology at primary school?

I'd like to ask what you remember about the work you did in primary design and technology with construction sets and material such as building blocks and Lego motors, wires, light bricks, buzzers and computer controls?

And

a) If there were any things which you really enjoyed?

b) If there were any things you didn't like so much?

2) Thinking back to the first two years at secondary school

What do you remember about the design and technology you did then?

And

a) If there were any things which you really enjoyed?

b) If there were any things you didn't like so much?

3) Thinking about design and technology you have done in the last two years.

And

a) If there were any things which you really enjoyed?

b) If there were any things you didn't like so much?

Do you think any of the things you tried out at primary school in design and technology helped you in secondary school in any way?

How do you feel now about any design and technology that you might have to tackle in the future, in the home, at work or at leisure?

Memories of the project

In answer to the question about their primary experiences with construction sets the response from every pupil was specific and overwhelmingly positive.

They could all remember models they had made so long ago:

> 'I remember making lots of cars.'
>
> 'I remember making a house and a doorbell.'
>
> 'I enjoyed making machines especially using the SEQ mini-computer to control them.'

They all said they had enjoyed the work with construction sets in primary school and were able to identify the different aspects which made the work enjoyable.

> 'I liked working with different types of equipment and having plenty of it.'
>
> 'I liked working with a friend or friends as a team – we didn't in most other subjects.'
>
> 'I enjoyed the freedom to choose what to make without it being prescribed.'
>
> 'I liked building things, sometimes being able to keep it for a bit, having the chance to make and improve it again in the next session.'

Negative comments about the primary project work were very sparse. Only three were offered even though they were specifically elicited.

One pupil said 'I didn't always feel like doing it,' and the other two disliked 'making models which the teacher said we had to make.'

Memories of technology at secondary school in Years 8 and 9

Pupils' memories of technology in the first two years were more mixed. A series of five short courses in food technology, resistant materials, textiles, graphic design and electrical technology gave pupils basic experience in each area. The most positive comments were made about the resistant materials course (10/11 pupils).

> 'I enjoyed making a game, making models from noodles, making puppets and especially making a table in woodwork.'

All the other courses were mentioned positively at least once and pupils mentioned textiles (six pupils) and food technology (five pupils) more frequently. Negative responses were few, brief and not very explicit.

Memories of technology at secondary school in Years 10 and 11

The two-year course which pupils followed for their GCSE technology examination allowed them to opt for any one of the five areas studied at basic level. In the sample of former primary project pupils interviewed only three of the five basic technology options had been chosen. Pupils' comments showed that to a large extent they had found these enjoyable.

The three pupils studying resistant materials made comments such as 'I liked working with wood, metal and plastics. The GCSE paper balanced all aspects and I enjoyed it all though I especially enjoyed learning how to shape and form veneers.' The only negative comment on this course was about the lack of girls 'There were only two girls doing this option – all the rest were boys.'

The food technology option was taken by seven of the eleven pupils interviewed. They made comments such as 'It looked good at the time when we had to choose.' 'I could see it included design, working with computers, making things.' 'In retrospect I liked the actual cooking, tasting the product and gaining information about nutrition.' 'I liked doing the project, designing and packaging and the production of it in a commercial way.'

The main negative comments concerned the heavy workload this course included. 'There was a lot of planning which had to be done and pressure when working it through.' 'I found writing it up hard.'

The textiles option was taken by only one interviewee who recalled 'enjoying making toys and bags for children' and had no negative comments to make about it.

Benefits of construction sets in primary school

Analysis of project pupils' response to this question showed that benefits had been felt in three areas: knowledge, skills and attitudes.

Two pupils said that the knowledge they had gained through 'having worked with wiring', 'of Lego and computers' and 'of making models which you could control' was useful. Three said that the personal skills which they developed by 'working with friends in a group' were valued highly. Six said that the work helped them develop attitudes such as confidence and independence in tackling hands-on work and stressed that they found few opportunities to do this in other areas of the curriculum. 'I think it helps you to be independent – to do things for yourself. It helps you with choosing what to do.'

Coping with technology in the future

Pupils were asked how they felt about coping with technology in the future in three typical situations. These included whether they would be happy using electrical and electronic equipment at home, whether they felt comfortable about using machinery and computers when they start to work and whether they felt they would be able to deal with technology such as bikes and cars. Of the 11 pupils, seven felt they would be happy in all three situations. 'I feel OK about any technology I might meet in future.' Four felt happy about using technology in the home or at work but uncertain about dealing confidently with garages and repair shops. 'I feel confident enough about computers in the future as I find them quite easy. I could manage to cope with everyday technology such as plugs and fuses at home now, I think, but I'm not sure I could deal with a garage if I had a problem with a car.'

Analysis of the interviews

The pupils interviewed were unanimous in their opinion that frequent work with construction sets was valuable and should be encouraged throughout primary schooling. They claimed it had offered them unique opportunities for developing their abilities in three distinct ways.

They felt that it had helped them to acquire knowledge through hands-on experience which was not available elsewhere in the primary curriculum. More important to them though were the opportunities it provided to choose what models they wanted to make and the allocation of enough time to develop them. This allowed them to be creative, developing their own ideas or modifying the original design. The third aspect they valued was the opportunity to gain confidence by working on a model with friends. Working together and cooperating as part of a group which could vary in size from two to ten children, was a well remembered and universally appreciated feature of the work.

In contrast, the pupils seemed to remember their first two years of design and technology at secondary school with mixed feelings. Of the five basic design and technology courses only the resistant materials course was praised by every pupil. None of the pupils felt that they had been able to exercise the choice and autonomy that they had enjoyed in the primary project work, nor did they remember cooperating with friends in the ways they had enjoyed on the primary project.

After the first two years of the basic course all pupils opted to take one of the five foundation courses it covered to GCSE level. During the next two years the numbers in the option

groups were very unbalanced. A very large group took the food technology option while much smaller groups took the four other options. This imbalance was less marked among the pupils interviewed. One of the interviewees took the graphic design option, three took the resistant materials option and seven took food technology. They could all mention specific things they had made, and said they appreciated the knowledge and skills acquired in the option they had chosen. While some would have liked it to be less pressured all had enjoyed some degree of autonomy and choice. Their work for GCSE seemed to be wholly individual, however, and there was no mention of working on it in collaboration with friends or as part of a team.

When the pupils interviewed looked forward to the future and expressed their feelings about technologies they might encounter later in life they were all very positive. They felt their knowledge and hands on practical experience, and the confidence and independence they had gained from their work in design and technology at primary and secondary school would stand them in good stead. They felt these attributes were developed best when they were given a choice of what to make and who to work with on tasks which allowed a degree of open ended development.

Discussion

Any conclusions drawn from this study must be cautious because of the small numbers involved. Furthermore, the interviews were conducted by the author with whom most pupils had worked in the primary school. Opportunities to acquire more longitudinal data are infrequent, however, without it assumptions of long term effects are unsafe and so this study may be seen as one step in the attempt to track the development of technological abilities. The data gathered here helps to describe some of the possible effects of using construction sets as part of the technology curriculum. It also raises wider issues about the organisation and management of design and technology in primary and secondary education which may profit from further investigation.

Although it was only possible to follow up a small number of the pupils originally involved in the primary project, in retrospect, extensive use of construction sets seems to have been worthwhile in the long term as well as during the primary phase. In their GCSE options the project pupils showed a slight bias toward work with the less popular options of resistant materials and electrical technology and they achieved slightly higher grades than non-project pupils in their results. More emphasis on the use of construction sets and greater coordination between primary and secondary phases may therefore help to increase the numbers of pupils choosing these options.

It is in the interviews that evidence of the deep seated value of this primary experience seems to emerge. Pupils said that extensive use of construction sets in primary technology provided opportunities not found elsewhere for choosing what to make, who to work with and how to proceed. They maintained that making such choices for themselves built up their independence, confidence and ability and enabled them to work as part of a team. Although the numbers involved were small, their collective statements give modest support to the conjecture that a greater focus on use of construction sets in primary technology would have positive, long lasting effects. This study also indicates that more opportunity for pupils to choose what to make, more time to achieve satisfying completion and more opportunities to benefit from the synergy of working with other pupils on joint enterprises may be a strategy worth considering at all levels of technological education.

References

Brown, C.A. (1995a) 'Girls, Boys and Technology: Competence, Confidence and Creativity in the Primary Years', *IDATER1995*: 4-9, Loughborough: Loughborough University

Brown, C.A. (1995b) *The Primary Technology Project Report*, School of Education and Professional Development, University of East Anglia

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