An Investigation into the Interaction of Teaching and Learning in Primary Design and Technology, Academic Ability and Classroom Behaviour

RESEARCH

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Abstract

This study arose as a result of the writer, a class teacher, investigating ways in which to enhance and extend learning within a particularly difficult primary year six class, where many children had learning difficulties of some form, or exhibited challenging behaviour, and in some cases fitted both categories. The study focuses on how behaviour is affected when children are actively involved in their own learning through designing and making activities requiring a problem solving approach.

The research

The research was based on a case study, data from observations of children, and the study and analysis of some of their work. The school involved was a large primary. The ability range of the children was vast, with the children coming from a variety of cultures and backgrounds. For the first element of the case study, pupil's characters and behaviours were observed in a natural setting with both the teacher and the classroom assistant participating, thus eliminating bias and ensuring that an accurate picture of each child could be developed. The second element of the case study involved the analysis of children's work, which would provide a useful and tangible source of evidence of their knowledge and understanding of design and technology activities. The final element of the case study involved academic assessments. For this, the results of the Standard Assessment Tasks (SATs) were utilised, together with Teacher Assessments for design and technology activities.

The children

Child A had little confidence in his own abilities and a low self-esteem. He displayed immature behaviour and found it difficult to concentrate. Balson (1992) implies that the extent to which pupils feel they can belong to the classroom by constructive behaviour will determine their willingness to learn and function co-operatively in school. He contends that it is a sense of inadequacy and of internal discouragement, together with fear of rejection, that are the major causes of all learning failures and behavioural problems in school. In this study, child A wandered around the class, disturbing others by calling names or by moving their things, annoying them and creating disruption. He would often hide under tables or lie on the floor refusing to do his work, saying things like, "I can't read," "I hate maths," "Why should I? I don't want to, you can't make me." Rogers (1994) contends that many teachers hold the belief that they must use counter power to make such students submit to their requests. Certainly it appears that the child is trying to provoke the teacher into some sort of confrontation. One explanation for this behaviour is that as child A had both learning difficulties and lacked social skills, he would find new activities threatening, and would react by becoming frustrated or agitated. He would also have had pressure upon him not to appear less able, together with the fear of being mocked by his peers. Child A could be very caring. His friends were usually younger children whom he was able to manipulate.

Child B was a very capable, popular boy with a quick wit. He was described by his last teacher as 'extremely independent and inventive'. He was a very strong character who knew exactly what he wanted. He did not tolerate fools gladly, and if annoyed, was very quick to lash out and to fight. He responded well when given responsibility, and could be extremely well behaved when he felt it would be to his advantage. Child B could be made to feel very humble if reprimanded quietly for inappropriate behaviour, such as using his quick tongue to intimidate less able children. Child B would sometimes try to exert control, challenging the teacher by refusing to work. In these situations, he contended that the work was 'boring'. When he adopted this attitude, he would usually display accompanying attention seeking behaviour such as throwing and flicking things at other children.

Child C was a very large boy who could be very clumsy. When asked to do things, he would often have a puzzled look on his face, probably because he lacked confidence. He was eager to please, however he could also be very grumpy and often employed avoidance tactics to escape from completing his work if he was experiencing difficulties. His tactics included feigning illness, asking to go to the toilet or seeking a pencil, rubber or sharpener. These tactics are among the most common strategies for work

avoidance. A further subtle tactic he occasionally used was to 'wait for help' in a 'help queue', allowing others to go in front, thus avoiding working for the duration of the lesson. Chiid C would also sometimes exhibit laziness, where he had learnt that this would achieve a purpose of involving the teacher, gaining special attention and assistance.

Child D was generally happy and contented, polite and respectful to others. However, he had a very sensitive nature and was easily upset and known to cry. Consequently, he had been branded as a 'softy' within the class, making him an easy target for other children, particularly the girls, who tended to pick on him. Child D always tried hard and was let down by his reading ability, but usually managed to do things once they had been explained to him simply. Child D was usually well behaved, but was sometimes led into doing silly things, and could be quite immature. Sometimes he was unable to sit quietly to listen to instructions, interrupting with irrelevant questions, or humming and pulling faces.

Teaching and learning in primary design and technology

Ritchie (1995) identifies three key features of children's learning that will help in choosing teaching approaches to design and technology, and these may be applied equally effectively across other areas of the curriculum:

- that children learn from experience
- that learning is an active process
- that learning takes place in a social context.

Teaching through problem solving encompasses all three types of learning mentioned, and may be defined as using, applying and developing existing skills and knowledge to a real situation, thus developing independent thinking. Problem solving is an unique opportunity for children to take some responsibility and ownership for their own learning. It should provide motivation for children by stimulating their interest through creative and enjoyable activities, promoting self-confidence and self-esteem. Ritchie suggests that when pupils learn through design and technology, they are actively constructing their own knowledge and understanding. Learning takes place through the development of skills, processes, knowledge and understanding, together with personal qualities, attitudes and values. This notion of active learning forms a sound basis for the teaching and learning of not only design and technology, but other National Curriculum subjects as well. Fisher (1990) contends that problem solving skills are complementary to the traditional curriculum, the skills of successful living. He suggests that these skills include general thinking skills, both creative and critical, and specific strategies such as observing, designing, making decisions, teamwork, 'brainstorming', implementing and evaluating solutions.

> "In learning through problem solving, we seek to generalise what we already know. What else is there to do?" Wood (1990).

In addition, Denton (1994) suggests,

> "By using groupwork appropriately, it is possible to help people both learn and achieve far more than through working individually."

Denton goes on to cite the following qualities gained through groupwork:

- value co-operation
- responsibility towards other members
- readiness to listen to others' points of view
- willingness to support the view which seems to carry the best hope of solution
- willingness to lead or follow as appropriate
- perseverance involving co-operation and communication.

Figure 1: Motivation poster by child A

Although this type of activity obviously requires care in planning and setting up, the rewards are all too abundant. Children get opportunities to work independently, to take charge of their own learning, to make decisions, both discussing and evaluating their work. At the same time the teacher is there to provide advice as necessary, as a back-up system – a human resource.

The case study

The approach adopted for this case study included a SATs type activity entitled 'Crowns', this being based upon a similar activity for the 1992, Key Stage 1 SATs entitled 'Designing and Making Protective Headgear'. For the 'Crowns' activity, children were required to consider a number of examples of crowns from pictures supplied. They were each asked to draw three initial crown designs from which they would select one to elaborate upon, adding appropriate details, and labelling necessary dimensions. They also listed tools and resources they would require. The children then proceeded to make their crowns. By observing children in other design and technology activities, it was also possible to prepare some initial teacher assessments for design and technology, as for the core curriculum areas.

Observations from the case study

It can be argued that there are a number of reasons why the children's behaviour improved during design and technology activities, and these varied for each child. Children such as child A, who are regarded as having special educational needs, often respond to and seem to 'find their niche' in some form of practical activity. Children who experience difficulties in attaining high standards of achievement in academic tasks often shine, demonstrating definite skills and abilities, together with confidence, when involved in art and design and technology activities. Booner (1974) observed that the CSE Model III examination, which was available for those children considered incapable of passing the GCE "was mainly of a practical nature". However, he also notes that the more able GCE students, such as child B began to demand teaching strategies consisting of outings and more practical tasks etc., which seemed more attractive as opposed to more formal, traditional teaching styles. Booner's comparison of "chalk and talk" traditional teaching to "discovery methods" concluded that:

> "passive learning is probably less efficient than active learning"

and that:

> "learning by doing may have more relevance ... and will involve an element of experience which the orthodox style cannot have."

Child B is noted as referring to written work as 'boring', and this is not because he cannot do it!

When children are motivated by their work, it seems reasonable to suppose that their behaviour will be better than when they are engaged in work that does not motivate them. The general approach to teaching and learning in design and technology could be described as a problem solving approach, which children do seem to enjoy. Bentley and Watts (1994) summarise enjoyment for learning in this way when they say,

> "in the classroom there is no doubt that the activity of problem solving itself is highly motivating – a feature that has been noted time and time again. Children enjoy the relative freedom and autonomy of making their own decisions, correcting their own mistakes and reaching their own solutions."

When children are motivated in their work, their energies will be directed into positive behaviours. For children such as child C and child D, this style of teaching provided them with an ideal opportunity to work together. A well known saying is 'two heads are better than one'. Child C and child D were very proud of their crown and worked very well as a team, demonstrating co-operative learning at its best. Fisher (1994) observes,

> "Problem solving activities will stimulate and develop skills of thinking and reasoning ... It can also provide opportunities for children to share ideas and to learn to work effectively with others, the 'Let's-work-this-out-together approach."

Again, enthusiasm and enjoyment for their work is very evident, and behaviour is excellent!

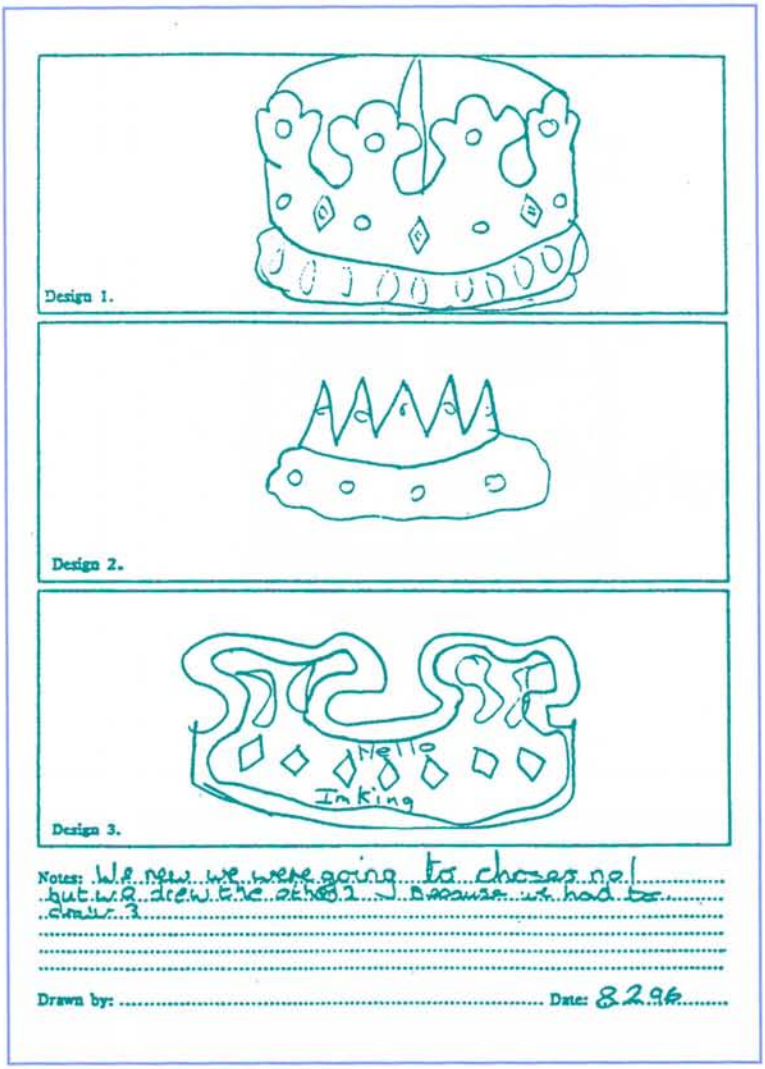


Figure 2: Three crown designs by child B

Results of the study and analysis of the childrens' work

The four children were chosen from the original study because their work was of most interest for this paper.

Child A

Child A was very keen to design and make his crown. He found it difficult to generate three designs as he already had an idea in his head. However, he 'went through the motions' designing as he knew that he would not be allowed to make his crown until he had done that. On deciding that the crown would be for his sister, he took measurements of her head – announcing, "I need 54cm plus a bit for the tab." His final product reflects his design except for a few details. Although child A did not complete his crown, he did concentrate for over two hours on his designing and making – a big achievement for him. His behaviour was

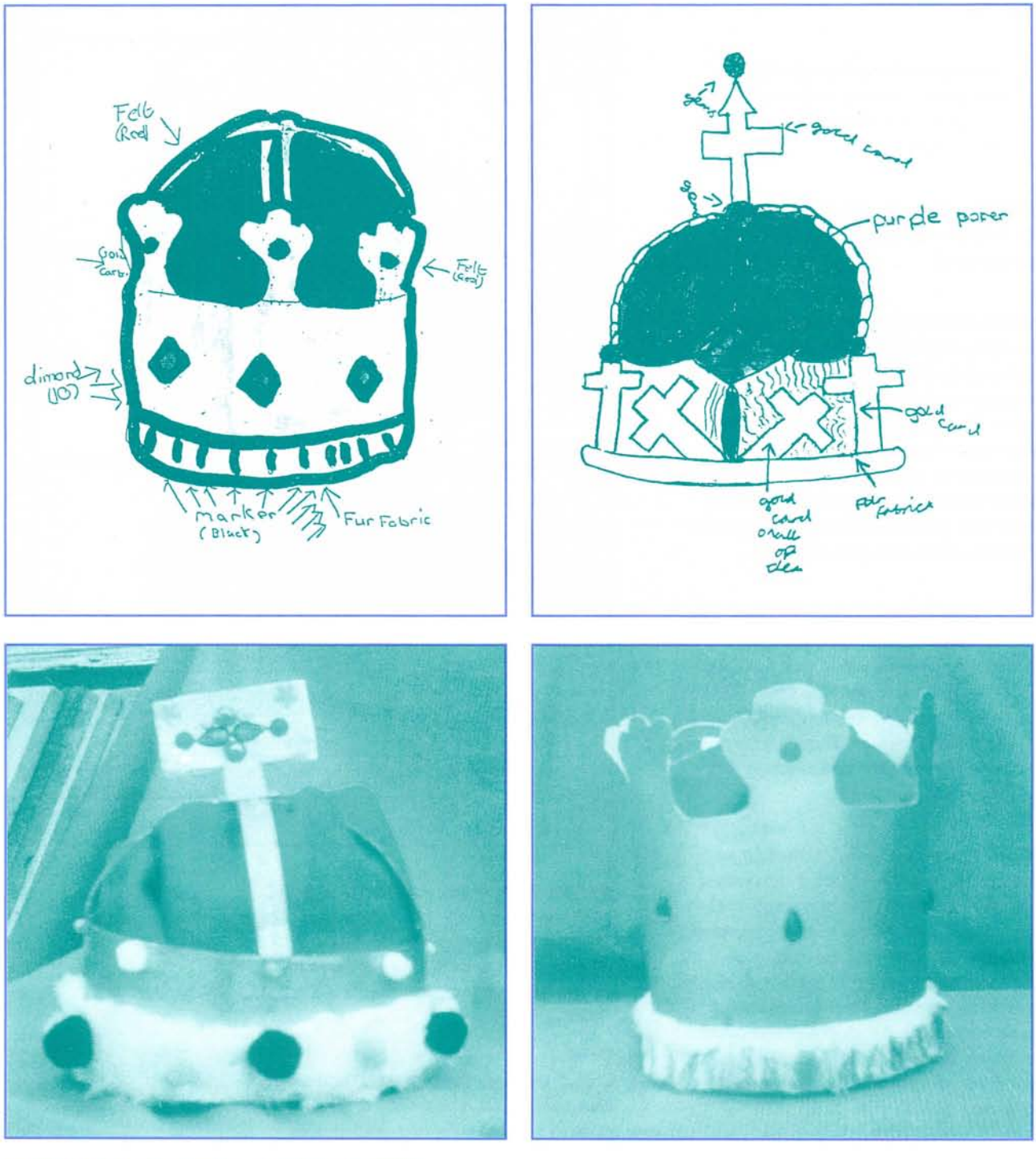


Figure 3: The final designs and the finished crowns

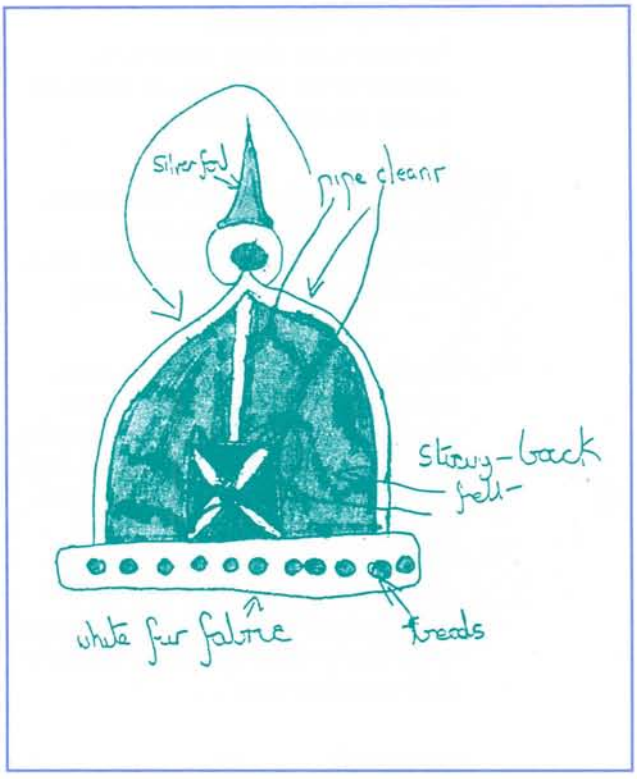
excellent, he remained on task and did not display any of his usual 'attention' seeking traits. He was in charge of his own learning and had personal motivation in making the crown for his sister. Child A would live to be accepted by other members of the class. Through this activity, he did get the admiration of others. Child A also wants to do well in school, as the motivation poster shows (see Figure 1). He was asked to design an advert. He decided that it would be for school.

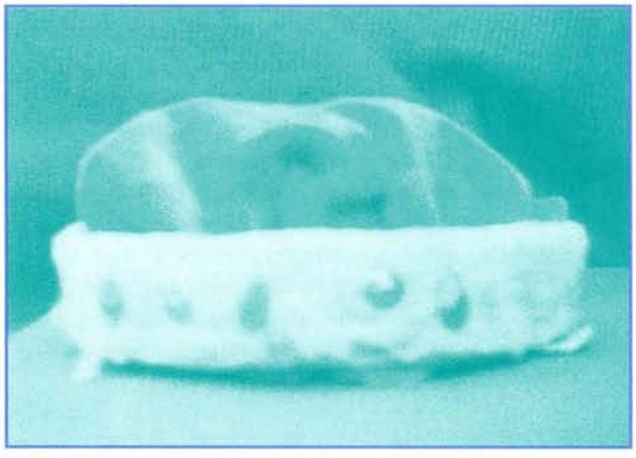
Child B

Child B worked through this activity to produce a crown of a good standard, which reflected his design. For the initial designs, child B and his friend worked together. Child B designed crowns 1 and 3, his friend designing crown 2 (see Figure 2). Child B noted, "We new (knew) we were going to choses (choose) no. 1 but we drew the other 2 because we had to draw 3." Although child B set out to work with his friend, he actually worked alone. He listed materials, but not sizes. This proved to be a mistake as he found that his finished crown did not fit – it was too small, yet he is quite capable of measuring! Child B paid a lot of attention to detail, taking great care when marking and cutting the gold card. When other children asked him for help in making their crowns, he was happy to assist, yet he is not usually very tolerant of children who seem less capable than himself. Although child B does well academically, he expresses particular interest in design and technology activities, often saying that written work is "boring!" – perhaps he has more confidence in this type of work. He certainly finds this way of working more exciting.

Child C and Child D

Child C and child D worked together to produce a magnificent crown which closely reflected their chosen design. The boys worked well as a team, carefully preparing three designs and finally selecting design 2, of which they stated, "we like it and we ingoud (enjoyed) droring (drawing) it. We are going to chose number 2 is the best." – evidence of children actually enjoying designing as well as making. When listing what they would need, the boys omitted to specify sizes, but did repeatedly measure





their crown against child D's head to ensure that it would fit. Child C wrote out quite detailed plans for making the crown. The boys took advice from child B about how to put the felt into their crown. For children C and D, neither of whom are very 'academic', this activity set them thinking, continually making decisions and discussing their work. They were on task for considerable lengths of time and obviously enjoyed this activity, repeatedly asking for opportunities to work on their crown, to modify and improve it. Behaviour from the boys was excellent during the activity.

Academic assessments

The table below details actual levels awarded for the 1996 SATs, as well as the Teacher Assessment levels.

For design and technology assessments, the level awarded is based upon consideration of the two elements of design and technology, designing and making.

The study indicates that there are many advantages to working in pairs or small groups – it is observed that child B, working alone, did not benefit from sharing his ideas with anyone, except when approached for help by other children. Child B's SATs results demonstrate that he did not do as well as he was expected to in design and technology, and this suggests that he needs to develop his ability to apply his academic skills to practical tasks.

Conclusions

The behaviour of all the children was notably improved during this activity – motivation for their work meant that children were on task and worked with enthusiasm, without the usual disruptive element. Through this method of learning, less able children often appeared to excel themselves in practical problem solving tasks, yet there are also many opportunities for them to practise and develop more academic skills, e.g. measurement in maths, speaking, listening and writing in English, properties of materials in science, etc.

Through this type of work, it is possible for all children to experience success. For example, child A received recognition and a form of acceptance from his peers, which he had not achieved through more formal academic activities. By achieving this success and recognition, children like child A will gain self-confidence and this will improve their self-esteem.

Finally, it is worth noting that the main findings of this study point towards the fact that carefully organised practical, problem solving design and technology activities provide an excellent strategy for dealing with behavioural problems, and that this style of learning may be extended through careful planning to other areas of the curriculum.

Acknowledgements

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Table 1

	ENGLISH		MATHS		SCIENCE		D&T	
	TA	SATs	TA	SATs	TA	SATs	TA	SATs
CHILD A	1	1	3	3	3	3	3	3
CHILD B	4	3	5	5	4	4	4	3
CHILD C	3	3	3	3	3	3	3	3
CHILD D	3	3	3	3	3	3	3	3