Holistic assessment in design and technology: theory and practice

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This article explains how teachers in an independent school developed their own assessment scheme for Key Stage 3 design and technology by referencing the APU design and technology assessment framework to National Curriculum attainment targets. The article highlights:

- the importance of teachers developing a shared understanding of 'capability' in design and technology
- the extent to which they found it helped to have a small but consistent set of variables within each level
- the way in which teachers' understanding of pupils' learning is enhanced when teachers work together to develop their own framework

Abstract

The Design and Technology National Curriculum is built upon the whole process of the subject and therefore must be assessed in the same holistic way. This article traces the development of such an assessment scheme for Year 7 pupils in an independent girls' school. It highlights the various difficulties involved in selecting criteria which match the age, ability and experience of the pupils when they enter the secondary school. The article concludes that teachers can assist their pupils to become capable in design and technology by developing their own assessment criteria, as long as they understand what is meant by the term 'capability'.

Introduction

It was the publication *The OFSTED Report* [1993] that prompted the staff in an independent girls' school to analyse and clarify the assessment requirements of the Design and Technology National Curriculum [DfE 1992]. They were, as the report had described, still very unsure about the adequacy of their present assessment procedures. This article illustrates the numerous difficulties involved in moving away from an assessment format which is based upon National Curriculum objectives to establishing an holistic assessment scheme referenced by criteria.

Background information

Farnborough Hill is an independent girls' school with approximately five hundred and twenty pupils on roll. Although the school is not legally bound to follow the National Curriculum it is committed to providing its Year 7 and 8 pupils with some experience of design and technology. In both years the girls are timetabled to spend approximately five weeks [two hours per week] in Food, Textiles, Graphics, Wood and Information Technology [IT]. The course in Year 9 is geared primarily towards preparing the girls for the GCSE examination in Food and Textiles.

Initial thoughts and research

The work began by identifying the aims of the project. This involved a great deal of departmental discussion but in the end the following six aims were decided upon:

a. To adequately prepare the girls for the GCSE examination [Food and Textiles].

b. To accommodate the pupils' interest and ability levels.

c. To clarify learning goals.

d. To improve the validity of assessment.

e. To improve the pupil's understanding of the reporting system.

f. To differentiate between the pupil's ability levels.

The first assessment scheme for Year 7 pupils was developed using the Key Stage 3 National Curriculum Attainment Targets [DfE 1992] for each level. These were used in each subject area during the academic year 1992/3. The staff criticised the schemes because they restricted the development of the pupil's technological capability by:

- Placing too much emphasis on the acquisition and repetition of manipulative skills.

- Restricting the development of the pupils' knowledge of the design process.

It was evident that when the National Curriculum assessment objectives were used as assessment criteria they did not recognise or reward the various levels of pupils responses [Cresswell and Houston 1991] because they prevented the pupils from developing a general awareness of technology; making their own value judgements; and of having any experience of tackling and solving real technological problems [Farrell 1993].

As a result of their initial experience, the staff thought it necessary to clarify their understanding of the term 'Technological Capability'. For this they turned to the Assessment of Performances' Final Report of the design and technology project carried out during 1985 to 1991. The staff concluded that both the APU's study and the National Curriculum were built upon the same assessment framework, that is, that they consisted of three dimensions of capability:

- conceptual acquisition and development.
- communication
- the interaction of conceptual understanding and communication through the processes of identifying, investigating, planning, developing, and appraising [*See Figure 1.*]

In the APU's pilot survey [1987-88] qualities were identified under each dimension and these were considered to be at the heart of capability in D&T:

Procedural Qualities.
recognising issues in the task;
developing proposals for a solution;
appraising the proposals through the issues;
growing ideas;
planning the work.

Communication Qualities:
the clarity of the communication;
the complexity of the communication;
the confidence of the communication;
the skill in communication.

"Conceptual Qualities:
understanding and using materials;
understanding and using energy systems;
understanding and using aesthetics;
understanding people".
[APU Ibid p.152].

Theory into Practice

It was the APU's definition and accompanying qualities of capability that the staff used to develop their own assessment scheme [*see Appendices 1, 1a*]. The Year 7 schemes of work were changed so that more open-ended project work could be carried out that required pupils to design and make across subject areas. These were grouped in the following ways:

IT and Textiles.
Graphics and Food.
Graphics and Wood.

The assessment scheme [*see Appendix 2*] for this work was tested with the pupils who were working on the combined IT and Textiles project. The section referred to as 'concepts' was excluded because the knowledge and skills that the pupils are expected to acquire at each key stage are described in the core and supporting programmes of study [DfE 1992].

Because of the number of variables contained in each of the three domains it took a long time to mark the work. In addition, in order to meet all the requirements the girls had to possess a deep understanding of the design process which many of them did not have. The staff expected there to be a discrepancy between the knowledge that the girls had of design and technology and the APU scheme because the latter had been devised to be used with GCSE candidates. For example, the teachers were unable to assess the

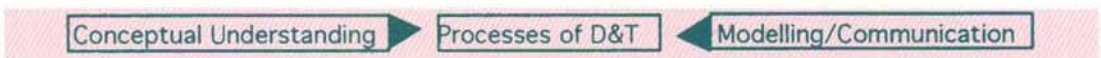

Figure 1 [APU Ibid p.29]

'issues' section because the pupils had little or no knowledge of these and therefore they could not identify them. Initially, the pupils were unable to praise and criticise the way in which they had approached and worked through their project. However, with teacher guidance and experience of working in each subject area, this gradually improved. Clearly, the development of these skills was essential, especially the area of appraisal which is a key element in the assessment of the design process [APU Ibid, Deforges 1989]. These problems regarding the appropriateness and depth of the assessment scheme had arisen because the department did not have any prior knowledge of the pupils' experience of design and technology in the primary school – a problem which many independent schools inevitably face when they draw from such a wide catchment area.

The inclusion of such a large number of variables presented the staff with additional problems regarding the following:

- Rank of importance
- Level of detail.
- Weighting.

In an attempt to select variables appropriate to the ages and ability levels of the pupils the staff turned to the National Curriculum [DfE Ibid] for assistance. They found that although variables are included in the document they are few in number and even then some of the statements are open to a number of interpretations. A good example of this lack of clarity can be found in Attainment Target 2, level 5 which requires pupils to produce a 'clear' order of work [DfE Ibid p.25]. Others are more straightforward. For example Attainment Target 1, level 3a requires pupils to "make realistic suggestions in response to a set task" [DfE Ibid p. 24]. Because of the absence of variables within the document the staff selected those used by the APU which met the requirements of each of the National Curriculum objectives. It was decided to restrict the number of variables within each section to two because at this early stage there was no obvious reason to introduce differential weighting.

They had experienced difficulties in quantifying the variables in terms of marks. For example what amount of detail do pupils need to include in their work on 'proposals' to obtain a mark of 7/10? The reporting system within the school demands that the marks the pupils receive are equated to grades so it was important for the teachers to reach a consensus on how they were going to differentiate between the various levels of pupil performance. The staff were adamant that they were going to move away from the infamous 'tick-box' system. Therefore, it was obvious that the only way to achieve this and all the other requirements was to develop an assessment scheme which was referenced by criteria.

One of the main stumbling blocks was to devise criteria that were clear and concise. Because the staff had decided to eliminate marks from the scheme it meant that statements had to be compiled which described specific levels of performance. It was decided that the maximum number of variables within each statement should remain at two, each having equal weighting. The department agreed to adopt the APU's four point scale because it could easily be translated into excellent, good, satisfactory and restricted to represent the grades A-D, thus accommodating the reporting requirements of the school.

This third assessment scheme [*see Appendix 3*] was tested with Year 7 pupils during the 1993/4 academic year. Although the results were pleasing, in that the pupils did produce work which met all the original aims, some of the statements did not fully match the pupils' abilities and experience in the subject. For example the 'planning' statements in this scheme read:

"An excellent, logical and concise order of work.
A good, logical and concise order of work.
A satisfactory order of work
A brief outline".

Many of the pupils had very little experience of devising an order of work, let alone one which was logical and concise. As previously stated, the National Curriculum requires pupils to produce a "clear order of work" [DfE Ibid p.25] consequently, the staff decided to concentrate the pupils' learning on developing a 'logical' order of work which, in their opinion, would be one which was 'clear'. The statements were amended to read:-

"A logical order of work.
A satisfactory order of work.
A brief outline.
None attempted."

The staff also concluded that it was important for Year 7 pupils to be aware of the importance of presenting their ideas in the best possible way. Therefore the 'making' statements were changed to include both interpretation and presentation of ideas.

This scheme [*see Appendix 4*] is currently running with our Year 7 pupils. To date we have had no problems. The pupils understand the requirements of the scheme and, as they have gained experience of working in this way, their overall standard of work has continued to improve. The staff have clarified learning goals, achieved differentiation and motivated the pupils to learn by providing them with assignment work which accommodates the various age and ability levels. In addition, by including resource tasks [knowledge and skills] within the capability tasks the teachers have ensured that the pupils have acquired a knowledge base for future project work as well as for GCSE work. Furthermore, the scheme is very versatile because it can accommodate the assessment of work in one or more of the technology areas depending on the type of task set.

Conclusions

The results from the empirical study have made it abundantly clear that teachers can assist their pupils to become capable in design and technology by developing their own teaching and assessment strategies which combine the procedures of design and technology [attainment targets] with the communication and conceptual qualities [the PoS]. However, this work has demonstrated that the implementation of such procedures depends very much on the teachers' interpretation and understanding of the term, 'capability'. Without a consensus of opinion on this underlying principle of design and technology it seems highly likely that the inconsistency between inter-school assessment procedures will continue.

This study has shown that pupils enter the secondary school with a diverse knowledge of design and technology. The main area of weakness is familiarity with the design process. Clearly, without a knowledge of this pupils cannot be expected to produce evidence which meets the requirements of the criteria contained within the National Curriculum. What is needed is a balance between the delivery of resource and capability tasks. Pupils will then receive instruction in the theoretical aspects of the subject as well as being guided through the design process. Only then will learning take place because the tasks will match the pupils' level of ability [Bruner 1971].

The teachers were aware very early on in this study that the main stumbling block of developing an holistic assessment scheme is the time involved in experimenting with and generating new assessment criteria. They all worked extremely hard to structure and restructure an assessment format alongside their teaching programme [Torrance 1992]. The National Curriculum requirements for design and technology and the examples of pupils' work published by the National Curriculum Council and SCAA [1995] assisted the teachers to identify some specific variables within the attainment targets and PoS for Key Stage 3 pupils. However, it soon became clear that they needed a lot more help and advice in selecting those most appropriate for Year 7 pupils. The results from this study have demonstrated that learning in Year 7 is successful if each of the assessment criteria contains a maximum of two and preferably one variable. Furthermore, it appears to be the only way to develop and reinforce the pupils knowledge and skills within the design process in Year 8.

Since this project began we have seen the introduction of yet another National Curriculum document for design and technology [SCAA 1995]. Once again the number of variables contained within it are few and far between. However, it is still built upon the holistic process of design and technology and consequently should present us with few problems. It is very comforting to know that after all our hard work we have established a basis upon which we can build and which will facilitate the requirements of this new and any subsequent documents.

The teachers involved in this study are much clearer about the structure and form of assessment required by design and technology in the National Curriculum. We realise that this is only a very small study and that further research is needed to substantiate our results. We do hope that our findings will be of some use to teachers in any type of educational establishment but especially those in the independent sector who sometimes feel that they stand alone.

References

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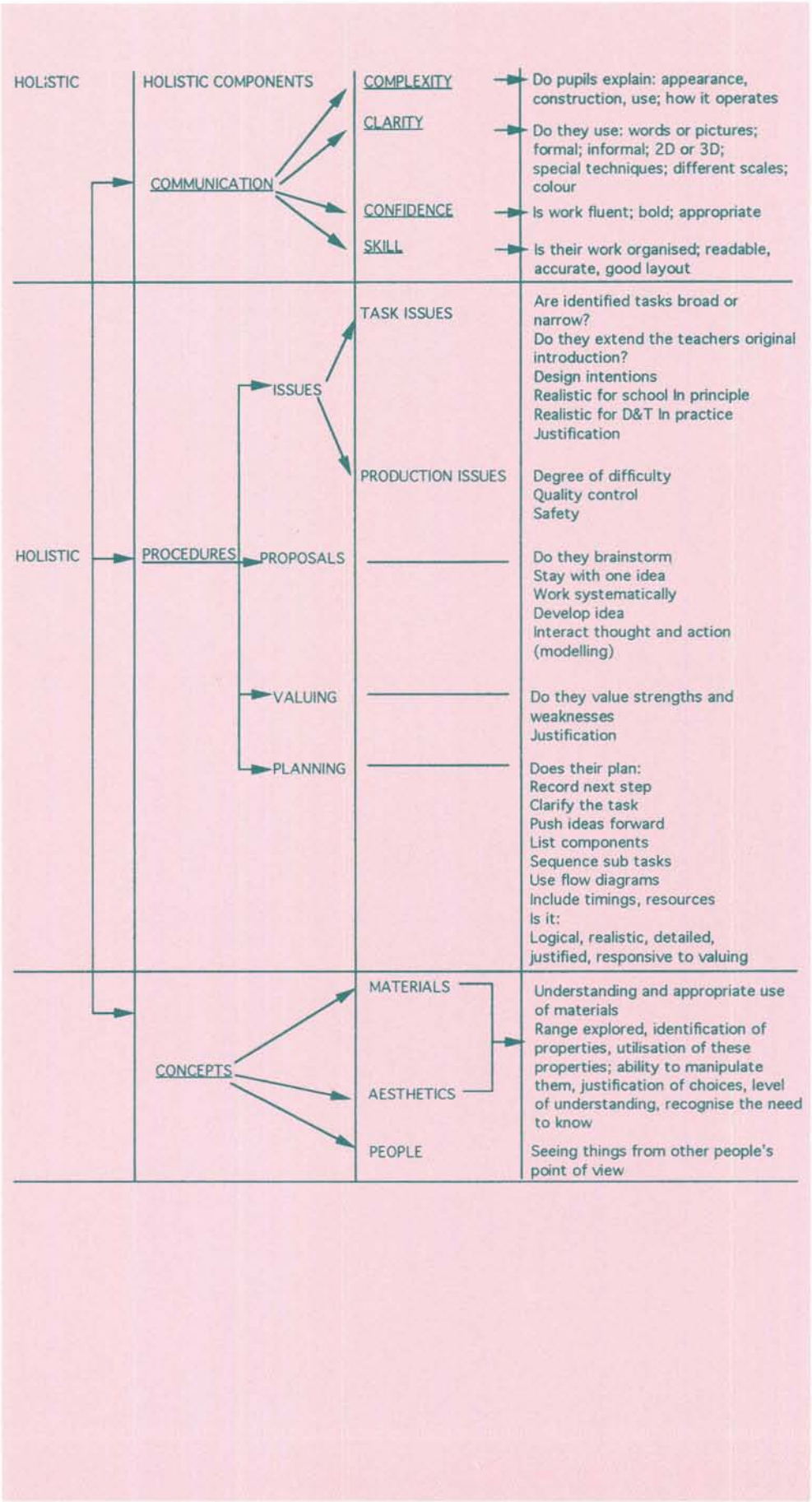
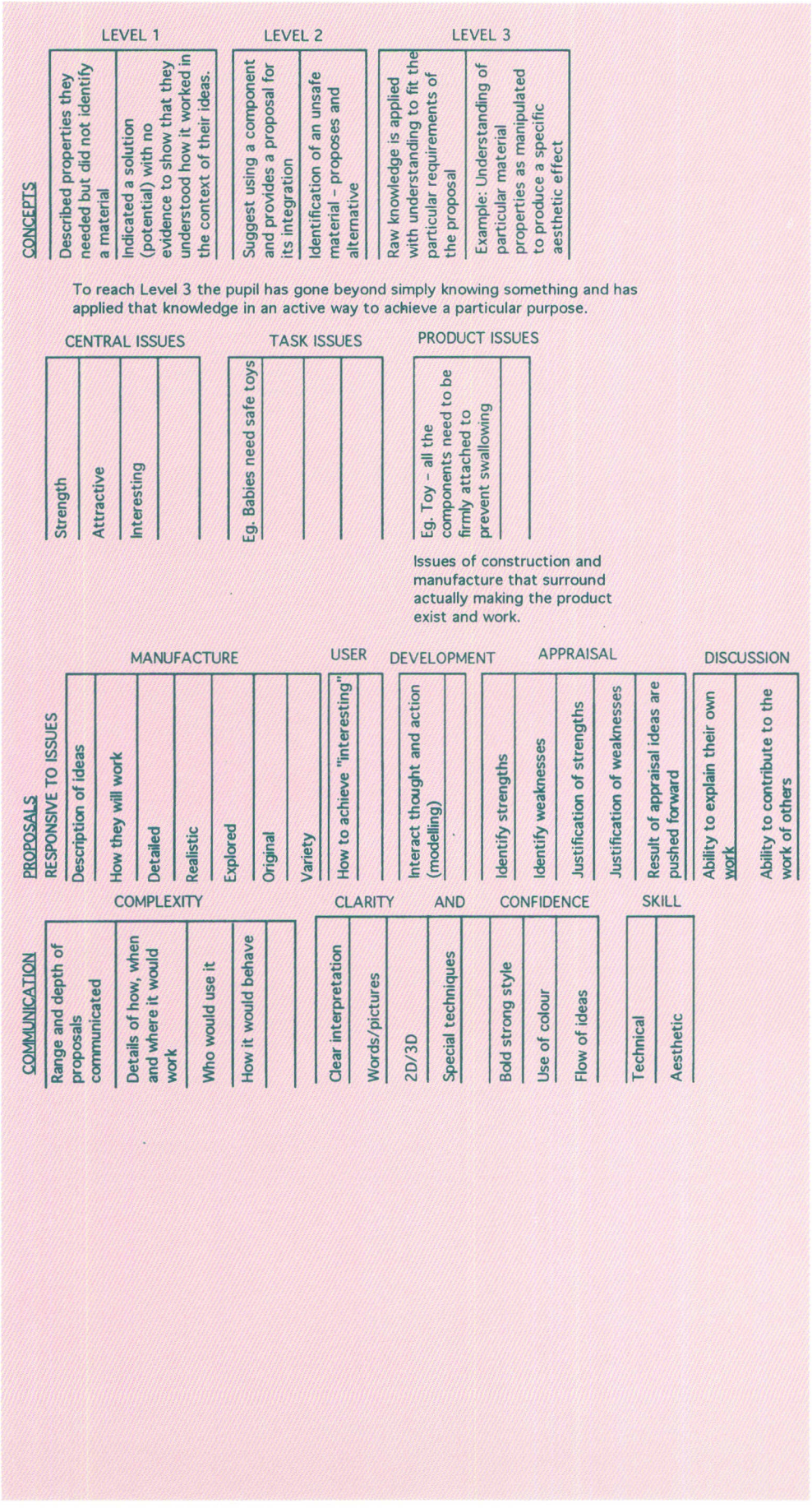
Appendix 1: Explanation of holistic components



Appendix 1a: Explanation of holistic components



ASSESSMENT

NAME									
FORM									
	MARK		MARK		MARK		MARK		MARK
CENTRAL ISSUES		PROPOSALS		DEVELOPMENT OF IDEAS		COMMUNICATION OF FINAL IDEAS		PLANNING	
SAFETY		DESCRIBE IDEAS		APPRAISAL OF IDEAS		RANGE AND DEPTH OF IDEAS		LIST RESOURCES	
STRENGTH		DETAILED		MODIFICATION OF IDEAS		AND PROPOSALS		USE FLOW DIAGRAMS	
ATTRACTIVE		REALISTIC				CLEAR INTERPRETATION OF		IS IT LOGICAL	
INTERESTING		EXPLORED				IDEAS IN WORDS, PICTURES		IS IT REALISTIC	
		ORIGINAL				USE OF SPECIAL TECHNIQUES		IS IT DETAILED	
		VARIETY				USE OF COLOUR		RESPONSIVE TO	
						ILLUSTRATION OF THE FLOW		STRENGTHS	
TASK ISSUES						OF IDEAS		& WEAKNESSES	
		FITNESS FOR							
		PURPOSE							
				ORAL DISCUSSION		CONCEPTS		MAKING	
				EXPLANATION OF IDEAS		(KNOWLEDGE AND SKILLS)			
				CONTRIBUTION TO					
PRODUCTION				GROUP WORK					
ISSUES		DEVELOPMENT							
		MODELLING							
								EVALUATING	
								(REFER TO CENTRAL ISSUES)	

Appendix 2

Appendix 3

RECORD OF ACHIEVEMENT		
Name	Form	
Identification of issues	No help needed	
	Some help needed	
	Considerable help needed	
Design proposals	Excellent range of detailed and imaginative ideas	
	Good range of detailed and imaginative ideas	
	Satisfactory range of detailed and imaginative ideas	
	Restricted range of ideas	
Development and analysis of ideas	Excellent variety of clear and realistic proposals	
	Good variety of clear and realistic proposals	
	Satisfactory variety of clear and realistic proposals	
	Restricted variety of ideas	
Communication of final ideas	Excellent use of words, pictures, colour, techniques	
	Good use of words, pictures, colour, techniques	
	Satisfactory use of words, pictures, colour, techniques	
	Restricted use of words, pictures, colour, techniques	
Planning using flow diagrams	An excellent, logical and concise order of work	
	A good logical and concise order of work	
	A satisfactory order of work	
	A brief outline	
Making	Excellent interpretation of ideas	
	Good interpretation of ideas	
	Satisfactory interpretation of ideas	
	Restricted interpretation of ideas	
Evaluation	A thorough and relevant account	
	A good account which needs more detail	
	An incomplete account	
	None attempted	

Appendix 4

	RECORD OF ACHIEVEMENT	AREAS OF TECHNOLOGY				
Name	Form	FD	TX	IT	GPH	WD
Identification of issues	No help needed					
	Some help needed					
	Considerable help needed					
Design proposals	Excellent range of detailed and imaginative ideas					
	Good range of detailed and imaginative ideas					
	Satisfactory range of detailed and imaginative ideas					
	Restricted range of ideas					
Development and analysis of ideas	Excellent variety of clear and realistic proposals					
	Good variety of clear and realistic proposals					
	Satisfactory variety of clear and realistic proposals					
	Restricted variety of ideas					
Communication of final ideas	Excellent use of words, pictures, colour, techniques					
	Good use of words, pictures, colour, techniques					
	Satisfactory use of words, pictures, colour, techniques					
	Restricted use of words, pictures, colour, techniques					
Planning using flow diagrams	A logical order of work					
	A satisfactory order of work					
	A brief outline					
	None attempted					
Making	Excellent interpretation and presentation of ideas					
	Good interpretation and presentation of ideas					
	Satisfactory interpretation and presentation of ideas					
	Restricted interpretation and presentation of ideas					
Evaluation	A thorough and relevant account					
	A good account which needs more detail					
	An incomplete account					
	None attempted					

Comments
Limitations/improvements
Homework always/usually/sometimes/rarely
Organisational skills always/usually/sometimes/rarely