IDENTIFICATION OF SOME CAUSES OF DEMOTIVATION AMONGST KEY STAGE 4 PUPILS STUDYING DESIGN AND TECHNOLOGY

E. Stephanie Atkinson

APPENDICES

Appendices

Appendix 1

Data gathering instruments

Interview Questions for Teachers of the Phase One Sample

General Questions

1 Are you affected by falling roles?

2 What type of catchment area is the school in?

3 Do you have good parental support? - attendance at parents evenings etc.

4 Is school uniform, discipline easy to maintain?

5 Do you have a supportive management structure? - work, discipline etc.

6 How are the pupil groupings organised (vertical/horizontal, house/year groups)?

7 Is there setting, streaming, mixed ability in all subjects?

Option Choices

8 With the cohort we are looking at can you remember how their option choices were organised?

9 How did pupils select which D&T subject to opt for?

10 Did all pupils get their first choice?

11 What is the percentage of girls in yrs 10/11 in D&T?

12 Which areas do girls tend to opt for?

Departmental Organisation

13 How are examination syllabuses chosen?

14 How are the teaching groups organised?

15 Are resources (space/materials/staffing) readily available?

16 Do you as a department encourage homework?

17 Do you encourage pupils to do extra work in school?

18 What is the department policy regarding working on your subject during other lesson times?

Years 7 - 9

19 How were yrs 7 - 9 organised when this yr 11 was yr 7?

20 Is it different now?

21 How much time was allocated to yrs 7 - 9 per pupil, how much time now?

Years 10/11

22 How much time was allocated to years 10/11 per pupil this year

23 How was the timing of course work assignments organised?

24 How do you choose who will/will not be entered for the examination?

25 When?

26 Once the decision has been made does it cause demotivational problems?

27 Final project - how long have you been able to give pupils to complete their major project in D&C, D&R and Technology?

28 Do you feel that the pupils have got the capability to fulfil the tasks adequately in their GCSE D&C, D&R, and Technology.

29 Which of the three areas do you feel the school is most successful in? why?

30 In the examination course work do you think you have fairness and comparibility between staff with regard to help with projects?

31 Do you feel it is easy to achieve fairness and compatibility in marking between all the groups?

32 How much parental help do you feel there is? Financial/resources?

33 How much parental help do you feel pupils get with their project work?

34 Which aspects of the design process do you feel parents help with most?

Design projects in D&R

35 Do you feel that long design projects demotivate or motivate pupils?

36 How many projects have you done with Years 10/11 this time through?

37 Do you have to impose any limit on the size or type of project?

38 Were you able to give choice in Yr 10 (limited or free)?

39 Were you able to give choice in Yr 11 or does the examination board set the questions?

40 Does giving choice of project help? In the short term or long term?

41 Do you feel that it is easier to motivate pupils when it is the exam board they are working for?

42 Is there a willingness to complete projects?

43 Why do you think projects do not get finished?

44 Is it a problem with just a few or a large number of pupils?

The design process

45 Can you put pupils enjoyment/ success with research, design, make, evaluate in a rank order?

46 Are girls different?

47 Which aspect do pupils enjoy the least? Girls?

48 Do you feel this ties in with their success/unsuccessful outcomes?

49 Which aspects do you feel you have the most difficulty in teaching?

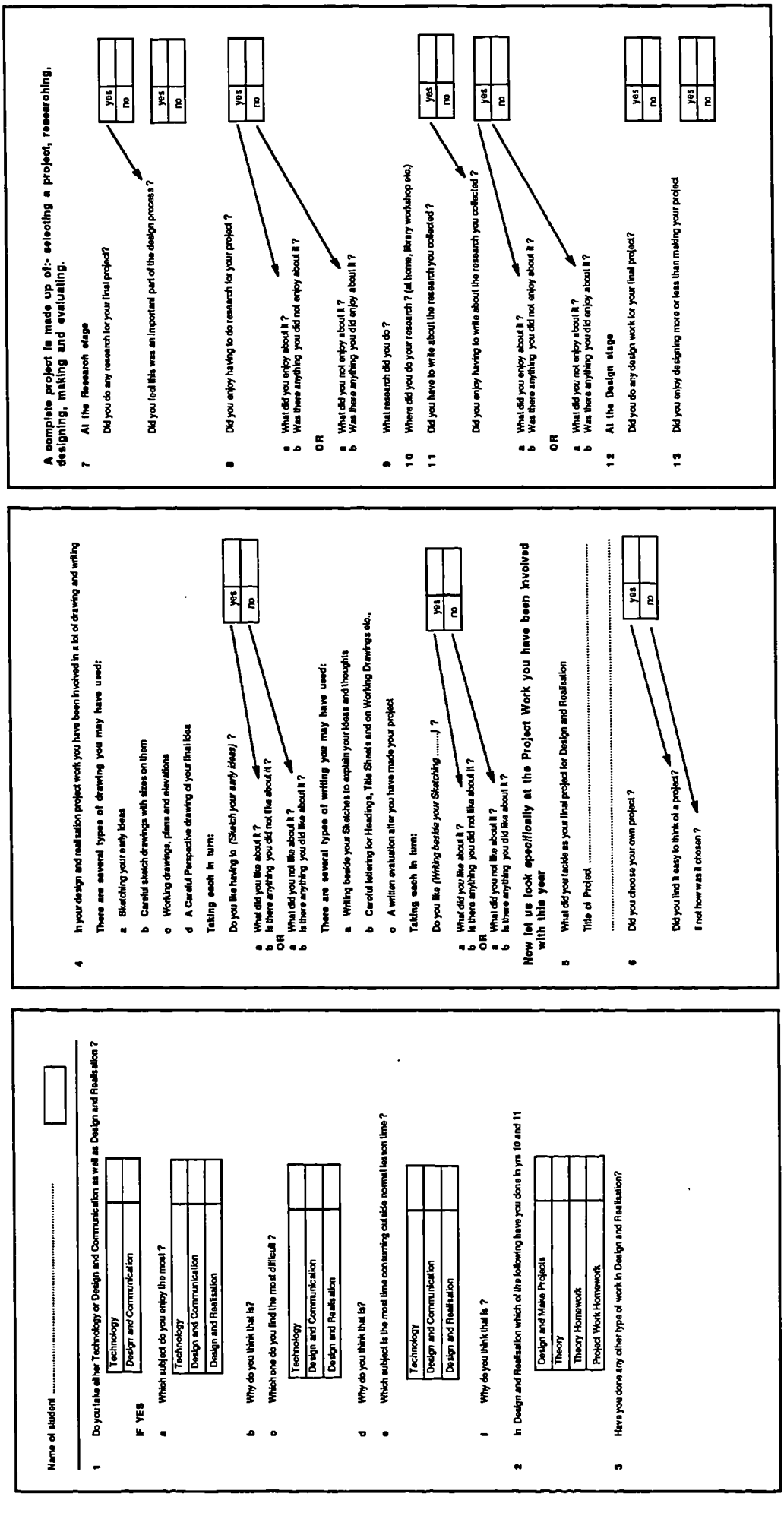
50 Which aspects do you find most difficult to resource?

51 Which aspects of the design process do pupils need most help with? Girls/boys any difference?

52 Do you feel the changes at key stage 3 - 4 will improve the subject?

53 Please can you indicate on this grid what you perceive are pupils preference for each aspect of the process (using same grid as given to pupils in their questionnaire)

Interview Pro-forma for the interview with the forty pupils in the eight chosen school during Phase One



14 Where you pleased with the design work you produced ?

yes
no

a What were you pleased with ?
b Was there anything you were not pleased with?

OR

a What were you not pleased with ?
b Was there anything you were pleased with ?

Taking each aspect of designing separately ask the pupils the following questions

15 Did you draw a number of different ideas or solutions ?

Cannot remember
yes
no

IF YES

i did you enjoy this aspect of designing ?
ii if you did not enjoy it why not?
iv what help did you need with this aspect of designing?
v *Who from* ? (teacher, parents friends etc.)

16 Did you do drawings to develop your chosen idea, drawing ways in which your chosen idea could work ?

Cannot remember
yes
no

IF YES

i did you enjoy this aspect of designing ?
ii if you did not enjoy it why not?
iv what help did you need with this aspect of designing?
v Who from ? (teacher, parents friends etc.)

17 Did you do Working drawings ?

Cannot remember
yes
no

IF YES

i did you enjoy this aspect of designing ?
ii if you did not enjoy it why not?
iii what help did you need with this aspect of designing?
iv Who from ? (teacher, parents friends etc.)

IF NO

i how did you work out on paper what size the materials for your projects would need to be?
ii how did you work out how you would make, join together the materials for your project?

18 **At the Making Stage**

Did you make your final project?

yes
no

Did you finish making it?

yes
no

19 Have you enjoyed making your projects?

yes
no

a What did you enjoy about making your project?
b Is there anything you did not enjoy?

OR

a What did you not *enjoy making* your project?
b Is there anything you did enjoy ?

tools
machines
wood
metal
etc

20 Where you pleased with the final project which you produced ?

yes
no

a What were you pleased with ?
b Was there anything you *were* not pleased with?

OR

a What were you not pleased with ?
b Was there anything you were pleased with ?

21 Did you make any three dimensional models to help you whilst you were designing ?

yes
no

Did you find it helpful ?
Did you *enjoy making them* ?

Would you have enjoyed making this sort of model if it had been appropriate ?

22 **At the Evaluating Stage**

Did you write an evaluation about your final project?

yes
no

23 Did you feel it was a good way to finish your project ?

yes
no

Explanation/Expand

24 How well do you feel you have done in your final project ?

Very well	
Well	
Average	
Not so well	
Not well at all	

25 Why do you think this is ?

26 Next year do you hope to be using the Design and Technology skills you have acquired during years 10 and 11, either in a job or at college

yes
no

27 For what purpose ?

For "A" level	
For your career	
Other please specify	

28 If your *were* given your options to *choose* again would you *choose* to do Design and Realisation again ?

yes
no
Do not know

29 Why
Why not ?

Thank you ever so much for your help.

Example of the Attitude questionnaire presented to forty pupils interviewed during Phase One and fifty pupils during Phase Two

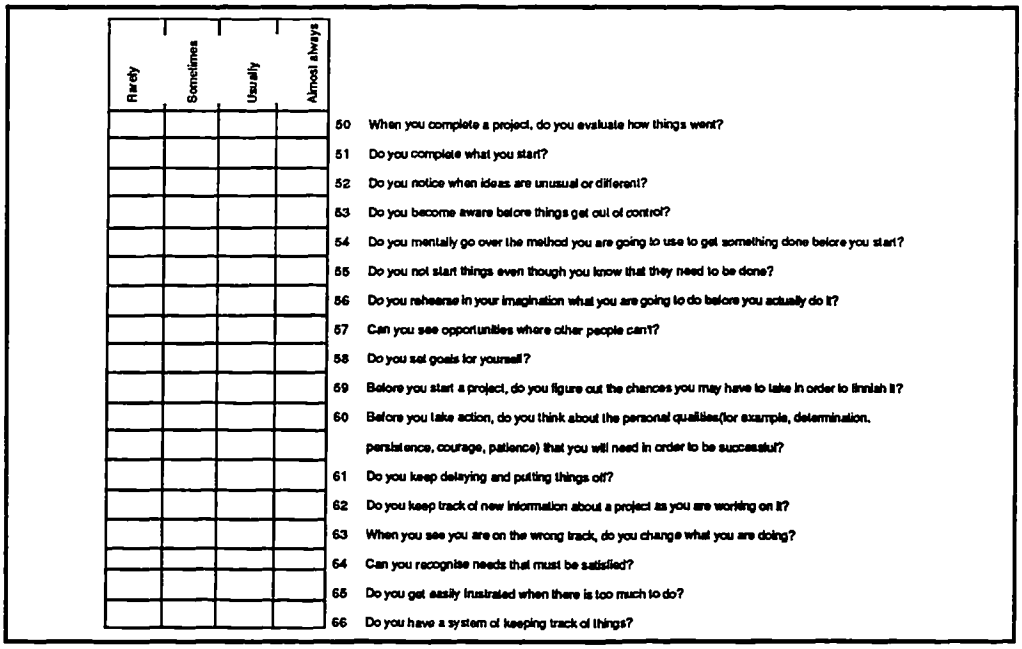
Please could you fill in this questionnaire to help me in my research. The information that you provide will be strictly confidential and will only be used for statistical analysis in my research.

Answer all the following questions by putting a tick in the most appropriate box .

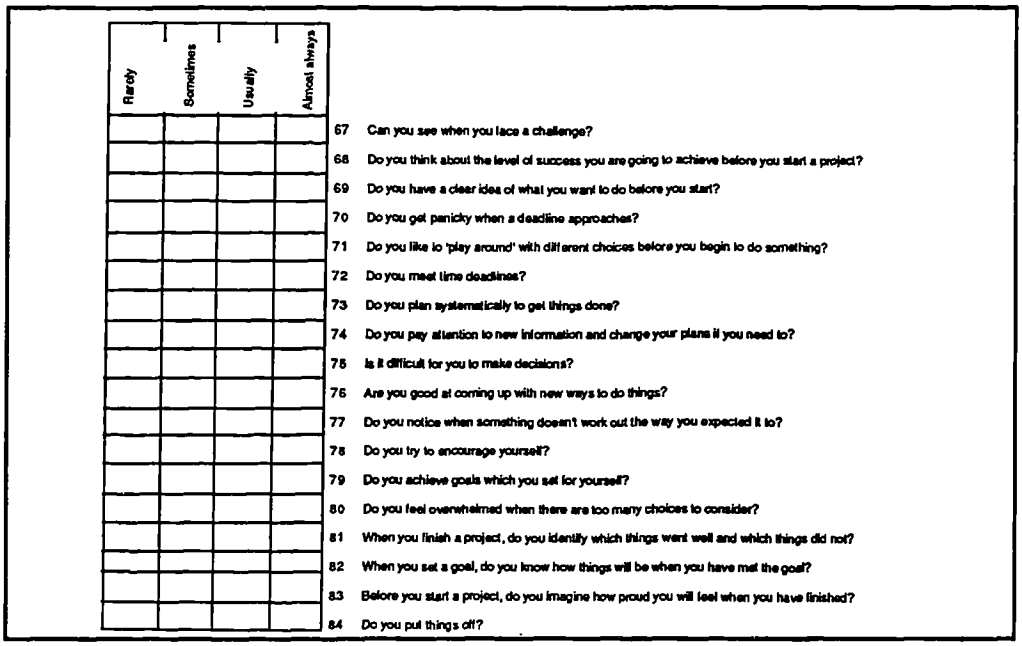
	Rarely	Sometimes	Usually	Almost always
1	Can you finish jobs on time?			
2	When you recognise a problem can you decide what to do?			
3	Can you think of various ways of doing something before you start?			
4	When you see you are on the wrong track can you change your strategy?			
5	When you have a choice to make is it difficult for you to decide what to do?			
6	Before starting out on a task do you imagen how successful you will feel when you have finished it?			
7	Do you take opportunities when you see them?			
8	As a project goes along are you able to make adaptions to your plan?			
9	Do you recognise problems at the time they occur?			
10	When you see an opportunity do you think of several ways of taking advatage of it?			
11	Do you start projects on a strong note but loose momentum as you go along?			
12	Before you do something, do you think of all of the problems that might come up along the way?			
13	When faced with a problem do you list your options?			
14	Do you write down the things you need to do?			

	Rarely	Sometimes	Usually	Almost always
15	Do you get overwhelmed by details?			
16	Do you identify all the tasks you need to do for a project so that you can plan enough time for each one?			
17	Do you complete projects ahead of time?			
18	Do you maintain the effort needed to finish a project?			
19	When you see something to be done, do you think of several ways to do it before you take action?			
20	After you have finished something, do you check to make sure that everything was done correctly?			
21	Do you hand things in late?			
22	When you see a chance to do something you want to do, do you make plans to do it?			
23	Do you finish what you start?			
24	Do you think of more than one solution to a problem before you decide what to do?			
25	After you finish do you review what happened along the way?			
26	Do you examine risks before you do something?			
27	Is it difficult for you to decide what course of action you should take?			
28	Can you tell the moment that things start to go wrong?			
29	Do you look ahead before you start something to identify things that might create a problem for you?			
30	Do you plan your work in order to use time well?			
31	When you have finished a project, do you look back to see what you liked and didn't like about it?			
32	After evaluating many possibilities, do you have trouble making up your mind which one is best?			

	Rarely	Sometimes	Usually	Almost always
33	Do you cross things off a list to indicate what you have accomplished?			
34	Do you organise the materials you will need for a job before you begin it?			
35	Are you aware when problems need to be 'ironed out'?			
36	Do you imagine how you are going to do something before you actually do it?			
37	Is it hard for you to make up your mind?			
38	Before you start to do something, do you consider different ways to go about it?			
39	Do you like to 'figure the odds' of success for what you do?			
40	Before you start something, do you think of what you have 'going for you' that will help you to succeed?			
41	Are you well organised?			
42	Do you like to know 'where you are going'?			
43	Is it hard for you to choose which way to do something?			
44	When you finish something, do you stop and think back about how things worked out before you go on to something else?			
45	Do you review past experience to avoid making the same errors again?			
46	Do you finish what you are working on before you start something new?			
47	As you work on a project , do you pay attention to how things are going?			
48	When you see something that needs to be done, do you decide what you are going to do about it?			
49	When you consider alternatives, is it hard for you to select one?			

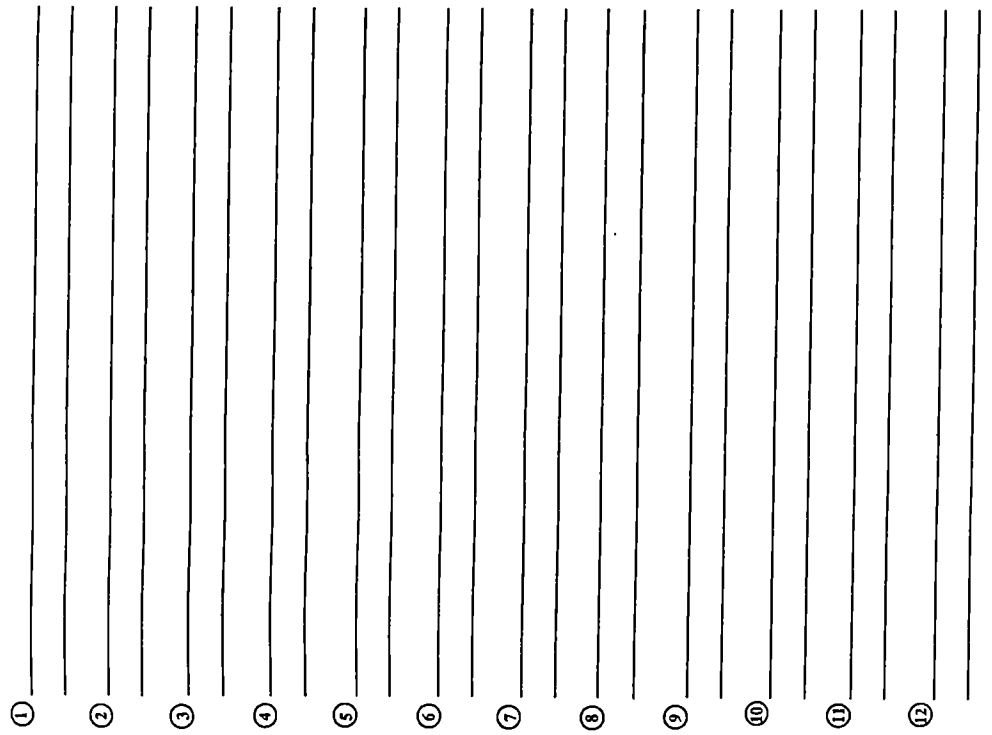


Rarely	Sometimes	Usually	Almost always		
				50	When you complete a project, do you evaluate how things went?
				51	Do you complete what you start?
				52	Do you notice when ideas are unusual or different?
				53	Do you become aware before things get out of control?
				54	Do you mentally go over the method you are going to use to get something done before you start?
				55	Do you not start things even though you know that they need to be done?
				56	Do you rehearse in your imagination what you are going to do before you actually do it?
				57	Can you see opportunities where other people can't?
				58	Do you set goals for yourself?
				59	Before you start a project, do you figure out the chances you may have to take in order to finnish it?
				60	Before you take action, do you think about the personal qualities(for example, determination, persistence, courage, patience) that you will need in order to be successful?
				61	Do you keep delaying and putting things off?
				62	Do you keep track of new information about a project as you are working on it?
				63	When you see you are on the wrong track, do you change what you are doing?
				64	Can you recognise needs that must be satisfied?
				65	Do you get easily frustrated when there is too much to do?
				66	Do you have a system of keeping track of things?



Rarely	Sometimes	Usually	Almost always		
				67	Can you see when you face a challenge?
				68	Do you think about the level of success you are going to achieve before you start a project?
				69	Do you have a clear idea of what you want to do before you start?
				70	Do you get panicky when a deadline approaches?
				71	Do you like to 'play around' with different choices before you begin to do something?
				72	Do you meet time deadlines?
				73	Do you plan systematically to get things done?
				74	Do you pay attention to new information and change your plans if you need to?
				75	Is it difficult for you to make decisions?
				76	Are you good at coming up with new ways to do things?
				77	Do you notice when something doesn't work out the way you expected it to?
				78	Do you try to encourage yourself?
				79	Do you achieve goals which you set for yourself?
				80	Do you feel overwhelmed when there are too many choices to consider?
				81	When you finish a project, do you identify which things went well and which things did not?
				82	When you set a goal, do you know how things will be when you have met the goal?
				83	Before you start a project, do you imagine how proud you will feel when you have finished?
				84	Do you put things off?

Example of the creativity test presented to fifty pupils from the eight schools during Phase Two



CREATIVITY TEST

Name: .....

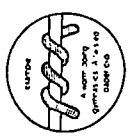
Please can you complete the following two tests to show me how creative you can be

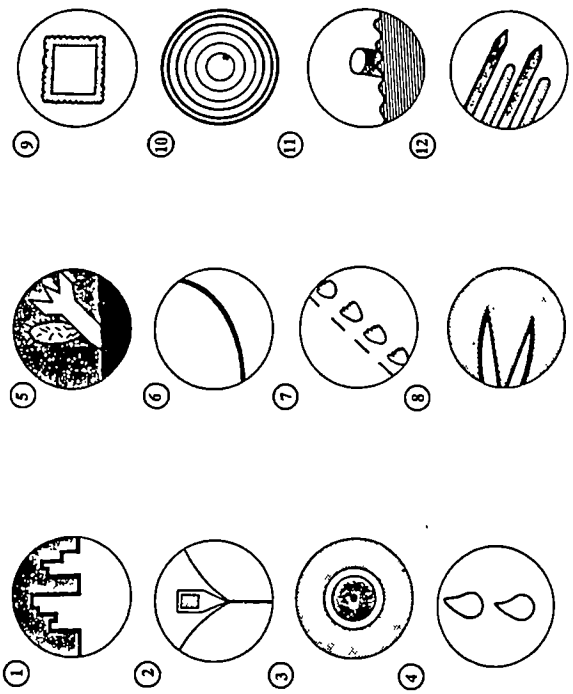
TEST ONE

The twelve circles illustrated below all contain images for you to interpret
There are no 'right' answers. I am looking to see how many interesting or unexpected interpretations you are able to think up.

Write your suggestions on the sheet facing next to the appropriate number.

Example

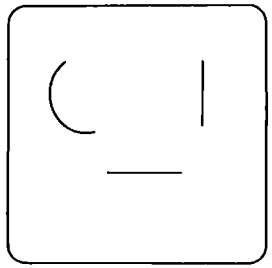


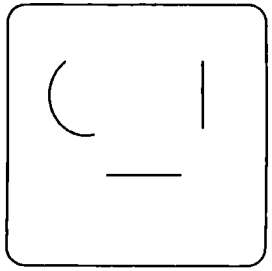


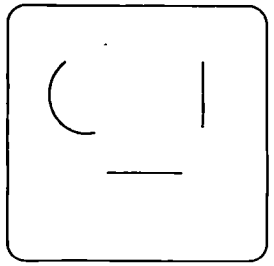
TEST TWO

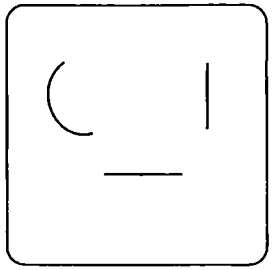
Including these three lines in your work, produce 12 different images or pictures. Your drawings can be either either abstract or representational.

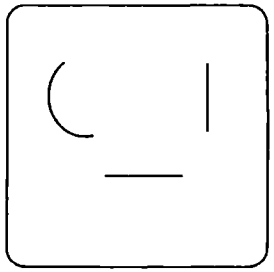
Remember that it is the variety that is important not the quality of drawing.
Give titles if appropriate.

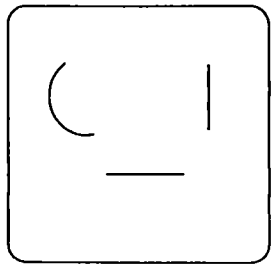
⑬ 

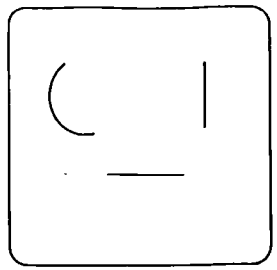
⑭ 

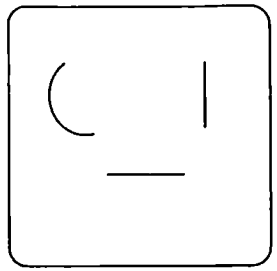
⑮ 

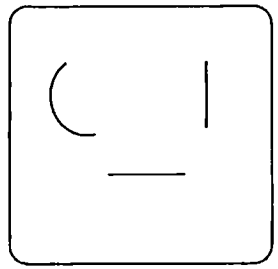
⑯ 

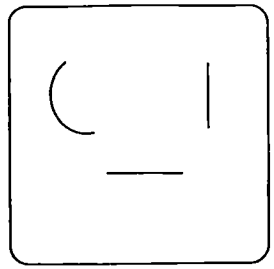
⑰ 

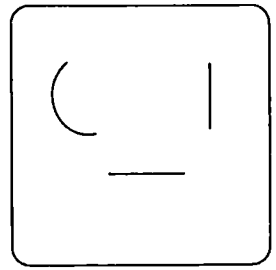
⑱ 

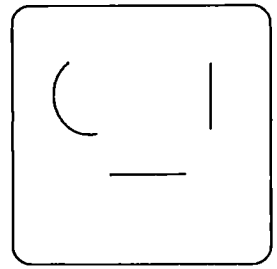
⑲ 

⑳ 

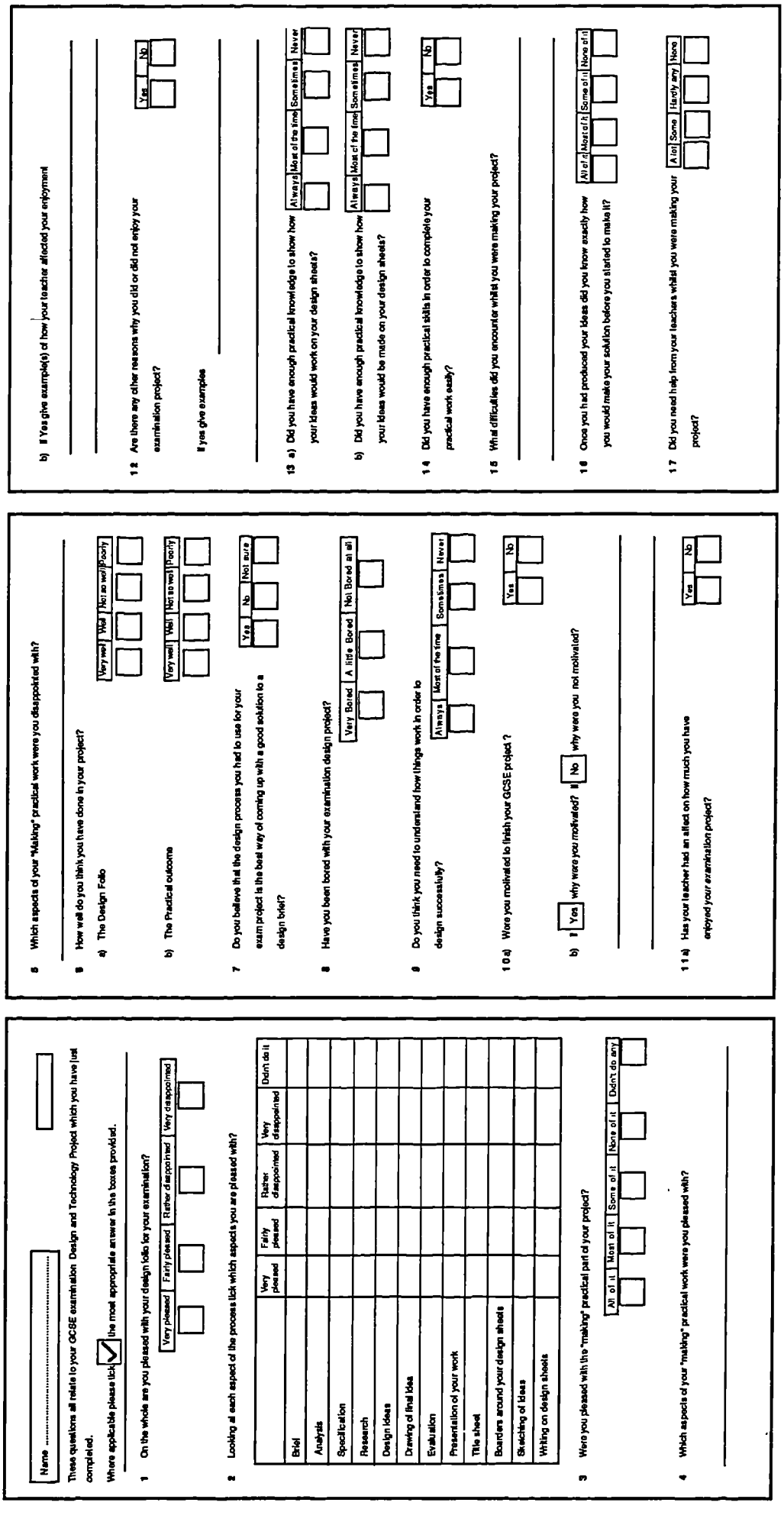
㉑ 

㉒ 

㉓ 

㉔ 

Example of the summative questionnaire presented to fifty pupils from the eight schools during Phase Two



Name .....

These questions all relate to your GCSE examination Design and Technology Project which you have just completed.

Where applicable please tick ✓ the most appropriate answer in the boxes provided.

1 On the whole are you pleased with your design folio for your examination?

Very pleased | Fairly pleased | Rather disappointed | Very disappointed

2 Looking at each aspect of the process tick which aspects you are pleased with?

	Very pleased	Fairly pleased	Rather disappointed	Very disappointed	Didn't do it
Brief					
Analysis					
Specification					
Research					
Design Ideas					
Drawing of final idea					
Evaluation					
Presentation of your work					
Title sheet					
Borders around your design sheets					
Sketching of ideas					
Writing on design sheets					

3 Were you pleased with the "making" practical part of your project?

All of it | Most of it | Some of it | None of it | Didn't do any

4 Which aspects of your "making" practical work were you pleased with?

5 Which aspects of your "Making" practical work were you disappointed with?

6 How well do you think you have done in your project?

a) The Design Folio — Very well | Well | Not as well | Poorly

b) The Practical outcome — Very well | Well | Not as well | Poorly

7 Do you believe that the design process you had to use for your exam project is the best way of coming up with a good solution to a design brief? — Yes | No | Not sure

8 Have you been bored with your examination design project? — Very Bored | A little Bored | Not Bored at all

9 Do you think you need to understand how things work in order to design successfully? — Always | Most of the time | Sometimes | Never

10 a) Were you motivated to finish your GCSE project ? — Yes | No

b) If Yes why were you motivated? If No why were you not motivated?

11 a) Has your teacher had an effect on how much you have enjoyed your examination project?

b) If Yes give example(s) of how your teacher affected your enjoyment

12 Are there any other reasons why you did or did not enjoy your examination project? — Yes | No

If yes give examples

13 a) Did you have enough practical knowledge to show how your ideas would work on your design sheets? — Always | Most of the time | Sometimes | Never

b) Did you have enough practical knowledge to show how your ideas would be made on your design sheets? — Always | Most of the time | Sometimes | Never

14 Did you have enough practical skills in order to complete your practical work easily? — Yes | No

15 What difficulties did you encounter whilst you were making your project?

16 Once you had produced your ideas did you know exactly how you would make your solution before you started to make it? — All of it | Most of it | Some of it | None of it

17 Did you need help from your teachers whilst you were making your project? — A lot | Some | Hardly any | None

18 Which aspects of your project needed the most help?

19 a) Did hand outs produced by the school help you to complete your project? Yes / No

b) Did the hand outs help you to meet all the assessment criteria for the examination? Always / Most of the time / Sometimes / Never

20 Do you think your teacher was enthusiastic about your examination project? very enthusiastic / enthusiastic / a little enthusiastic / not enthusiastic at all

21 Do you feel that your teachers enthusiasm or lack of enthusiasm affected how well you worked on your project. Yes / No / Not sure

22 Was your teacher able to give you enough help with your project? Yes / No

23 If your teacher did not give you enough help why do you think that was?

24 a) Did you find it easy to make your final idea? All of it / Most of it / Some of it / None of it

b) Did you have a picture in your mind of what your chosen idea would look like before you started making it? Yes / No

c) Did it turn out exactly as you expected? All of it / Most of it / Some of it / None of it

d) Did it turn out exactly like the drawing you had before you started to make it? Yes / No

e) When you started to make it did you know in detail how it was all going to be joined together? All of it / Most of it / Some of it / None of it

25 a) Did you finish all of your folio, practical work and evaluation by the first deadline set for completion of your project? Yes / No

b) If you answered No which aspects did you fail to finish? The design Folio / The evaluation / The practical work

26 a) Were you given the criteria by which your work would be assessed for your GCSE ? Yes / No

b) Did you understand the criteria? Understood all of them / some of them / none of them / wasn't interested

c) Do you feel the criteria helped you to design more efficiently / more easily / don't think it helped

d) Did you feel that knowing the criteria helped you to achieve better marks for your GCSE? Yes / No / Not sure

27 What was the most difficult part of your project?

28 Which aspect of your project gave you the most pleasure?

29 If you were able to choose your options again and were given a free choice, would you choose to take Technology? Yes / No / Not sure

Thank you very much for all the help you have given me with my research.

All the best with the rest of your examinations. *Stephanie Atkinson*

Questions for the Interviews with two teachers during Phase Two extension

* Do you think the year 11 pupils have enjoyed their D&T examination project?
* How confident do you feel your pupils are at achieving good results?
* Do you think it is more important for pupils to enjoy their project work or have confidence in their own ability to achieve satisfactory results in order to gain a good grade at GCSE?
* How was years 7 - 9 structured for this years year 11?
* Was it skills based?
* How did you teach your year 11 pupils to design?
* Do you ever use 3D modelling as part of the design process?
* When? During idea generation? During final detailing of chosen idea?
* Do you usually have a picture in your mind of how each pupil is going to tackle the manufacturing stage before they start?
* Do you think the majority of your pupils have a clear understanding of how their product will fit together before they start manufacturing?
* On the whole do you think that your year 11 pupils were proud of what they made in Year 11?
* What strategies do you use to get pupils to manage their time and meet assessment deadlines?
* Do you teach both girls and boys for GCSE?
* Do you feel that either sex is advantaged or disadvantaged by the examination assessment criteria?
* Do you find you can get girls to be responsible for their own projects?
* Equally during both designing and making?
* Do you find the duration of the major project too long or too short for the majority of pupils?
* Can you tick in the box which of these have an effect upon how a pupil does in their GCSE D&T examination project? (Appendices Page 12 for list given to teachers)
* Are there any others you would add?
* Looking at each list in turn can you single out three which you would feel are more important than the rest by putting a cross beside them?
* Looking at each list in turn can you single out three which you would feel are not very important? Use a circle
* Do you feel that the GCSE D&T assessment criteria helped your pupils to develop genuine design capability.
* How easy do you find it to teach pupils to design?

* Do you think that by year 11 they should know how to design and that your task should be more to set deadlines to keep them on target?

* Have you enjoyed teaching this year's year 11?

* Do you think that the new Orders are more helpful than the last version?

List given to teachers to complete

Pupil dependent

- ☐ Intellectual level
- ☐ Creativity level
- ☐ General level of motivation
- ☐ Learning Style
- ☐ Conceptual understanding of the whole design process
- ☐ Knowledge base
- ☐ Skill levels - design communication
- ☐ Skill levels - craft
- ☐ Other coursework assignments for other subjects
- ☐ Any others?
- ☐
- ☐

Teacher dependent

- ☐ Timing of the project within the course structure
- ☐ Teaching strategies adopted
- ☐ Teacher's conceptual understanding of the design process
- ☐ Teacher's knowledge base
- ☐ Teacher's skill levels
- ☐ Teacher's ability to have the answer stored in their heads
- ☐ Teacher's enthusiasm
- ☐ Teacher's relationship with the pupils
- ☐ Any others?
- ☐

Appendix 2

Raw data

Raw data from the information received from 179 pupils during Phase One regarding their perception about their enjoyment, independence from teacher and ability to achievesatisfactory results in their project work

Pupil Code		A	B	C	D	E	F	G	H	I	J	
7.01	F	4	2	2	3	3	4	2	4	3	4	
Total Score	103	4	4	4	4	2	3	4	3	3	4	
		4	2	4	4	4	3	4	4	4	4	
7.02	F	4	3	4	4	4	4	4	4	4	3	
Total Score	116	4	3	2	4	4	3	4	4	3	4	
		4	3	3	4	4	4	3	4	4	4	
7.03	F	3	3	3	3	4	4	3	4	3	3	
Total Score	97	4	3	4	2	3	3	3	4	4	3	
		4	3	3	3	3	3	3	3	3	3	
7.04	M	4	4	3	4	4	4	3	4	3	3	
Total Score	107	4	4	4	3	3	4	4	3	3	4	
		4	3	4	4	4	4	3	3	3	3	
7.05	M	4	2	3	3	4	4	2	3	4	1	
Total Score	95	4	4	3	3	2	4	4	3	4	4	
		4	3	2	4	4	3	3	2	4	1	
7.06	M	4	4	2	3	4	3	2	4	4	3	
Total Score	98	4	4	4	3	2	2	4	1	4	4	
		3	3	3	3	2	2	2	1	3	3	
7.07	M	4	3	3	3	4	4	3	4	3	3	
Total Score	106	4	4	4	4	3	4	4	4	4	4	
		3	3	4	3	3	4	2	4	4	3	
7.08	M	3	3	3	4	4	4	3	4	4	3	
Total Score	97	4	2	4	2	4	4	4	2	4	2	
		2	3	2	3	4	3	2	4	4	3	
7.09	M	3	3	3	3	3	4	4	4	3	2	
Total Score	103	4	4	3	3	4	3	4	2	4	4	
		4	4	4	3	3	3	4	4	3	4	
7.10	M	2	3	3	4	3	4	2	4	4	3	
Total Score	95	4	3	3	3	4	2	3	4	4	3	
		3	3	3	3	4	3	2	4	4	4	
7.11	F	4	3	3	3	4	4	2	4	3	3	
Total Score	98	4	4	4	3	4	4	3	3	2	3	
		3	3	2	3	3	3	3	3	3	3	
7.12	F	3	3	2	3	3	3	3	4	4	3	
Total Score	93	3	3	4	3	3	2	3	3	2	4	
		3	3	2	4	3	3	3	4	4	3	
7.13	M	3	3	3	2	3	3	2	2	1	1	
Total Score	72	3	3	2	2	4	4	4	3	2	2	
		3	3	2	2	1	1	1	3	2	2	
7.14	M	3	3	3	3	3	4	4	4	4	2	
Total Score	106	4	4	4	3	3	4	3	4	3	4	
		4	4	4	3	4	3	4	3	4	4	
7.15	M	3	3	3	2	4	3	2	4	3	3	
Total Score	85	2	3	4	2	3	2	4	4	2	2	
		3	2	2	2	3	3	2	4	3	3	
7.16	M	3	3	4	4	4	4	3	4	3	3	
Total Score	108	3	4	4	2	2	2	4	2	4	4	
		3	4	2	4	4	4	2	4	4	3	
7.17	M	3	3	4	2	4	4	3	4	3	3	
Total Score	105	4	4	4	3	4	3	3	2	4	4	
		4	4	3	3	4	3	4	4	4	4	
7.18	M	4	3	4	3	4	4	3	4	4	2	
Total Score	85	3	3	3	3	1	1	3	1	3	3	
		3	3	3	3	1	2	3	2	3	3	
7.19	M	3	2	3	4	4	4	1	4	3	1	
Total Score	89	3	2	3	3	4	4	1	4	4	2	
		3	2	3	3	4	4	1	4	4	2	
12.13	F	3	1	3	3	3	3	1	1	3	1	
Total Score	80	2	2	2	2	2	2	2	1	2	1	
		2	2	2	2	2	2	2	2	2	2	
21.01	M	3	3	3	3	3	3	2	3	2	2	
Total Score	91	3	4	3	3	3	3	3	3	4	4	
		2	3	3	3	3	3	3	4	4	3	
21.02	M	4	3	3	3	4	4	3	4	3	3	
Total Score	91	4	4	3	3	3	3	3	4	4	4	
		2	2	2	2	2	2	2	3	2	3	
21.03	M	4	4	3	3	4	4	2	4	3	2	
Total Score	99	4	4	4	4	4	3	4	4	3	3	
		2	2	3	3	4	3	2	4	3	3	
21.04	M	3	2	1	3	3	4	2	4	4	1	
Total Score	89	4	3	2	3	4	3	2	4	3	4	
		3	4	2	3	3	2	4	3	3	3	
21.05	M	3	3	2	2	4	3	2	4	2	2	
Total Score	97	4	3	3	4	4	3	3	4	4	4	
		3	3	3	3	3	4	3	4	4	4	
21.06	M	4	4	3	3	4	4	2	4	3	2	
Total Score	104	4	4	3	3	4	3	4	3	4	3	
		4	3	3	4	3	3	4	4	4	4	
21.07	M	3	2	3	4	4	3	3	4	3	3	
Total Score	99	3	4	4	4	3	3	4	4	4	4	
		3	3	2	3	3	3	3	4	3	3	

Pupil Code		A	B	C	D	E	F	G	H	I	J	
21.11	M	4	3	3	3	3	3	3	4	2	1	
Total Score	82	3	3	3	3	3	3	3	3	3	3	
		4	3	3	4	3	3	3	4	3	3	
21.12	M	3	3	2	3	3	4	1	4	4	1	
Total Score	83	3	3	2	2	3	1	3	2	4	3	
		3	3	2	3	3	2	3	3	4	3	
21.14	F	4	3	3	3	4	4	3	4	3	3	
Total Score	92	3	4	3	2	3	3	4	2	2	4	
		3	2	2	2	4	4	2	4	3	2	
21.15	M	3	3	3	3	3	3	3	4	4	2	
Total Score	98	4	3	3	3	4	4	2	4	4	2	
		3	4	3	3	4	4	3	4	4	3	
21.16	M	3	3	3	3	3	3	2	4	4	2	
Total Score	88	4	3	3	3	4	4	2	4	4	2	
		3	4	3	3	4	4	3	4	4	3	
21.17	M	3	1	2	2	2	2	2	3	2	2	
Total Score	85	4	3	4	3	4	4	4	3	3	4	
		3	2	2	3	3	4	2	4	2	3	
21.18	F	3	2	2	2	4	4	3	4	3	2	
Total Score	88	4	4	4	4	4	4	4	4	4	4	
		3	3	3	3	3	2	2	4	2	2	
21.19	M	3	3	3	3	3	3	4	4	4	3	
Total Score	89	4	3	4	3	3	4	4	3	3	3	
		3	3	3	3	3	3	3	4	4	3	
21.20	M	3	3	3	3	4	4	3	4	3	2	
Total Score	100	3	3	4	4	3	3	4	3	3	3	
		3	4	4	3	3	3	4	3	4	4	
21.21	F	2	3	2	2	3	2	1	2	2	2	
Total Score	89	4	3	3	3	4	3	4	4	3	4	
		3	3	2	3	3	3	4	4	4	4	
21.22	M	3	3	4	4	4	4	2	4	3	2	
Total Score	100	3	4	4	4	4	4	4	4	4	3	
		3	4	4	4	4	4	3	4	4	3	
21.23	M	3	4	3	3	4	4	3	4	4	3	
Total Score	110	3	4	4	4	4	4	4	3	4	4	
		3	4	4	4	4	4	4	4	3	3	
21.24	F	3	3	2	2	3	4	1	4	1	1	
Total Score	77	4	3	4	4	4	3	4	2	3	3	
		3	2	2	2	1	2	1	3	2	1	
21.25	M	2	2	3	3	1	1	2	4	3	3	
Total Score	78	2	4	3	4	1	2	2	2	2	3	
		2	4	3	2	2	3	2	4	3	2	
21.26	F	3	3	2	3	3	2	2	4	2	2	
Total Score	91	3	3	2	4	4	4	4	4	3	3	
		4	4	2	3	3	3	2	4	4	2	
31.01	F	3	3	2	2	3	3	2	3	1	1	
Total Score	77	4	3	3	3	2	2	2	2	3	3	
		3	3	2	3	3	2	3	3	3	3	
31.02	M	3	3	3	3	3	3	3	4	4	3	
Total Score	80	4	3	3	3	4	4	3	4	3	3	
		4	3	3	3	4	3	3	4	3	3	
31.03	M	3	3	2	4	4	4	3	4	3	3	
Total Score	109	4	4	3	4	4	3	4	4	4	4	
		4	4	3	4	4	3	4	4	4	4	
31.04	M	3	3	3	3	3	4	3	4	4	3	
Total Score	103	4	4	3	3	3	3	4	3	4	4	
		4	4	3	3	3	3	4	3	4	4	
31.05	M	3	2	3	3	4	4	3	4	2	2	
Total Score	91	4	3	3	3	3	3	3	4	3	3	
		3	2	2	3	3	3	3	4	3	3	
31.06	M	3	3	2	2	2	2	1	4	1	1	
Total Score	92	4	4	3	4	4	4	4	3	4	4	
		3	4	4	3	2	3	2	4	4	4	
31.07	M	3	2	1	1	3	3	3	4	1	2	
Total Score	74	3	2	2	2	4	3	2	4	2	2	
		2	2	2	3	4	2	3	4	1	2	
31.08	M	1	1	1	2	2	2	2	4	2	2	
Total Score	87	3	2	2	2	2	2	2	3	3	3	
		3	2	2	3	3	2	1	3	3	2	
31.09	M	4	3	2	3	4	4	2	4	4	3	
Total Score	105	4	4	3	4	3	4	4	4	4	4	
		3	3	3	4	4	4	2	4	4	3	
21.00	M	4	2	2	3	1	2	3	4	4	1	
Total Score	72	2	2	2	2	2	2	3	2	2	3	
		3	2	3	1	2	3	4	3	2	1	
21.09	M	4	3	3	4	4	4	3	4	4	2	
Total Score	77	2	2	1	1	3	2	1	4	2	2	
		2	2	3	3	3	1	2	3	3	1	
21.10	M	2	2	3	3	4	2	0	4	1	1	
Total Score	82	4	4	4	4	4	4	4	2	2	2	
		4	3	3	3	2	1	2	2	3	2	

Pupil Code		A	B	C	D	E	F	G	H	I	J	
32.01	M	3	2	3	3	4	4	3	4	4	3	Enjoyment
Total Score	93	4	3	3	3	3	3	2	2	4	3	Independence
		4	2	4	3	3	3	2	3	3	3	Achieving good results
32.02	M	3	3	2	2	4	3	2	4	2	2	Enjoyment
Total Score	86	3	3	3	3	3	3	3	3	3	3	Independence
		2	3	3	3	3	3	3	3	3	3	Achieving good results
32.03	M	3	2	3	3	3	2	2	2	2	2	Enjoyment
Total Score	89	4	3	3	2	2	3	3	1	3	3	Independence
		3	4	4	3	2	2	3	2	3	3	Achieving good results
32.04	F	2	3	2	4	4	2	3	3	3	3	Enjoyment
Total Score	82	4	4	4	3	3	3	2	3	2	4	Independence
		4	4	4	3	2	2	3	3	3	3	Achieving good results
32.05	M	3	2	3	3	3	1	3	3	1	0	Enjoyment
Total Score	48	1	1	1	1	1	1	1	1	1	0	Independence
		3	1	2	2	2	2	2	3	1	0	Achieving good results
32.06	M	0	3	3	3	4	4	4	4	3	0	Enjoyment
Total Score	81	1	2	2	2	4	4	1	4	2	1	Independence
		4	3	2	3	4	4	2	4	2	2	Achieving good results
32.07	M	0	2	3	2	3	3	3	4	2	1	Enjoyment
Total Score	76	4	3	4	3	2	2	1	2	3	3	Independence
		4	2	3	3	2	3	2	4	3	1	Achieving good results
32.08	M	0	3	3	3	4	4	4	4	3	0	Enjoyment
Total Score	75	1	2	2	2	4	4	1	4	2	1	Independence
		0	3	2	3	4	4	2	4	2	0	Achieving good results
32.09	M	0	0	2	3	3	2	2	3	3	1	Enjoyment
Total Score	49	1	2	4	2	2	2	0	0	0	0	Independence
		3	2	1	2	2	2	0	3	0	2	Achieving good results
32.09	M	3	2	2	2	4	4	4	4	3	2	Enjoyment
Total Score	78	4	3	4	2	3	2	2	2	2	2	Independence
		3	3	3	2	2	2	0	2	3	2	Achieving good results
32.10	M	2	2	3	2	2	3	2	2	2	2	Enjoyment
Total Score	73	3	3	3	3	2	3	2	2	3	2	Independence
		3	3	3	2	2	2	2	3	3	2	Achieving good results
32.11	M	4	2	2	2	4	4	3	4	3	3	Enjoyment
Total Score	87	3	3	2	2	4	2	1	4	4	4	Independence
		4	3	2	2	2	3	3	3	2	3	Achieving good results
32.12	M	4	2	3	4	4	4	3	4	3	2	Enjoyment
Total Score	104	3	3	4	3	4	3	4	3	4	4	Independence
		4	3	4	4	4	3	3	4	4	3	Achieving good results
32.13	M	0	3	2	3	3	3	2	4	4	0	Enjoyment
Total Score	88	3	3	3	2	2	3	3	4	3	4	Independence
		3	3	3	3	3	3	2	4	3	4	Achieving good results
32.14	M	3	2	2	2	2	1	4	3	0	0	Enjoyment
Total Score	78	3	3	4	3	2	2	2	4	4	4	Independence
		3	2	3	3	2	3	1	4	3	4	Achieving good results
32.15	M	4	3	3	3	4	4	3	4	3	3	Enjoyment
Total Score	95	4	4	3	3	4	2	4	2	3	3	Independence
		3	3	2	2	3	3	2	4	4	3	Achieving good results
32.16	M	2	2	1	3	3	4	0	4	2	0	Enjoyment
Total Score	78	4	4	4	4	2	3	0	3	4	4	Independence
		3	3	2	2	3	3	1	4	2	2	Achieving good results
32.17	M	3	4	4	4	3	4	2	4	4	3	Enjoyment
Total Score	80	4	3	3	3	3	4	3	2	2	2	Independence
		3	3	1	1	3	3	3	3	3	3	Achieving good results
32.18	M	3	1	1	2	0	0	0	2	0	0	Enjoyment
Total Score	45	4	4	3	3	2	0	0	0	0	0	Independence
		3	2	2	2	1	1	1	3	2	3	Achieving good results
32.19	M	3	2	1	2	4	4	2	3	2	1	Enjoyment
Total Score	71	3	4	3	3	2	2	3	3	3	3	Independence
		3	2	2	1	2	2	1	3	1	1	Achieving good results
32.20	F	4	2	3	2	4	3	2	2	3	3	Enjoyment
Total Score	85	4	3	2	2	4	2	4	3	4	4	Independence
		4	4	3	3	4	3	4	2	4	4	Achieving good results
31.10	M	2	2	2	3	3	2	2	3	2	1	Enjoyment
Total Score	70	3	3	3	2	3	3	2	4	3	2	Independence
		3	3	3	3	3	3	2	4	3	3	Achieving good results
31.11	M	2	2	2	1	0	0	0	0	0	0	Enjoyment
Total Score	36	3	2	2	2	0	0	0	0	0	0	Independence
		3	3	2	2	1	1	2	1	2	3	Achieving good results
31.12	M	3	3	3	3	3	4	3	4	3	3	Enjoyment
Total Score	99	4	3	3	4	4	4	4	4	4	3	Independence
		3	3	3	3	3	3	3	3	3	3	Achieving good results
31.13	M	3	3	2	2	3	3	2	4	2	2	Enjoyment
Total Score	87	4	4	3	1	3	3	4	4	3	3	Independence
		2	3	3	3	2	3	3	4	3	3	Achieving good results
31.14	M	3	3	4	3	4	4	3	4	4	3	Enjoyment
Total Score	95	4	4	4	1	1	4	1	4	4	4	Independence
		3	3	4	4	3	3	3	3	3	3	Achieving good results
31.15	M	1	1	0	1	1	0	0	1	0	0	Enjoyment
Total Score	48	4	2	2	3	4	2	2	2	3	4	Independence
		2	2	2	2	2	1	1	1	1	1	Achieving good results

Pupil Code		A	B	C	D	E	F	G	H	I	J	
32.21	M	3	3	3	2	2	2	2	4	3	3	
Total Score	101	4	4	4	4	4	4	4	3	4	4	
		4	3	2	3	4	3	4	4	4	4	
32.22	M	4	3	4	4	4	4	4	4	3	3	
Total Score	94	4	4	3	4	3	3	3	2	2	3	
		3	2	2	3	3	2	3	2	3	3	
32.23	M	4	3	3	3	3	3	3	4	4	3	
Total Score	91	4	3	2	3	3	2	2	3	3	4	
		3	3	2	3	3	3	2	4	2	4	
32.24	M	3	2	3	3	3	3	0	4	3	3	
Total Score	74	4	4	3	3	3	3	1	3	1	1	
		4	3	2	3	3	3	0	3	0	0	
32.25	M	3	3	3	4	3	3	3	3	4	2	
Total Score	98	4	4	4	4	4	3	4	3	4	4	
		4	3	4	3	2	3	3	2	2	3	
35.01	M	3	4	3	3	4	4	3	4	3	3	
Total Score	94	3	4	2	2	3	3	4	2	4	4	
		3	4	2	4	3	3	3	4	2	1	
35.02	M	0	2	3	3	4	4	2	4	4	2	
Total Score	90	4	3	3	2	3	3	4	4	3	3	
		4	3	3	3	4	3	2	3	3	2	
35.03	M	0	3	3	4	4	4	4	4	3	4	
Total Score	106	4	4	3	3	3	3	4	3	4	3	
		4	4	3	4	4	4	4	4	4	4	
35.04	M	0	2	3	3	4	4	3	4	2	2	
Total Score	86	4	3	3	3	3	3	3	3	3	3	
		4	2	3	3	4	3	1	4	2	2	
35.05	M	3	3	3	3	4	4	3	4	3	3	
Total Score	106	4	4	4	3	3	4	3	3	4	3	
		3	3	3	3	3	3	3	3	4	3	
35.06	M	3	2	3	3	4	4	3	4	3	2	
Total Score	96	4	4	2	4	4	2	2	4	3	4	
		4	3	3	3	3	2	2	4	4	4	
35.07	M	3	3	3	3	4	4	2	4	2	2	
Total Score	89	3	3	3	3	3	3	2	4	3	4	
		3	2	3	3	3	2	2	4	3	3	
35.08	M	0	2	3	2	4	4	3	3	2	2	
Total Score	88	3	4	4	3	2	2	3	2	4	4	
		3	3	2	2	2	2	2	2	3	3	
35.09	M	3	2	1	2	4	3	1	3	2	1	
Total Score	86	4	4	4	3	2	2	2	3	3	3	
		4	3	2	3	3	3	2	3	2	3	
35.10	M	0	2	3	3	4	4	3	4	3	3	
Total Score	88	3	4	3	3	3	3	3	2	3	3	
		3	3	3	2	3	3	3	3	3	3	
35.11	M	3	2	3	3	3	4	3	4	3	0	
Total Score	90	4	3	3	3	3	3	4	2	4	4	
		3	3	2	3	4	3	4	3	4	0	
35.12	M	3	2	3	2	3	4	1	4	3	0	
Total Score	77	4	3	3	2	4	2	3	2	2	2	
		2	2	3	2	4	2	3	2	2	2	
35.13	M	3	2	3	3	4	4	3	4	2	3	
Total Score	84	2	2	3	3	3	3	4	3	3	3	
		2	2	2	2	3	3	2	4	2	2	
35.14	M	3	2	2	2	3	3	2	4	3	3	
Total Score	84	3	3	3	2	2	3	2	2	2	3	
		2	2	3	4	4	3	3	4	4	3	
35.15	M	0	2	3	3	4	4	2	4	2	2	
Total Score	86	3	3	4	4	4	3	3	4	3	3	
		2	2	3	2	4	4	2	3	3	3	
35.16	M	3	2	2	3	3	4	4	4	3	2	
Total Score	87	2	3	3	4	4	3	2	4	2	2	
		3	2	3	3	4	4	3	4	1	1	
35.01	M	3	3	2	2	2	4	1	3	1	1	
Total Score	86	4	4	4	3	4	3	4	3	3	4	
		4	3	3	3	4	4	1	4	1	1	
35.02	M	3	3	2	2	3	3	3	4	3	3	
Total Score	91	3	3	3	3	4	4	3	4	3	4	
		3	2	2	2	3	3	3	4	3	3	
35.03	F	4	3	2	2	3	3	4	4	4	4	
Total Score	102	4	3	3	3	3	3	4	4	4	4	
		3	3	3	3	3	3	4	4	4	4	
35.04	F	2	3	3	4	4	4	3	3	4	0	
Total Score	94	2	3	3	3	4	3	4	2	4	4	
		2	4	3	2	3	4	4	3	4	3	
35.05	M	2	1	1	2	1	3	2	3	1	1	
Total Score	59	3	1	2	1	2	3	1	2	1	4	
		3	2	1	2	1	4	1	2	3	3	
35.06	M	2	1	1	2	3	3	2	4	1	0	
Total Score	79	4	4	4	4	3	4	2	4	2	2	
		2	3	3	2	3	3	2	4	3	2	
35.07	M	3	3	4	3	4	3	3	3	3	3	
Total Score	110	4	4	4	4	4	4	4	3	4	4	
		4	4	4	4	4	4	4	3	4	4	
35.08	M	4	3	4	4	3	4	2	4	3	3	
Total Score	101	3	4	3	4	4	4	2	4	2	2	
		4	3	3	4	4	3	4	4	3	3	
35.09	M	4	2	2	2	2	3	3	4	4	3	
Total Score	86	3	3	3	2	3	4	4	4	4	4	
		3	3	2	3	4	4	2	4	4	4	
35.10	M	3	3	4	4	3	4	3	4	3	3	
Total Score	84	3	2	3	2	3	3	3	2	3	3	
		3	2	2	3	3	3	2	2	3	2	
35.11	M	4	1	1	2	2	2	1	3	1	1	
Total Score	80	4	4	4	4	4	4	4	4	4	4	
		4	2	2	2	2	2	1	3	2	2	
35.12	M	2	2	3	3	3	3	2	4	2	1	
Total Score	47											
		2	2	3	3	1	1	1	4	3	2	
35.13	M	3	3	3	3	4	4	3	4	3	3	
Total Score	100	3	4	3	3	4	4	3	4	3	4	
		2	3	3	3	4	4	3	4	3	3	
35.14	M	1	1	1	1	1	3	1	3	1	1	
Total Score	30											
		2	1	2	2	2	2	1	2	1	1	
35.15	M	1	1	1	1	1	0	0	0	0	0	
Total Score	17	1	1	1	1	0	0	0	0	0	0	
		2	1	3	2	0	0	0	0	0	0	
35.16	F	3	2	3	4	4	4	3	4	4	3	
Total Score	97	4	4	4	3	4	3	2	2	3	4	
		4	3	4	3	4	2	2	2	3	3	
35.17	M	1	1	1	1	1	1	1	1	0	1	
Total Score	59	3	3	3	3	3	3	3	3	3	3	
		2	2	2	2	2	2	2	2	2	2	
35.18	M	4	3	3	4	4	4	2	4	2	2	
Total Score	105	4	4	3	3	4	3	4	4	4	4	
		4	3	4	4	4	4	3	4	3	3	
35.19	M	4	4	3	4	3	4	4	4	4	3	
Total Score	111	4	4	4	4	3	4	4	4	4	3	
		2	3	4	4	4	4	3	4	4	3	
35.20	M											
Total Score	63	4	4	3	3	4	4	3	4	2	2	
		3	3	2	3	3	4	2	4	3	3	
35.21	M	3	3	3	3	3	3	3	3	3	3	
Total Score	93	4	3	3	3	3	3	4	4	2	3	
		3	3	3	3	3	3	3	4	3	3	
35.22	M	2	1	1	1	0	0	0	0	0	0	
Total Score	25	1	1	1	1	1	1	1	1	1	1	
		4	1	1	1	1	1	1	1	1	1	
35.23	M	3	3	3	3	0	0	0	0	0	0	
Total Score	63	4	4	4	3	0	0	0	0	0	0	
		4	4	4	3	3	3	4	3	4	4	
35.24	M	4	3	3	3	4	4	4	4	3	2	
Total Score	99	4	2	4	2	2	2	2	4	4	4	
		3	2	4	4	4	3	3	4	4	4	
35.25	M	4	3	3	4	4	4	3	4	3	3	
Total Score	108	4	4	4	3	4	4	4	3	4	4	
		3	2	3	3	4	4	4	4	4	4	
35.26	M	4	3	3	4	4	3	4	4	3	3	
Total Score	109	4	4	4	3	4	4	3	3	3	4	
		3	3	4	4	4	4	4	4	4	4	
35.27	M	4	3	3	3	4	4	4	4	3	2	
Total Score	100	4	2	4	2	2	2	2	4	4	4	
		4	4	4	4	4	3	3	4	3	3	
35.28	M	1	0	1	1	0	0	0	0	0	0	
Total Score	53	4	4	4	4	4	4	4	4	4	4	
		1	1	1	1	1	1	1	1	1	1	
35.29	F	4	3	3	3	3	4	2	4	3	2	
Total Score	104	4	4	4	3	4	3	4	4	4	4	
		4	4	4	4	3	4	1	4	3	4	
35.30	M	2	2	2	2	2	4	3	4	2	1	
Total Score	93	4	3	4	3	4	4	3	4	2	3	
		4	3	4	3	4	4	3	4	3	3	
35.31	M	3	2	2	2	4	4	1	4	2	1	
Total Score	99	4	4	3	3	4	4	3	4	4	3	
		4	3	4	4	4	3	3	4	4	4	
35.32	M	4	4	3	3	4	3	3	4	3	3	
Total Score	95	4	3	3	2	3	2	4	2	2	4	
		4	4	3	3	3	3	3	3	3	3	
35.33	F	3	3	4	4	4	4	3	4	4	3	
Total Score	111	4	4	4	4	4	4	4	3	4	4	
		4	4	4	4	4	4	2	4	3	3	
35.34	M	3	1	2	3	4	4	2	4	2	1	
Total Score	91	4	3	4	3	3	4	3	4	3	3	
		3	3	3	3	4	4	3	4	2	2	
35.35	M	3	3	3	4	3	3	3	4	3	3	
Total Score	89	4	3	2	3	3	4	3	3	3	4	
		3	2	3	3	2	2	2	3	2	3	
35.36	M	3	3	3	4	4	4	2	4	3	3	
Total Score	97	4	4	3	3	3	3	2	3	3	3	
		3	3	3	3	4	4	3	4	3	3	
35.37	M	3	3	3	3	3	3	3	4	3	3	
Total Score	84	4	4	4	3	3	3	3	3	3	3	
		4	3	3	4	4	3	4	4	3	3	
35.38	M	4	2	1	3	4	4	3	4	3	3	Enjoyment
Total Score	92	3	3	3	3	3	3	3	3	3	3	Independence
		4	3	3	3	3	3	3	3	3	3	Achieving good results
35.40	M	1	1	1	1	4	4	1	4	1	1	Enjoyment
Total Score	88	4	4	4	4	4	4	4	4	2	4	Independence
		4	4	3	3	4	4	3	4	2	2	Achieving good results
35.41	M	3	2	4	3	2	3	3	2	3	2	Enjoyment
Total Score	75	2	3	3	3	3	3	3	3	2	4	Independence
		3	2	3	1	2	2	3	3	2	1	Achieving good results
35.42	M	3	2	3	3	3	3	3	4	4	2	Enjoyment
Total Score	101	4	3	3	3	4	4	4	3	3	4	Independence
		3	4	4	4	4	4	4	4	2	3	Achieving good results
35.43	M	3	2	3	3	3	3	3	4	2	1	Enjoyment
Total Score	92	4	4	3	3	4	3	4	3	4	4	Independence
		4	4	3	2	3	3	3	2	3	2	Achieving good results
47.01	M	3	4	3	4	4	4	3	4	4	2	Enjoyment
Total Score	105	4	3	3	3	3	3	4	4	4	3	Independence
		4	4	3	3	4	3	4	4	4	3	Achieving good results
47.02	M											Enjoyment
Total Score												Independence
												Achieving good results
47.03	M	4	3	2	2	3	4	1	4	3	2	Enjoyment
Total Score	81	3	3	2	2	4	4	2	4	2	2	Independence
		3	2	1	1	4	4	1	4	3	2	Achieving good results
47.04	M	3	3	2	3	4	4	3	4	3	3	Enjoyment
Total Score	106	4	4	3	4	4	4	4	4	4	4	Independence
		4	4	4	3	3	3	4	4	4	4	Achieving good results
47.05	M	3	3	2	3	4	4	3	4	3	3	Enjoyment
Total Score	101	4	4	4	4	4	4	4	4	4	4	Independence
		2	2	3	2	4	2	3	4	4	3	Achieving good results
47.06	M	3	3	2	3	4	4	3	4	3	3	Enjoyment
Total Score	106	4	4	4	4	4	4	4	4	4	4	Independence
		4	4	3	3	4	2	3	4	4	3	Achieving good results
47.07	M	3	2	2	3	3	2	0	0	0	0	Enjoyment
Total Score	15											Independence
												Achieving good results
47.08	M	1	1	2	3	3	3	2	1	1	3	Enjoyment
Total Score	28											Independence
												Achieving good results
47.09	M	3	2	2	3	2	2	3	2	1	2	Enjoyment
Total Score	22											Independence
												Achieving good results
47.10	M	4	3	3	3	4	3	3	4	3	2	Enjoyment
Total Score	97	4	3	3	3	4	4	3	4	3	3	Independence
		4	3	3	3	3	3	3	4	3	2	Achieving good results
47.11	M	4	4	2	3	3	1	1	3	1	2	Enjoyment
Total Score	103	4	4	4	4	4	4	4	4	4	4	Independence
		4	4	3	4	4	4	4	4	4	4	Achieving good results
47.12	M											Enjoyment
Total Score												Independence
												Achieving good results
47.13	M	4	3	3	4	4	4	3	4	2	2	Enjoyment
Total Score	94	3	4	3	2	4	4	3	4	2	2	Independence
		3	3	3	2	4	3	3	4	3	2	Achieving good results
47.14	M	3	2	3	3	3	4	4	4	3	2	Enjoyment
Total Score	88	3	2	2	3	3	3	3	4	2	2	Independence
												Achieving good results
49.01	M	4	4	4	4	4	4	3	4	4	3	Enjoyment
Total Score	109	4	3	4	4	4	4	3	4	3	3	Independence
		4	4	4	4	4	4	2	4	4	1	Achieving good results
49.02	M	4	3	3	3	3	3	3	3	3	3	Enjoyment
Total Score	71	1	1	1	1	1	1	1	1	1	2	Independence
		4	2	2	3	3	3	3	3	3	3	Achieving good results
49.03	F	3	3	3	4	4	4	3	4	4	3	Enjoyment
Total Score	101	4	4	3	4	3	3	4	4	4	3	Independence
		3	3	3	3	3	3	3	3	3	3	Achieving good results
49.04	M	3	2	2	2	2	2	3	4	4	1	Enjoyment
Total Score	86	2	2	2	2	2	2	2	1	1	1	Independence
		1	2	1	2	2	2	1	3	1	1	Achieving good results
49.05	F	4	4	4	4	4	4	4	1	4	4	Enjoyment
Total Score	106	4	4	4	4	2	3	4	2	4	4	Independence
		4	4	3	4	2	3	4	2	4	4	Achieving good results
49.06	M	4	4	3	4	4	4	4	4	4	4	Enjoyment
Total Score	83	2	4	2	3	2	2	2	3	2	2	Independence
												Achieving good results
49.07	F	4	3	2	3	3	2	3	4	3	3	Enjoyment
Total Score	77	2	3	2	3	3	2	2	1	2	2	Independence
		2	3	3	3	4	2	1	3	2	3	Achieving good results
49.08	M	4	2	2	4	4	4	1	4	2	2	Enjoyment
Total Score	79	3	3	2	3	1	2	1	4	1	3	Independence
		3	2	2	4	4	4	1	4	1	2	Achieving good results
49.09	M	4	3	3	3	3	3	3	3	3	3	Enjoyment
Total Score	96	3	4	4	3	2	3	4	3	4	4	Independence
		4	3	3	2	3	2	3	3	4	4	Achieving good results
49.10	M	4	4	3	4	3	4	2	4	4	1	Enjoyment
Total Score	94	3	1	3	2	2	2	2	2	2	2	Independence
		4	4	4	4	4	4	4	4	4	4	Achieving good results

Pupil Code		A	B	C	D	E	F	G	H	I	J	
49.11	M	4	3	3	4	4	4	2	4	4	1	Enjoyment
Total Score	102	4	4	4	3	3	3	3	3	4	4	Independence
		4	4	4	3	3	3	3	3	4	3	Achieving good results
49.12	F	3	3	4	4	4	4	3	3	4	3	Enjoyment
Total Score	89	4	3	3	3	3	3	2	2	3	2	Independence
		4	3	2	2	3	3	2	2	3	2	Achieving good results
49.13	F	4	3	4	4	4	4	4	4	4	4	Enjoyment
Total Score	104	4	3	3	2	4	1	4	3	3	4	Independence
		4	4	4	3	2	2	3	4	4	4	Achieving good results
49.14	M	3	2	3	2	4	4	2	4	3	2	Enjoyment
Total Score	89	4	4	3	3	2	2	3	2	3	4	Independence
		3	3	3	3	4	4	2	3	3	2	Achieving good results
49.15	M	4	4	4	4	4	4	4	4	4	4	Enjoyment
Total Score	116	3	4	4	3	4	4	4	4	4	3	Independence
		4	3	4	4	4	4	4	4	4	4	Achieving good results
49.16	F	3	4	3	4	4	4	3	3	4	4	Enjoyment
Total Score	102	3	4	3	4	3	3	4	3	4	4	Independence
		3	4	2	3	3	3	3	3	4	3	Achieving good results
49.17	M	3	3	3	3	3	3	3	4	3	3	Enjoyment
Total Score	87	3	3	2	3	3	3	4	2	2	2	Independence
		2	3	3	3	3	3	3	3	3	3	Achieving good results
49.18	M	2	1	3	4	4	4	3	4	3	2	Enjoyment
Total Score	94	4	3	3	3	2	3	4	4	4	4	Independence
		2	2	3	3	4	4	3	3	3	3	Achieving good results
49.19	M	4	4	3	2	4	4	3	4	4	3	Enjoyment
Total Score	110	4	4	4	4	3	3	3	4	3	4	Independence
		4	4	4	4	4	4	4	4	4	3	Achieving good results
49.20	F	3	2	2	3	3	2	3	3	2	2	Enjoyment
Total Score	88	3	3	4	3	3	3	4	3	4	4	Independence
		3	3	3	3	2	3	2	3	3	4	Achieving good results
49.21	M	4	4	3	4	4	4	2	4	4	2	Enjoyment
Total Score	78	2	2	2	2	2	2	2	2	2	2	Independence
		2	4	2	4	2	2	2	2	2	2	Achieving good results

Key

Pupil Code:

M/F	Male/Female
A	Selecting a project (Max 4)
B	Researching project (Max 4)
C	Thinking of Solutions (Max 4)
D	Detailing chosen idea (Max 4)
E	Making final solution (Max 4)
F	Making solution work (Max 4)
G	Evaluating project (Max 4)
H	Using tools and equipment (Max 4)
I	Putting folio together (Max 4)
J	Writing report (Max 4)

Raw data from the information received from 179 pupils during Phase One regarding the rank order concerning enjoyment of: researching; designing; making; evaluating.

Pupil Code	Sex	R	D	M	E	R	D	M	E
7.01	F	3	2	1	4	2	4	1	2
7.02	F	4	2	1	3	3	1	1	3
7.03	F	4	2	1	3	2	2	1	2
7.04	M	4	2	1	3	1	3	1	4
7.05	M	3	1	1	3	3	2	1	4
7.06	M	3	2	1	4	1	3	2	4
7.07	M	1	2	3	4	2	3	1	3
7.08	M	3	2	1	4	3	2	1	4
7.09	M	3	2	1	4	2	2	1	2
7.10	M	2	3	1	4	3	1	1	3
7.11	F	3	2	1	4	1	3	2	3
7.12	F	3	2	1	4	2	2	1	2
7.13	M	2	3	1	4	1	3	2	4
7.14	M	3	2	1	4	3	2	1	3
7.15	M	3	4	1	2	2	3	1	4
7.16	M	3	2	1	4	3	2	1	3
7.17	M	2	4	1	3	2	2	1	2
7.18	M	2	1	4	3	3	2	1	4
7.19	M	3	2	1	4	3	2	1	4
12.13	F	1	2	4	3	3	1	2	4
21.01	M	3	2	1	4	1	3	1	4
21.02	M	3	2	1	4	2	3	1	3
21.03	M	3	2	1	4	1	2	2	4
21.04	M	3	2	1	4	3	2	1	4
21.05	M	3	2	1	4	2	3	1	3
21.06	M	3	2	1	4	1	3	1	4
21.07	M	3	1	1	4	4	2	1	3
21.08	M	2	1	4	3	1	1	3	4
21.09	M	3	1	1	4	3	2	1	4
21.10	M	3	2	1	4	3	2	1	4
21.11	M	3	2	1	4	1	3	2	4
21.12	M	3	2	1	4	2	2	1	4
21.14	F	2	3	1	4	2	3	1	3
21.15	M	3	2	1	4	3	1	1	4
21.16	M	2	2	1	4	3	1	1	4
21.17	M	4	3	1	2	2	2	1	2
21.18	F	3	2	1	4	2	4	1	2
21.19	M	3	2	1	4	4	2	2	1
21.20	M	3	2	1	4	2	2	1	4
21.21	F	2	3	1	4	1	3	2	4
21.22	M	3	2	1	4	3	2	1	4
21.23	M	2	3	1	4	2	3	1	4
21.24	F	3	2	1	4	2	3	1	4
21.25	M	2	4	1	3	3	1	3	2
21.26	F	3	2	1	4	1	3	1	4
31.01	F	4	2	1	3	1	3	2	4
31.02	M	3	2	1	4	3	1	1	3
31.03	M	3	2	1	4	2	2	1	2
31.04	M	3	2	1	4	3	2	1	3
31.05	M	4	2	1	3	3	2	1	3
31.06	M	3	2	1	4	1	3	2	4
31.07	M	2	3	1	4	2	4	1	2
31.08	M	3	4	1	2	4	3	1	2
31.09	M	3	2	1	4	2	3	1	4
31.10	M	3	2	1	4	3	2	1	4
31.11	M					1	2	3	3
31.12	M	3	2	1	4	2	2	1	2
31.13	M	2	3	1	4	2	3	1	3
31.14	M	3	2	1	4	3	2	1	3
31.15	M	2	1	3	4	1	3	2	4
32.01	M	3	2	1	4	4	2	1	3
32.02	M	3	2	1	4	2	3	1	3
32.03	M	3	2	1	4	2	1	3	4
32.04	F	2	4	1	2	4	1	1	1
32.05	M	3	2	1	4	1	2	2	4
32.06	M	3	2	1	4	4	2	1	3
32.07	M	4	2	1	3	4	3	1	2
32.08	M	1	2	2	2	3	2	1	4
32.09	M	1	2	2	2	4	1	1	3
32.09	M	3	2	1	4	3	4	1	2
32.10	M	3	1	2	4	3	1	2	3
32.11	M	3	2	1	4	2	4	1	2
32.12	M	3	2	1	4	3	2	1	4
32.13	M	3	2	1	4	3	2	1	4
32.14	M	2	1	3	4	1	4	2	2
32.15	M	2	3	1	4	2	3	1	3
32.16	M	3	2	1	4	2	2	1	4
32.17	M	3	2	1	4	3	1	2	4
32.18	M	2	1	3	4	1	2	3	4
32.19	M	4	2	1	3	2	3	1	4
32.20	F	4	1	2	3	1	3	1	4
32.21	M	3	2	1	4	1	2	2	4
32.22	M	3	2	1	4	4	2	1	3
32.23	M	3	2	1	4	1	2	2	4
32.24	M	4	2	1	3	3	2	1	4
32.25	M	2	1	3	4	2	1	2	4
35.01	M	3	4	1	2	2	3	1	3
35.02	M	3	2	1	4	4	2	1	3
35.03	M	3	4	1	2	4	3	1	1
35.04	M	4	2	1	3	4	2	1	3
35.05	M	3	2	1	4	2	2	1	2
35.06	M	2	1	2	2	3	2	1	3
35.07	M	3	2	1	4	2	3	1	4
35.08	M	3	2	1	4	4	3	1	2
35.09	M	3	2	1	4	2	3	1	4
35.10	M	3	2	1	4	4	2	1	2
35.11	M	4	2	1	3	3	2	1	4
35.12	M	4	2	1	3	3	2	1	4
35.13	M	4	2	1	3	4	3	1	2
35.14	M	3	2	1	4	2	4	1	2
35.15	M	4	2	1	3	4	2	1	3
35.16	M	4	2	1	3	4	3	1	2
36.01	M	2	3	1	4	1	3	1	4
36.02	M	4	2	1	3	2	4	1	2
36.03	F	2	3	1	4	4	2	2	1
36.04	F	3	1	2	4	3	1	1	4
36.05	M	4	2	1	3	2	4	1	2
36.06	M	4	2	1	3	2	3	1	4
36.07	M	2	1	3	4	3	1	1	3
36.08	M	1	1	1	2	2	3	1	4
36.09	M	4	3	1	2	1	4	1	1
36.10	M	3	2	1	4	3	2	1	4
36.11	M	3	2	1	4	2	3	1	4
36.12	M					3	2	1	4
36.13	M	3	2	1	4	2	2	1	2
36.14	M	3	2	1	3	2	2	1	2
36.15	M	2	1	3	3	1	2	3	4
36.16	F	4	2	1	2	4	2	1	3
36.17	M	3	2	1	4	1	4	1	1
36.18	M	4	2	1	3	2	3	1	4
36.19	M	4	2	1	3	1	2	2	1
36.20	M	3	2	1	4				
36.21	M	3	2	1	4	1	1	1	1
36.22	M	2	3	1	4	1	2	3	3
36.23	M	3	2	1	4	1	2	3	3
36.24	M	2	3	1	4	2	3	1	3
36.25	M	4	3	1	2	2	3	1	4
36.26	M	4	2	1	3	2	3	1	2
36.27	M	2	3	1	4	2	3	1	3
36.28	M	1	1	1	1	2	1	3	3
36.29	F	3	2	1	4	2	3	1	4
36.30	M	3	2	1	4	2	2	1	2
36.31	M	3	2	1	4	2	3	1	4
36.32	M	3	2	1	4	1	3	2	3
36.33	F	3	2	1	4	3	1	1	3
36.34	M	3	2	1	4	3	2	1	4
36.35	M	3	2	1	4	3	1	1	3
36.36	M	3	2	1	4	3	2	1	4
36.37	M	4	2	1	3	2	2	1	2
36.38	M	3	2	1	4	2	4	1	2
36.40	M	4	2	1	3	2	2	1	2
36.41	M	4	2	1	3	1	3	3	1
36.42	M	3	2	1	4	3	1	1	3
36.43	M	2	3	1	4	3	2	1	4
47.01	M	4	1	2	3	3	2	1	3
47.02	M	4	1	1	1				
47.03	M	3	2	1	4	2	3	1	4
47.04	M	3	2	1	4	2	4	1	2
47.05	M	2	3	1	4	2	4	1	2
47.06	M	3	2	1	4	2	4	1	2
47.07	M	2	2	1	4	1	2	2	4
47.08	M	3	2	1	4	4	3	2	1
47.09	M	4	1	3	1				
47.10	M	3	2	1	4	2	3	1	4
47.11	M	3	2	1	4	1	3	2	4
47.12	M	2	2	1	2				
47.13	M	3	2	1	4	2	3	1	4
47.14	M	4	2	1	3	4	2	1	2
49.01	M	4	1	1	1	1	1	1	4
49.02	M	1	1	1	4	1	2	2	2
49.03	F	2	2	1	2	3	2	1	3
49.04	M	4	3	1	2	3	1	1	4
49.05	F	2	1	4	3	1	1	4	1
49.06	M	2	2	1	4	1	4	1	1
49.07	F	4	2	1	3	4	2	1	3
49.08	M	3	2	1	4	2	3	1	4
49.09	M	2	2	1	4	1	2	2	2
49.10	M	3	2	1	4	1	2	2	4
49.11	M	3	2	1	4	3	2	1	4
49.12	F	3	2	1	4	3	1	2	3
49.13	F	3	2	1	4	4	1	1	1
49.14	M	3	2	1	4	3	2	1	4
49.15	M	3	1	2	4	1	1	1	1
49.16	F	2	3	1	4	3	1	1	3
49.17	M	2	2	1	4	2	2	1	2
49.18	M	4	2	1	3	4	2	1	3
49.19	M	3	2	1	4	1	3	1	3
49.20	F	3	2	1	4	2	4	1	2
49.21	M	2	1	3	4	1	3	1	4

Key

Pupil Code:

Sex	Male/Female
R	Researching data from Rank Order Q 11 (Max 4)
D	Designing data from Rank Order Q 11 (Max 4)
M	Making data from Rank Order Q 11 (Max 4)
E	Evaluating data from Rank Order Q 11 (Max 4)
R	Researching data from Q7 (Max 4)
D	Designing data from Q7 (Max 4)
M	Making data from Q7 (Max 4)
E	Evaluating data from Q7 (Max 4).

Raw data from the information received from 179 pupils during Phase One regarding total enjoyment score, level of boredom, incomplete Projects.

Pupil Code	S	E	B	IP
7.01	F	31	1	0
7.02	F	38	0	0
7.03	F	33	1	0
7.04	M	36	0	0
7.05	M	30	2	1
7.06	M	33	2	1
7.07	M	34	1	1
7.08	M	35	1	1
7.09	M	32	1	1
7.10	M	32	1	0
7.11	F	33	1	1
7.12	F	31	1	1
7.13	M	23	2	2
7.14	M	33	1	1
7.15	M	30	1	2
7.16	M	35	0	1
7.17	M	33	1	1
7.18	M	35	0	2
7.19	M	29	1	1
12.13	F	22	2	0
21.01	M	27	1	0
21.02	M	34	1	0
21.03	M	33	1	4
21.04	M	27	0	0
21.05	M	27	1	2
21.06	M	33	1	1
21.07	M	32	0	1
21.08	M	26	1	1
21.09	M	35	1	0
21.10	M	23	1	1
21.11	M	29	1	0
21.12	M	28	1	4
21.14	F	34	1	0
21.15	M	31	1	1
21.16	M	30	1	0
21.17	M	21	2	1
21.18	F	29	0	0
21.19	M	33	0	0
21.20	M	32	1	1
21.21	F	21	2	0
21.22	M	33	1	0
21.23	M	35	1	0
21.24	F	24	2	0
21.25	M	24	1	1
21.26	F	26	2	0
31.01	F	22	1	2
31.02	M	32	0	1
31.03	M	33	1	0
31.04	M	33	1	0
31.05	M	30	2	0
31.06	M	21	1	0
31.07	M	23	1	1
31.08	M	19	1	0
31.09	M	33	0	0
31.10	M	22	1	2
31.11	M	7	1	3
31.12	M	32	0	0
31.13	M	26	1	0
31.14	M	35	1	0
31.15	M	5	2	2
32.01	M	33	1	1
32.02	M	27	1	4
32.03	M	24	1	0
32.04	F	29	1	1
32.05	M	22	1	1
32.06	M	26	1	1
32.07	M	24	2	0
32.08	M	26	1	2
32.09	M	19	1	2
32.10	M	30	0	2
32.11	M	22	2	1
32.12	M	31	1	0
32.13	M	33	1	0
32.14	M	24	1	1
32.15	M	19	2	5
32.16	M	34	1	1
32.17	M	21	1	1
32.18	M	35	0	0
32.19	M	8	2	2
32.20	F	24	1	0
32.21	M	26	1	0
32.22	M	27	1	0
32.23	M	37	1	1
32.24	M	33	0	1
32.25	M	27	1	2
35.01	M	31	0	1
35.02	M	34	1	3
35.03	M	26	1	0
35.04	M	33	0	0
35.05	M	27	2	0
35.06	M	33	1	3
35.08	M	31	1	1
35.07	M	30	1	0
35.08	M	25	1	1
35.09	M	22	0	5
35.10	M	29	0	0
35.11	M	25	1	1
35.12	M	25	1	4
35.13	M	31	1	3
35.14	M	27	1	1
35.15	M	26	1	0
35.16	M	30	1	0
36.01	M	22	1	4
36.02	M	29	1	0
36.03	F	33	0	0
36.04	F	30	2	1
36.05	M	17	2	4
36.06	M	19	2	0
36.07	M	32	0	0
36.08	M	34	1	0
36.09	M	29	2	1
36.10	M	32	1	2
36.11	M	16	2	3
36.12	M	25	1	2
36.13	M	33	1	2
36.14	M	14	2	6
36.15	M	6	2	0
36.16	F	34	1	0
36.17	M	9	2	0
36.18	M	32	0	2
36.19	M	36	1	2
36.20	M		0	1
36.21	M	30	1	1
36.22	M	6	2	5
36.23	M	12	1	4
36.24	M	34	0	0
36.25	M	35	1	1
36.26	M	35	0	1
36.27	M	34	0	0
36.28	M	3	2	5
36.29	F	31	0	2
36.30	M	24	1	4
36.31	M	26	0	0
36.32	M	34	1	2
36.33	F	36	0	0
36.34	M	26	0	0
36.35	M	32	1	4
36.36	M	33	0	0
36.37	M	31	0	5
36.39	M	31	1	0
36.40	M	19	2	0
36.41	M	27	2	0
36.42	M	30	1	4
36.43	M	27	1	6
47.01	M	35	1	1
47.02	M			
47.03	M	26	1	0
47.04	M	32	1	5
47.05	M	32	2	1
47.06	M	32	1	5
47.07	M	15		
47.08	M	20		2
47.09	M	22		
47.10	M	32	1	1
47.11	M	24	2	0
47.12	M			
47.13	M	33	1	2
47.14	M	31	1	2
49.01	M	36	0	0
49.02	M	31	0	2
49.03	F	35	0	0
49.04	M	25	1	3
49.05	F	37	1	0
49.06	M	39	0	3
49.07	F	30	1	3
49.08	M	29	1	3
49.09	M	31	1	1
49.10	M	33	0	2
49.11	M	33	0	0
49.12	F	35	1	0
49.13	F	39	1	0
49.14	M	29	1	2
49.15	M	40	0	0
49.16	F	30	1	0
49.17	M	31	1	1
49.18	M	30	1	0
49.19	M	35	0	0
49.20	F	25	1	0
49.21	M	35	0	3

Key

Pupil Code:

Sex	Male/Female
E	Enjoyment score (Max 40)
B	Boredom score (Max 2)
IP	Number of incomplete projects

Raw data from the information received from the chosen 50 pupils during Phase Two regarding background information concerning various skills. Data taken from results of Questionnaire given to 124 pupils (Figure 6.3), goal orientation test, creativity test, project work, observation, school mark given for the project.

	Pupil ...	Goal 1	Goal 2	L/D 1	L/D (SA)	C/C	D/M 1	Matrix	Sex	F/U	Ms	%	WA	IV	Es	D/As	Cs	D/C	D/S	W/C	W/S	Acting	Pla...	Refl...	Teacher Strategy
1	07.2.01	250	3	Dislikes	Dislikes	Can	De-motivated	B	f	F	3	66.0	A4	I1	2.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	3.0	Interventionist
2	07.2.02	261	4	Likes	Dislikes	Can	Conform	E	m	F	4	78.0	A3	V4	2.0	4.0	2.0	4.0	4.0	4.0	4.0	2.0	4.0	4.0	Interventionist
3	07.2.04	220	2	Dislikes	Dislikes	Can	Motivated	A	m	U	4	83.0	A4	V2	2.0	3.0	4.0	3.0	3.0	3.0	4.0	1.0	2.0	2.0	Interventionist
4	07.2.05	229	2	Likes	Dislikes	Not	De-motivated	B	m	F	3	64.0	A3	I3	4.0	2.0	4.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0	Interventionist
5	07.2.06	197	1	Likes	Dislikes	Can	Conform	E	f	F	4	84.0	W2	V3	2.0	3.0	3.0	4.0	3.0	3.0	4.0	1.0	1.0	1.0	Interventionist
6	07.2.11	203	1	Dislikes	Dislikes	Not	De-motivated	F	m	F	1	24.0	A2	I4	1.0	1.0	2.0	1.0	2.0	1.0	1.0	3.0	1.0	1.0	Interventionist
7	07.2.14	203	1	Dislikes	Dislikes	Not	Conform	E	f	U	3	54.0	W3	V2	1.0	2.0	2.0	1.0	1.0	2.0	3.0	1.0	2.0	1.0	Interventionist
8	21.2.03	204	1	Dislikes	Dislikes	Can	De-motivated	D	f	U	3	57.0	W1	V3	4.0	4.0	1.0	2.0	4.0	4.0	2.0	2.0	2.0	1.0	Interventionist
9	21.2.04	178	1	Dislikes	Dislikes	Not	De-motivated	F	m	U	0	0.0	W3	I2	3.0	1.0	1.0	3.0	1.0	1.0	2.0	1.0	3.0	3.0	Interventionist
10	21.2.05	0	0	Likes	Dislikes	Can	De-motivated	D	m	F	1	23.0	W4	I2	4.0	4.0	1.0	4.0	4.0	3.0	4.0	0.0	0.0	0.0	Interventionist
11	21.2.06	254	4	Likes	Likes	Can	Motivated	A	f	F	4	94.0	A2	V4	3.0	4.0	4.0	4.0	4.0	4.0	2.0	4.0	4.0	4.0	Interventionist
12	21.2.07	164	1	Likes	Dislikes	Not	De-motivated	F	f	U	1	23.0	W3	V4	2.0	1.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	Interventionist
13	21.2.10	231	3	Dislikes	Dislikes	Can	De-motivated	F	m	U	2	40.0	A4	I3	3.0	3.0	3.0	3.0	3.0	1.0	3.0	2.0	3.0	2.0	Interventionist
14	31.2.03	209	1	Dislikes	Dislikes	Can	Conform	E	m	U	1	21.0	A2	V3	2.0	3.0	1.0	3.0	4.0	3.0	4.0	0.0	0.0	0.0	Collaborative
15	31.2.05	209	1	Dislikes	Dislikes	Can	De-motivated	D	m	U	2	40.0	W4	I2	2.0	3.0	1.0	3.0	3.0	3.0	4.0	0.0	0.0	0.0	Collaborative
16	31.2.06	170	1	Dislikes	Dislikes	Not	De-motivated	B	m	U	1	18.0	A2	V4	4.0	2.0	4.0	2.0	2.0	4.0	2.0	1.0	1.0	1.0	Collaborative
17	31.2.10	233	3	Dislikes	Dislikes	Not	De-motivated	F	m	U	1	26.0	W4	V1	1.0	1.0	3.0	2.0	1.0	1.0	1.0	3.0	2.0	3.0	Collaborative
18	31.2.15	238	3	Likes	Likes	Can	Motivated	C	m	F	3	61.0	A3	V4	2.0	4.0	2.0	4.0	4.0	2.0	4.0	3.0	3.0	3.0	Collaborative
19	31.2.18	205	1	Likes	Dislikes	Not	Conform	E	m	F	2	32.0	W1	V2	2.0	3.0	3.0	2.0	1.0	3.0	2.0	4.0	1.0	2.0	Collaborative
20	32.2.02	210	2	Likes	Dislikes	Not	De-motivated	F	m	U	2	40.0	A2	V2	2.0	3.0	1.0	3.0	2.0	2.0	4.0	2.0	2.0	1.0	Collaborative
21	32.2.03	202	1	Dislikes	Dislikes	Can	De-motivated	D	m	U	2	43.0	A1	V3	3.0	2.0	1.0	2.0	2.0	2.0	3.0	2.0	1.0	1.0	Collaborative
22	32.2.04	0	0	Dislikes	Dislikes	Not	De-motivated	F	m	U	0	0.0	W4	I3	3.0	1.0	1.0	2.0	3.0	3.0	2.0	0.0	0.0	0.0	Collaborative
23	32.2.08	238	3	Likes	Likes	Can	Motivated	C	f	F	2	50.0	W4	I2	3.0	3.0	1.0	2.0	3.0	1.0	4.0	2.0	3.0	4.0	Collaborative
24	32.2.09	218	2	Dislikes	Dislikes	Can	Motivated	C	m	F	3	72.0	A1	I1	3.0	3.0	1.0	4.0	4.0	4.0	2.0	1.0	2.0	3.0	Collaborative
25	32.2.10	230	2	Dislikes	Dislikes	Not	De-motivated	D	m	F	2	33.0	A3	V3	2.0	2.0	1.0	3.0	3.0	2.0	1.0	2.0	3.0	2.0	Collaborative
26	35.2.05	213	2	Dislikes	Dislikes	Can	De-motivated	D	m	U	1	11.0	A1	V1	1.0	2.0	1.0	1.0	1.0	3.0	3.0	1.0	2.0	2.0	Interventionist
27	35.2.11	222	2	Likes	Dislikes	Not	De-motivated	B	m	U	1	21.0	W1	I1	1.0	1.0	4.0	1.0	2.0	2.0	2.0	3.0	2.0	2.0	Interventionist
28	35.2.12	234	3	Dislikes	Dislikes	Not	De-motivated	F	f	U	2	51.0	W4	V3	2.0	2.0	3.0	3.0	2.0	2.0	2.0	4.0	2.0	2.0	Interventionist
29	35.2.14	230	3	Dislikes	Dislikes	Can	De-motivated	B	f	F	2	33.0	A1	V3	2.0	3.0	4.0	4.0	2.0	3.0	2.0	4.0	3.0	3.0	Interventionist
30	35.2.15	237	3	Dislikes	Dislikes	Not	De-motivated	F	f	U	1	14.0	A1	I2	2.0	1.0	2.0	1.0	2.0	1.0	1.0	4.0	2.0	3.0	Interventionist
31	35.2.17	209	1	Likes	Dislikes	Not	De-motivated	B	m	U	1	7.0	A4	I3	1.0	1.0	4.0	1.0	1.0	1.0	1.0	2.0	1.0	2.0	Interventionist
32	36.2.07	262	4	Likes	Likes	Can	Motivated	C	m	F	3	61.0	A3	V1	3.0	3.0	3.0	2.0	4.0	3.0	3.0	2.0	4.0	4.0	Collaborative
33	36.2.08	162	1	Likes	Dislikes	Not	De-motivated	F	m	U	0	0.0	A2	I4	2.0	1.0	1.0	3.0	3.0	2.0	1.0	1.0	1.0	1.0	Collaborative
34	36.2.09	253	4	Dislikes	Dislikes	Not	Conform	E	m	F	3	59.0	A4	I1	2.0	1.0	2.0	2.0	2.0	1.0	1.0	3.0	4.0	4.0	Collaborative
35	36.2.12	0	0	Dislikes	Dislikes	Not	De-motivated	F	f	U	0	0.0	A2	V3	2.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	Collaborative
36	36.2.17	202	1	Dislikes	Dislikes	Can	De-motivated	D	m	U	1	20.0	W2	V4	1.0	4.0	3.0	4.0	4.0	4.0	4.0	2.0	1.0	1.0	Collaborative
37	36.2.20	260	4	Likes	Likes	Can	Motivated	C	f	F	3	70.0	W3	I3	4.0	3.0	1.0	2.0	3.0	3.0	4.0	2.0	4.0	4.0	Collaborative
38	47.2.01	235	3	Dislikes	Dislikes	Can	De-motivated	F	m	F	3	64.0	A2	V2	4.0	4.0	2.0	4.0	4.0	4.0	4.0	3.0	2.0	3.0	Interventionist
39	47.2.05	226	2	Likes	Likes	Can	Motivated	C	m	F	2	49.0	A2	V3	4.0	4.0	3.0	3.0	4.0	4.0	4.0	4.0	2.0	1.0	Interventionist
40	47.2.11	195	1	Dislikes	Dislikes	Not	De-motivated	F	m	U	1	28.0	W2	I1	1.0	1.0	1.0	1.0	2.0	2.0	1.0	3.0	1.0	1.0	Interventionist
41	47.2.13	236	3	Dislikes	Dislikes	Not	De-motivated	F	m	U	2	46.0	A4	V1	4.0	2.0	3.0	1.0	3.0	2.0	3.0	4.0	2.0	3.0	Interventionist
42	47.2.14	286	4	Likes	Dislikes	Can	De-motivated	B	m	U	4	78.0	A1	I4	4.0	1.0	4.0	4.0	3.0	1.0	1.0	4.0	4.0	4.0	Interventionist
43	47.2.15	265	4	Dislikes	Dislikes	Can	De-motivated	F	m	U	2	32.0	W2	I4	4.0	3.0	2.0	4.0	3.0	4.0	3.0	4.0	4.0	4.0	Interventionist
44	47.2.17	266	4	Likes	Dislikes	Can	De-motivated	D	m	U	3	56.0	W4	I3	3.0	3.0	3.0	4.0	3.0	2.0	3.0	4.0	4.0	4.0	Interventionist
45	49.2.02	257	4	Dislikes	Dislikes	Can	Motivated	C	f	U	4	98.0	A2	V1	1.0	2.0	2.0	2.0	1.0	2.0	4.0	4.0	3.0	4.0	Interventionist
46	49.2.03	250	3	Dislikes	Dislikes	Can	Conform	E	m	F	4	90.0	A4	I3	2.0	4.0	2.0	3.0	2.0	4.0	4.0	2.0	4.0	3.0	Interventionist
47	49.2.06	191	1	Likes	Dislikes	Can	De-motivated	B	m	U	4	95.0	A4	V4	2.0	3.0	4.0	2.0	4.0	4.0	3.0	1.0	1.0	2.0	Interventionist
48	49.2.07	242	3	Dislikes	Dislikes	Not	De-motivated	F	m	U	3	53.0	W3	V1	2.0	2.0	2.0	1.0	1.0	3.0	2.0	2.0	3.0	3.0	Interventionist
49	49.2.09	269	4	Likes	Likes	Can	Motivated	A	f	F	4	88.0	A2	I4	4.0	4.0	4.0	2.0	2.0	4.0	4.0	3.0	4.0	4.0	Interventionist
50	49.2.13	224	2	Dislikes	Dislikes	Not	De-motivated	F	m	U	3	55.0	A4	I2	2.0	1.0	2.0	2.0	1.0	1.0	4.0	2.0	3.0	2.0	Interventionist

Key

Pupil Code

Goal 1	Total goal orientation score (Max)
Goal 2	Goal orientation score (Max 4)
L/D 1	Like or dislike design project work (pupil perception)
L/D SA	Like or dislike design project work (researcher's perception)
C/C	Can or cannot achieve good results (researcher's perception)
D/M1	Demotivated, motivated or conform (researcher's perception)
Matrix	Code from sample choice matrix (figure 6.5)
Sex	Male/Female
F/U	Finished or unfinished project by school deadline
Ms	Mark as a score (Max 4)
%	Percentage given for project by school
WA	Wholist/Analytic score (4 = extreme of continuum)
IV	Verbaliser/Imager score (4 = extreme of continuum)
Es	Enjoyment score (Max 4)
D/As	Design ability (pupil perception) (Max 4)
Cs	Creativity test score (Max 4)
D/C	Concept skills whilst drawing (pupil perception) (Max 4)
D/S	Drawing skills (pupil perception) (Max 4)
W/C	Concept skills whilst writing (pupil perception) (Max 4)
W/S	Writing skills (pupil perception) (Max 4)
Acting	Goal orientation Acting score (Max 4)
Pla..	Goal orientation Planning score (Max 4)
Refl...	Goal orientation Reflection score (Max 4)

Teacher Strategy

Raw data from the information received from the chosen 50 pupils during Phase Two regarding background information concerning various skills. Data taken from results of CSA test, goal orientation test, creativity test, project work, observation, school mark given for the project.

	Pupil Code	Sex	F/U	WA	IV	Cs	%	Ss	Rs	Es	De-s	Pl-s	Ms	Pr-s	E1-s	E2-s	Dr-s	Wr-s	Retro...
1	07.2.01	f	Fini...	A4	I1	4.0	66	3.0	3.0	2.0	3.0	3.0	3.0	2.0	2.0	3.0	2.0	4.0	Maj...
2	07.2.02	m	Fini...	A3	V4	2.0	78	4.0	3.0	4.0	3.0	2.0	1.0	2.0	3.0	0.0	2.0	4.0	Maj...
3	07.2.04	m	Unfi...	A4	V2	4.0	83	4.0	4.0	1.0	2.0	2.0	2.0	3.0	3.0	3.0	2.0	5.0	Maj...
4	07.2.05	m	Fini...	A3	I3	4.0	64	2.0	2.0	2.0	2.0	1.0	2.0	3.0	1.0	3.0	2.0	2.0	Maj...
5	07.2.06	f	Fini...	W2	V3	4.0	84	4.0	4.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	Maj...
6	07.2.11	m	Fini...	A2	I4	2.0	24	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	Maj...
7	07.2.14	f	Unfi...	W3	V2	2.0	54	3.0	2.0	1.0	1.0	1.0	2.0	2.0	1.0	2.0	2.0	2.0	Maj...
8	21.2.03	f	Unfi...	W1	V3	1.0	57	2.0	2.0	1.0	2.0	2.0	2.0	3.0	2.0	3.0	2.0	3.0	None
9	21.2.04	m	Unfi...	W3	I2	1.0	0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	1.0	Maj...
10	21.2.05	m	Fini...	W4	I2	1.0	23	2.0	1.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	2.0	2.0	Some
11	21.2.06	f	Fini...	A2	V4	4.0	94	5.0	5.0	5.0	3.0	3.0	3.0	2.0	3.0	3.0	5.0	4.0	Maj...
12	21.2.07	f	Unfi...	W3	V4	1.0	23	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	Maj...
13	21.2.10	m	Unfi...	A4	I3	3.0	40	3.0	1.0	1.0	2.0	2.0	2.0	1.0	2.0	0.0	1.0	2.0	Maj...
14	31.2.03	m	Unfi...	A2	V3	1.0	21	0.0	1.0	1.0	4.0	3.0	3.0	2.0	1.0	1.0	1.0	1.0	Maj...
15	31.2.05	m	Unfi...	W4	I2	1.0	40	3.0	2.0	2.0	2.0	3.0	3.0	2.0	2.0	2.0	3.0	2.0	Some
16	31.2.06	m	Unfi...	A2	V4	4.0	18	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	0.0	1.0	1.0	Maj...
17	31.2.10	m	Unfi...	W4	V1	3.0	26	1.0	1.0	1.0	2.0	1.0	2.0	1.0	0.0	1.0	1.0	2.0	Maj...
18	31.2.15	m	Fini...	A3	V4	2.0	61	4.0	2.0	4.0	4.0	4.0	4.0	2.0	2.0	3.0	4.0	2.0	Some
19	31.2.18	m	Fini...	W1	V2	3.0	32	1.0	2.0	2.0	4.0	3.0	2.0	2.0	1.0	0.0	3.0	2.0	Some
20	32.2.02	m	Unfi...	A2	V2	1.0	40	1.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	Maj...
21	32.2.03	m	Unfi...	A1	V3	1.0	43	2.0	2.0	2.0	3.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	Maj...
22	32.2.04	m	Unfi...	W4	I3	1.0	0	1.0	1.0	4.0	2.0	0.0	0.0	0.0	2.0	0.0	1.0	1.0	Maj...
23	32.2.08	f	Fini...	W4	I2	1.0	50	3.0	3.0	3.0	3.0	3.0	4.0	3.0	2.0	2.0	2.0	3.0	Maj...
24	32.2.09	m	Fini...	A1	I1	1.0	72	4.0	5.0	4.0	5.0	3.0	4.0	3.0	4.0	4.0	4.0	3.0	Maj...
25	32.2.10	m	Fini...	A3	V3	1.0	33	2.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	Maj...
26	35.2.05	m	Unfi...	A1	V1	1.0	11	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	4.0	Maj...
27	35.2.11	m	Unfi...	W1	I1	4.0	21	3.0	2.0	1.0	2.0	1.0	2.0	1.0	1.0	2.0	2.0	3.0	Maj...
28	35.2.12	f	Unfi...	W4	V3	3.0	51	4.0	2.0	1.0	1.0	0.0	2.0	1.0	1.0	3.0	0.0	4.0	Maj...
29	35.2.14	f	Fini...	A1	V3	4.0	33	3.0	1.0	1.0	2.0	1.0	2.0	1.0	1.0	2.0	1.0	2.0	Maj...
30	35.2.15	f	Unfi...	A1	I2	2.0	14	1.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0	Some
31	35.2.17	m	Unfi...	A4	I3	4.0	7	1.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	1.0	Some
32	36.2.07	m	Fini...	A3	V1	3.0	61	1.0	3.0	2.0	3.0	1.0	3.0	2.0	2.0	3.0	3.0	2.0	None
33	36.2.08	m	Unfi...	A2	I4	1.0	0	1.0	2.0	3.0	1.0	1.0	2.0	1.0	2.0	3.0	3.0	3.0	Some
34	36.2.09	m	Fini...	A4	I1	2.0	59	2.0	3.0	3.0	3.0	3.0	4.0	4.0	2.0	4.0	3.0	2.0	Some
35	36.2.12	f	Unfi...	A2	V3	1.0	0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Maj...
36	36.2.17	m	Unfi...	W2	V4	3.0	20	0.0	1.0	1.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	2.0	Some
37	36.2.20	f	Fini...	W3	I3	1.0	70	3.0	2.0	3.0	5.0	2.0	3.0	3.0	3.0	2.0	3.0	3.0	None
38	47.2.01	m	Fini...	A2	V2	2.0	64	3.0	4.0	1.0	3.0	1.0	2.0	1.0	2.0	2.0	1.0	4.0	Maj...
39	47.2.05	m	Fini...	A2	V3	3.0	49	2.0	3.0	3.0	3.0	2.0	2.0	2.0	1.0	2.0	3.0	2.0	Maj...
40	47.2.11	m	Unfi...	W2	I1	1.0	28	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	2.0	Maj...
41	47.2.13	m	Unfi...	A4	V1	3.0	46	0.0	4.0	4.0	2.0	0.0	2.0	4.0	1.0	1.0	3.0	3.0	Some
42	47.2.14	m	Unfi...	A1	I4	4.0	78	2.0	5.0	2.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	4.0	Maj...
43	47.2.15	m	Unfi...	W2	I4	2.0	32	2.0	1.0	2.0	3.0	0.0	1.0	1.0	1.0	1.0	4.0	2.0	Maj...
44	47.2.17	m	Unfi...	W4	I3	3.0	56	0.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0	2.0	Maj...
45	49.2.02	f	Unfi...	A2	V3	2.0	98	4.0	4.0	2.0	2.0	2.0	3.0	2.0	2.0	2.0	0.0	5.0	Maj...
46	49.2.03	m	Fini...	A4	I3	2.0	90	3.0	3.0	3.0	2.0	2.0	3.0	2.0	2.0	2.0	1.0	4.0	Maj...
47	49.2.06	m	Unfi...	A4	V4	4.0	95	2.0	2.0	2.0	0.0	0.0	2.0	2.0	1.0	3.0	3.0	4.0	Maj...
48	49.2.07	m	Unfi...	W3	V1	2.0	53	2.0	2.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	Maj...
49	49.2.09	f	Fini...	A2	I4	4.0	88	3.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0	3.0	2.0	4.0	Maj...
50	49.2.13	m	Unfi...	A4	I2	2.0	55	2.0	3.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	Maj...

Key

Pupil Code

Sex Male/Female

F/U Finished or unfinished project by school deadline

WA Wholist/Analytic score (4 = extreme of continuum)

IV Verbaliser/Imager score (4 = extreme of continuum)

Cs Creativity test score (Max 4)

% Percentage given for project by school

Ss Specification score (Max 4)

Rs Research score (Max 4)

Es Early ideas score(Max 4)

De-s Detailing of chosen idea score (Max 4)

Pl-s Planning for manufacture score (Max 4)

Ms Manufacturing score (Max 4)

Pr-s End product score (Max 4)

E1-s Ongoing evaluation score (Max 4)

E2-s Final evaluation score (Max 4)

Dr-s Drawing skills score (Max 4)

Wr-s Writing skill score (Max 4)

Retro... Whether used retrospective designing

Raw data from the creativity test given to the 50 pupils during Phase Two.

Pupil Code 49/09	f	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	183.5	15	5	9.5	18	18	17	18	19	19	15	12	18
C2 order	1												

Pupil Code 07/01	f	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	180.5	6.5	12	18	13	19	9	15	17	19	15	18	19
C2 order	2												

Pupil Code 49/06	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	175	19	18	15	16	19	13	19	10	19	3.5	15	10.5
C2 order	3												

Pupil Code 21/06	f	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	173	1	15	12	5	15	17	19	19	19	19	15	17
C2 order	4												

Pupil Code 35/17	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	171.5	1	19	19	16	12	9.5	19	12	19	12	14	19
C2 order	5												

Pupil Code 07/05	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	161	1	3	17	7	19	9	18	19	19	15	19	15
C2 order	6												

Pupil Code 31/06	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	160	7	13	1	7	16	17	8	19	19	15	19	19
C2 order	7												

Pupil Code 35/14	f	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	157.5	14	14	8	19	9	19	15	19	2.5	18	19	1
C2 order	8												

Pupil Code 47/14	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	155.5	19	19	19	3	1	18	16	19	1.5	15	8	17
C2 order	9												

Pupil Code 07/04	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	151	1	3	19	7	11	9	18	15	18	18	13	19
C2 order	10												

Pupil Code 35/11	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	147	18	19	5	18	14	4	3	19	12	4	19	12
C2 order	11												

Pupil Code 21/10	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	145	1	7	10	19	6	17	13	12	12	12	17	19
C2 order	12												

Pupil Code 31/18	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	141	1	12	12	5	8	15	1	17	17	17	18	18
C2 order	13												

Pupil Code 07/06	f	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	137	2	9	5	19	10	2	19	18	12	17	18	6
C2 order	14												

Pupil Code 35/12	f	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	133	1	7	11	19	1	15	2	19	12	15	19	14
C2 order	15												

Pupil Code 47/13	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	132.5	1.5	2.5	15	19	7.5	10	6	12	19	4	19	17
C2 order	16												

Pupil Code 47/17	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	132	1.5	6	15	4	17	19	13	9.5	12	2	16	17
C2 order	17												

Pupil Code 36/17	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	130.5	2	2	17	18	1	13	18	7.5	9	9	19	15
C2 order	18												

Pupil Code 47/05	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	127	19	19	12	18	1	4	19	2.5	9	2	19	2.5
C2 order	19												

Pupil Code 31/10	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	125	9	2	4.5	19	3.5	9.5	19	19	9.5	9.5	16	4.5
C2 order	20												

Pupil Code 36/07	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	124	1	7	10	5	13	11	4	4	19	18	19	13
C2 order	21												

Pupil Code 07/02	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	120	1	6	7	6	5	19	19	4	19	6	19	9
C2 order	22												

Pupil Code 47/01	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	119.5	10	1	3.5	2	15	3.5	15	12	19	19	19	0.5
C2 order	23												

Pupil Code 07/14	f	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	119	1	4	12	9	5	10	15	3	15	15	18	12
C2 order	24												

Pupil Code 07/11	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	118	9	8	19	12	19	12	10	19	10	0	0	
C2 order	25												

Pupil Code 47/15	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	115	1	5	4	3	16	4	10	12	19	9	15	19
C2 order	26												

Pupil Code 36/09	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	112	3.5	3	15	11	0	1	5	7.5	15	15	17	19
C2 order	27												

Pupil Code 31/15	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	111	4	19	12	3	12	12	18	8	0	4	19	0
C2 order	28												

Pupil Code 49/07	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	111	7	16	3	1	1	17	10	12	19	15	9	3
C2 order	28												

Pupil Code 49/02	f	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	106	1	7	11	15	5	5	17	10	9	7	7	12
C2 order	30												

Pupil Code 35/15	f	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	104.5	1	5	6	13	6	1	4	9	4.5	19	15	19
C2 order	31												

Pupil Code 49/13	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	100	2	18	1	19	13	2	1	9	5	17	9	4
C2 order	32												

Pupil Code 49/03	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	99	5	12	3.5	16	1	11	18	6	11	1.5	8	6
C2 order	33												

Pupil Code 47/11	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	93.5	7	6	5.5	1	5	10	17	8	4	19	6	5
C2 order	34												

Pupil Code 32/08	f	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	89	17	19	6	19	1	7	4	8	8	4	4	0
C2 order	35												

Pupil Code 21/07	f	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*
Creativity 2 total	84	\	\	\	\	\	\	\	\	\	\	\	\
C2 order	36												

Pupil Code 35/05	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	81	16	1	17	9	12	3	8	10	3	0	0	0
C2 order	37												

Pupil Code 32/09	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	80.5	1	4		15	3.5	11	12	7	8	0	15	4
C2 order	38												

Pupil Code 21/04	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	80	1	1	18	2	19	9	17	2	2	2	2	5
C2 order	39												

Pupil Code 36/08	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	75	1	6	12	15	17	12	12	0	0	0	0	0
C2 order	40												

Pupil Code 36/20	f	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	70	17	17	12	3	19	2	0	0	0	0	0	0
C2 order	41												

Pupil Code 21/03	f	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	61	1	9	19	3	3	17	3	6	0	0	0	0
C2 order	42												

Pupil Code 32/10	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	56	1	10	2	10	11	5	5	2	2	2	4	2
C2 order	43												

Pupil Code 32/02	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	55	1	2	2	2	2	3	12	10	2	2	15	2
C2 order	44												

Pupil Code 32/03	m	13	14	15	16	17	18	19	20	21	22	23	24
Creativity 2 total	32	1	2	2	2	12	12	1	0	0	0	0	0
C2 order	45												

Key

Pupil Code:
Creativity 2 Total: Total score Max Score 228
C2 order: Position in sample in rank order
13 - 24: Score for each drawing Max Score 19

Appendix 3

Examples of data bases used during Phase One and Phase Two

Example of data base showing individual pupil responses to: enjoyment, independence whilst working, perceived ability to achieve good results; rank order of enjoyment of researching, designing, making and evaluating; number of projects incomplete; level of boredom

Pupil Code 7.01 | F | Total Score 103 /120

	Enjoyment	Independence from Teacher	Achieving Good Results	
SP1 / SP2 / SP3	4	4	4	Selecting project
RP1 / RP2 / RP3	2	4	2	Researching project
TS1 / TS2 / TS3	2	4	4	Thinking of solutions
WI1 / WI2 / WI3	3	4	4	Detailing chosen idea
MS1 / MS2 / MS3	3	2	4	Making final solution
MW1 / MW2 / MW3	4	3	3	Making solution work
EP1 / EP2 / EP3	2	4	4	Evaluating project
UW1 / UW2 / UW3	4	3	4	Using tools and equipment
PW1 / PW2 / PW3	3	3	4	Putting together folio
WR1 / WR2 / WR3	4	4	4	Writing report
	31	35	37	TOTALS /40
	3.00	4.00	3.00	Researching
	2.67	3.67	4.00	Designing
	3.67	2.67	3.67	Making
	3.00	4.00	4.00	Evaluating

RANK ORDERS	Snap Decision on enjoyment of Process in General	Enjoyment of Various Aspects of the Process in Yr 10/11	Success in Achieving Good Results
Researching	3	2	4
Designing	2	4	1
Making	1	1	3
Evaluating	4	2	1

Number of Projects Incomplete 0 out of 2

Bored with Design 1

Pupil Code 36.22 | M | Total Score 28 /120

	Enjoyment	Independence from Teacher	Achieving Good Results	
SP1 / SP2 / SP3	2	1	4	Selecting project
RP1 / RP2 / RP3	1	1	1	Researching project
TS1 / TS2 / TS3	1	1	1	Thinking of solutions
WI1 / WI2 / WI3	1	1	1	Detailing chosen idea
MS1 / MS2 / MS3	0	1	1	Making final solution
MW1 / MW2 / MW3	0	1	1	Making solution work
EP1 / EP2 / EP3	0	1	1	Evaluating project
UW1 / UW2 / UW3	0	1	1	Using tools and equipment
PW1 / PW2 / PW3	0	1	1	Putting together folio
WR1 / WR2 / WR3	0	1	1	Writing report
	5	10	13	TOTALS /40
	1.50	1.00	2.50	Researching
	0.67	1.00	1.00	Designing
	0.00	1.00	1.00	Making
	0.00	1.00	1.00	Evaluating

RANK ORDERS	Snap Decision on enjoyment of Process in General	Enjoyment of Various Aspects of the Process in Yr 10/11	Success in Achieving Good Results
Researching	2	1	1
Designing	3	2	2
Making	1	3	2
Evaluating	4	4	2

Number of Projects Incomplete 5 out of 5

Bored with Design 2

Pupil Code 47.14 | M | Total Score 58 /120

	Enjoyment	Independence from Teacher	Achieving Good Results	
SP1 / SP2 / SP3	3	3		Selecting project
RP1 / RP2 / RP3	2	2		Researching project
TS1 / TS2 / TS3	3	2		Thinking of solutions
WI1 / WI2 / WI3	3	3		Detailing chosen idea
MS1 / MS2 / MS3	3	3		Making final solution
MW1 / MW2 / MW3	4	3		Making solution work
EP1 / EP2 / EP3	4	3		Evaluating project
UW1 / UW2 / UW3	4	4		Using tools and equipment
PW1 / PW2 / PW3	3	2		Putting together folio
WR1 / WR2 / WR3	2	2		Writing report
	31	27		TOTALS /40
	2.50	2.50		Researching
	3.00	2.33		Designing
	3.67	3.33		Making
	3.00	2.50		Evaluating

RANK ORDERS	Snap Decision on enjoyment of Process in General	Enjoyment of Various Aspects of the Process in Yr 10/11	Success in Achieving Good Results
Researching	4	4	
Designing	2	2	
Making	1	1	
Evaluating	3	3	

Number of Projects Incomplete 2 out of 5

Bored with Design 1

Example of data base showing individual pupil responses to: total score for enjoyment/ independence/ capability to achieve a good result; level of boredom; enjoyment of solving problems; if and when extra work was done; parental interest.

Pupil Code 32.15 M

	Score Max 40
Enjoyment of Project work	19
Independence from teachers help	31
Pupil perception of their Capability to achieve good results	28

Boredom with Project work	Not bored	A little bored	Very bored
		1	

Enjoying Solving problems oneself	always	sometimes	never
In the Classroom		1	
At Home	1		

Carrying out extra work in school	1
Carrying out extra work at home	1
Parents interested in the project	1
Recieving help from parents	1

Pupil Code 32.16 M

	Score Max 40
Enjoyment of Project work	34
Independence from teachers help	32
Pupil perception of their Capability to achieve good results	29

Boredom with Project work	Not bored	A little bored	Very bored
		1	

Enjoying Solving problems oneself	always	sometimes	never
In the Classroom		1	
At Home		1	

Carrying out extra work in school	1
Carrying out extra work at home	1
Parents interested in the project	1
Recieving help from parents	1

Example of data base showing individual pupil responses to: reasons for boredom and whether those pupils who were bored, were a little bored or very bored

Pupil Code 7.02 F Not bored 1 A little bored Very bored

General	
	Everything
	Theory
	Design in general
	When finished before the deadline with nothing to do
	When stuck and it takes a long time to move forward
The Design Process	
	Analysis and Specification
	Research
	Evaluation
	Thinking of a problem to solve
	Coming up with ideas
	Thinking of many initial ideas
	Developing the chosen idea
	Choosing the final solution
	The final solution
Designing	Having to think of lots of ideas when I know which one I am going to do
	Drawing
	Writing
	Paperwork
	Working out the dimensions
	Working drawings
Making	
	Practical
	Measuring
	Waiting for materials
	Sanding
	Filing
General	All of it
	The slowness of the process
Teacher	Teachers inputs
Design Process	Research
	Designing
	Making
	Evaluating
	Writing
	Working Drawings
Enjoy trying to solve difficulties in the Classroom 1	At home 1

Pupil Code 7.03 F Not bored A little bored 1 Very bored

General	
	Everything
	Theory
	Design in general
	When finished before the deadline with nothing to do
	When stuck and it takes a long time to move forward
The Design Process	
	Analysis and Specification
	Research
	Evaluation
	Thinking of a problem to solve
	Coming up with ideas
	Thinking of many initial ideas
	Developing the chosen idea
	Choosing the final solution
	The final solution
Designing 1	Having to think of lots of ideas when I know which one I am going to do
1	Drawing
	Writing
	Paperwork
	Working out the dimensions
	Working drawings
Making	
	Practical
	Measuring
	Waiting for materials
	Sanding
	Filing
General	All of it
	The slowness of the process
Teacher	Teachers inputs
Design Process	Research
	Designing
	Making
	Evaluating
	Writing
	Working Drawings
Enjoy trying to solve difficulties in the Classroom 1	At home 1

cont

Pupil Code 7.05 M	Not bored	A little bored	Very bored 1
General			
	Everything		
	Theory		
	Design in general		
	When finished before the deadline with nothing to do		
	When stuck and it takes a long time to move forward		
The Design Process			
	Analysis and Specification		
	Research		
	Evaluation		
	Thinking of a problem to solve		
	Coming up with ideas		
	Thinking of many initial ideas		
	Developing the chosen idea		
	Choosing the final solution		
	The final solution		
Designing	Having to think of lots of ideas when I know which one I am going to do		
	Drawing		
	Writing		
	Paperwork		
	Working out the dimensions		
	Working drawings		
Making			
	Practical		
	Measuring		
	Waiting for materials		
	Sanding		
	Filing		
General	All of it		
	The slowness of the process		
Teacher	Teachers inputs		
Design Process 1	1 Research		
	Designing		
	Making		
	Evaluating		
	Writing		
	Working Drawings		
Enjoy trying to solve difficulties			
In the Classroom 1	**At home** 1		

General	22			
		1	Everything	
		5	Theory	
		14	Design in general	
		1	When finished before the *deadline with nothing to do*	
		1	When stuck and it takes a long time to move forward	
The Design Process	57			
		3	Analysis and Specification	
		17	Research	
		14	Evaluation	
		1	Thinking of a problem to solve	
		1	Coming up with ideas	
		11	Thinking of many initial ideas	
		4	Developing the chosen idea	
		2	Choosing the final solution	**A Little Bored**
		1	The final solution	
		5		
Designing	46			
		11	Drawing	
		22	Writing	
		6	Paperwork	
		3	Working out the dimensions	
		4	Working drawings	
Making	12			
		2	Practical	
		4	Measuring	
		2	Waiting for materials	
		3	Sanding	
		1	Filing	

General	18	15	All of it	
		3	The slowness of the process	
Teacher	1	1	Teachers inputs	
Design Process	15	5	Research	**Very Bored**
		2	Designing	
		2	Making	
		1	Evaluating	
		4	Writing	
		1	Working Drawings	

Enjoy trying to solve difficulties						
In the Classroom	37	123	12	**At home**	50	90	26

Example of data base showing individual pupil responses to: when extra time was spent on project work; parental interest details; details of help from parents.

Extra Time and Parental Help Given to Project Work

Pupil code 7.11	F

In School	N	0

How Often	When
twice a week	during lunch time
once a week	after school
twice a month	during private study
only when projects need finishing	during other lessons
whenever needed	Saturday morning
3/4 times a week	before school
as often as possible	

At Home	Y	1

Which Aspect of Project work? Max Score 3

selecting a project	3
research	3
designing	3
working out technical details	3
making your chosen design	1
evaluating your project	3
writing up your report	3
putting together your design folio	3

Are Parents interested in project work 2

Help from parents with project work 0

selecting a project	0
research	0
designing	0
working out technical details	0
making your chosen design	0
evaluating your project	0
writing up your report	0
putting together your design folio	0

Extra Time and Parental Help Given to Project Work

Pupil code 7.06	M

In School	Y	1

How Often		When	
twice a week		during lunch time	1
once a week		after school	
twice a month	1	during private study	
only when projects need finishing		during other lessons	
whenever needed		Saturday morning	
3/4 times a week		before school	
as often as possible			

At Home	N	0

Which Aspect of Project work?

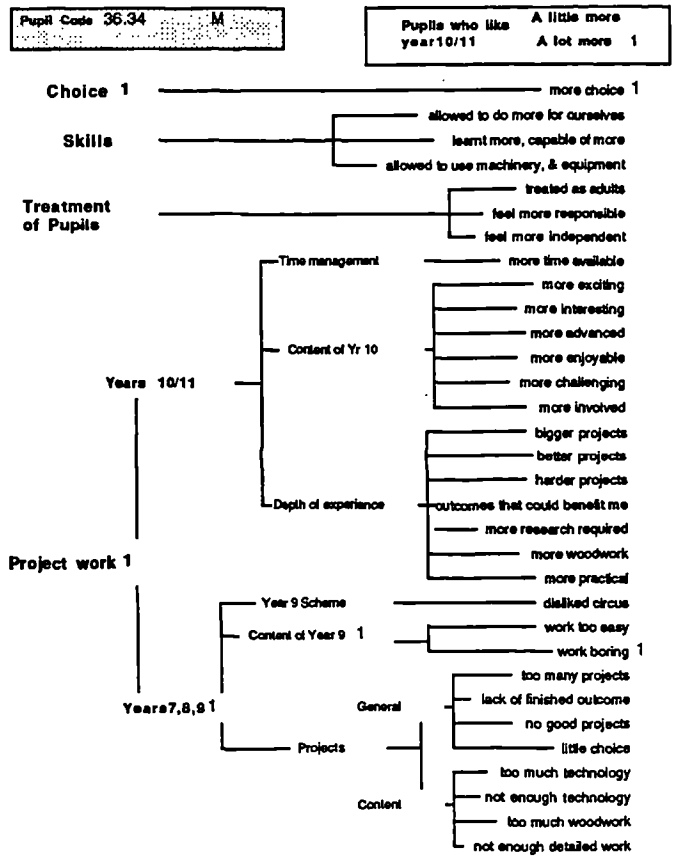
selecting a project	0
research	0
designing	0
working out technical details	0
making your chosen design	0
evaluating your project	0
writing up your report	0
putting together your design folio	0

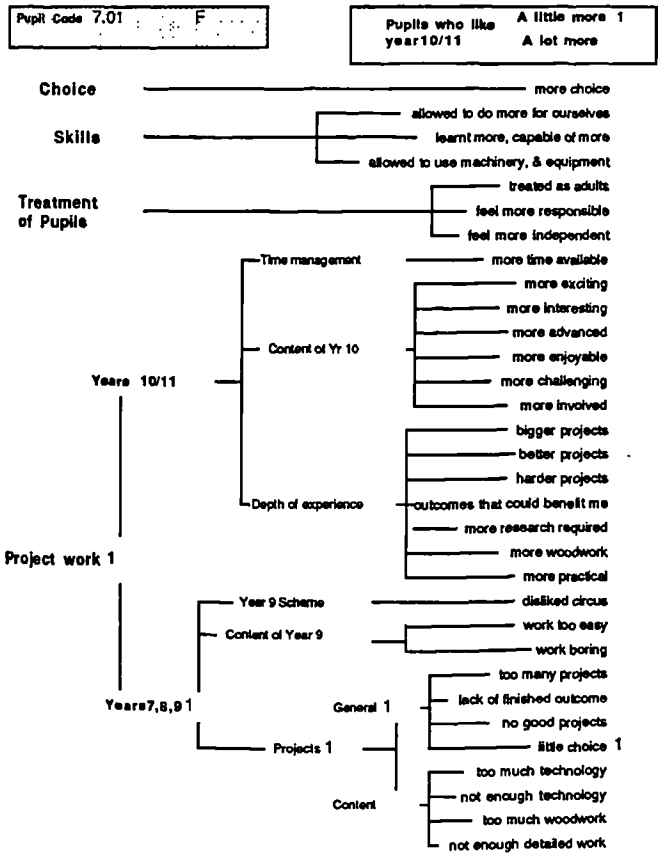
Are Parents interested in project work 0 0

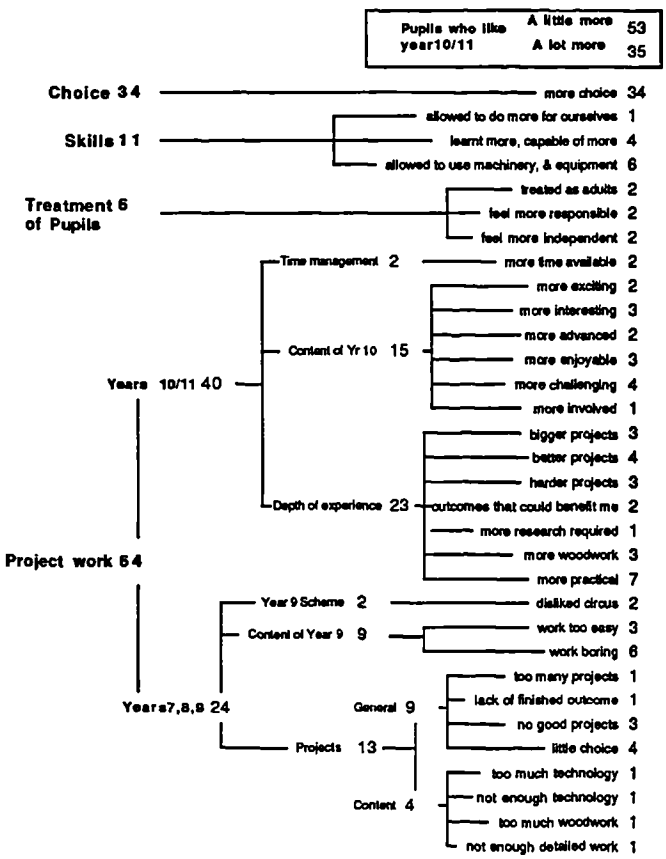
Help from parents with project work 0

selecting a project	0
research	0
designing	0
working out technical details	0
making your chosen design	0
evaluating your project	0
writing up your report	0
putting together your design folio	0

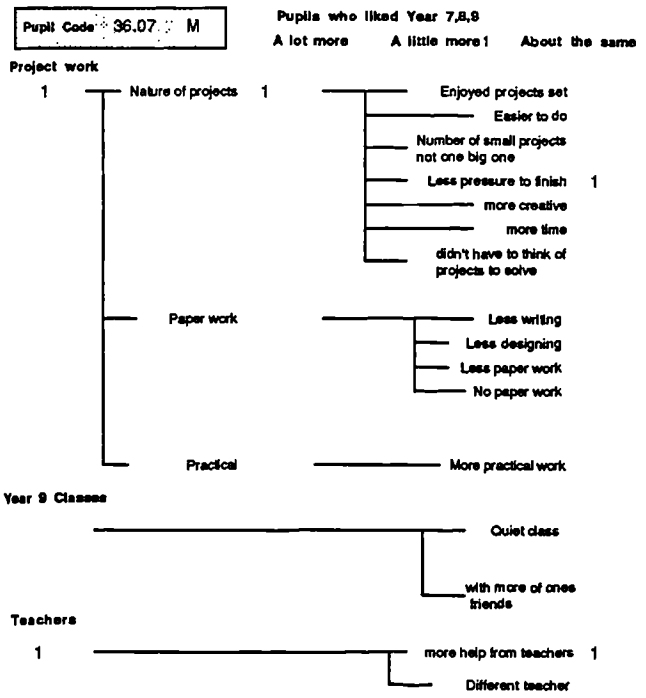
Example of data base showing individual pupil responses to: reasons why pupils liked Years 10 and 11 more than Years 7 - 9.

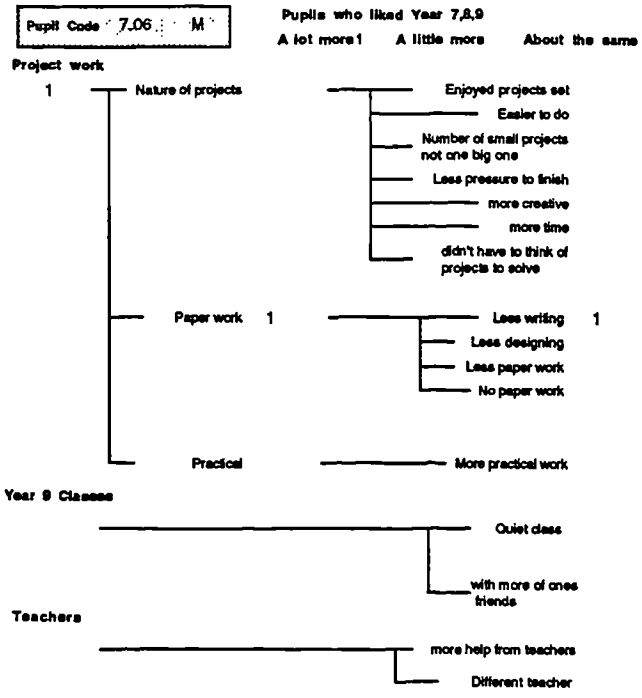


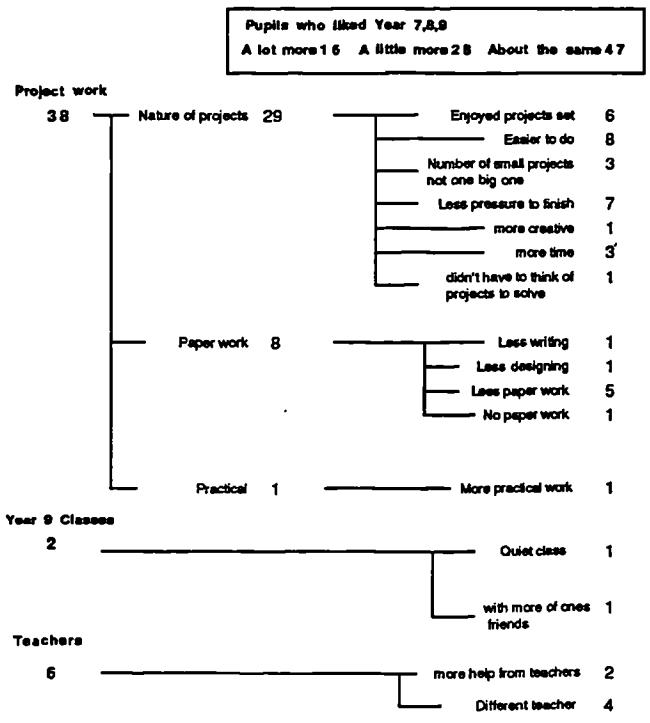




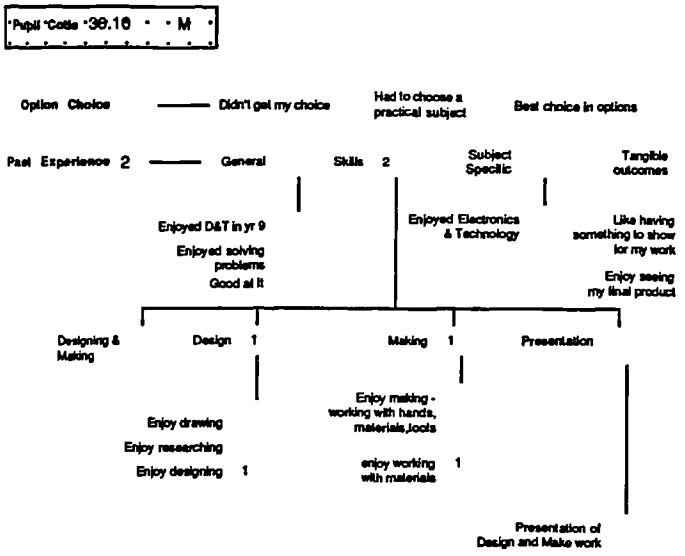
Example of data base showing individual pupil responses to: reasons why pupils liked Years 7 - 9 more than Years 10 and 11.

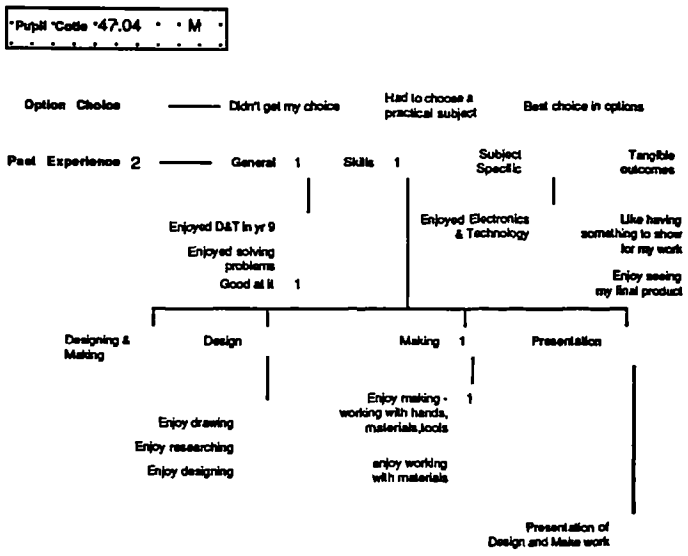


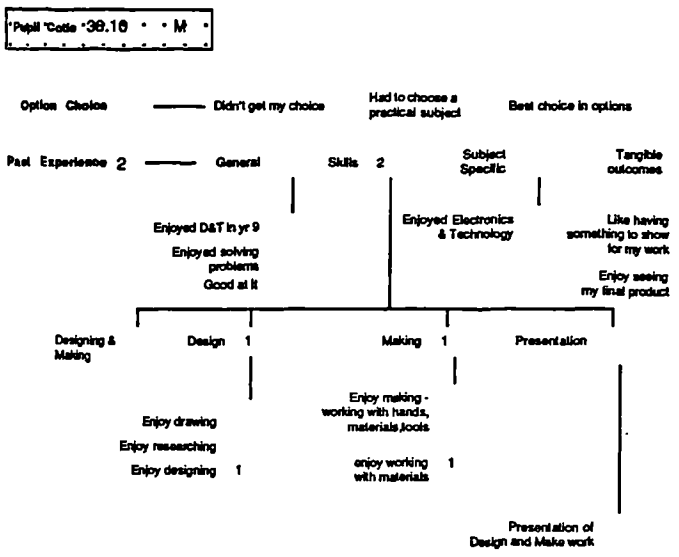


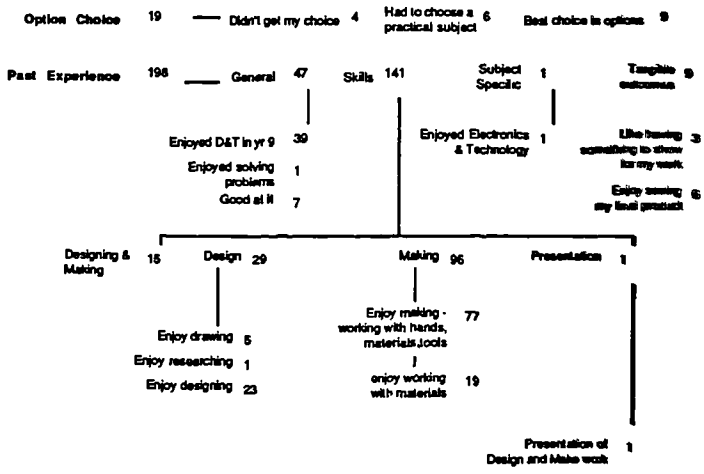


Example of data base showing individual pupil responses to: reasons why pupils chose design and realisation to take for their GCSE examination.

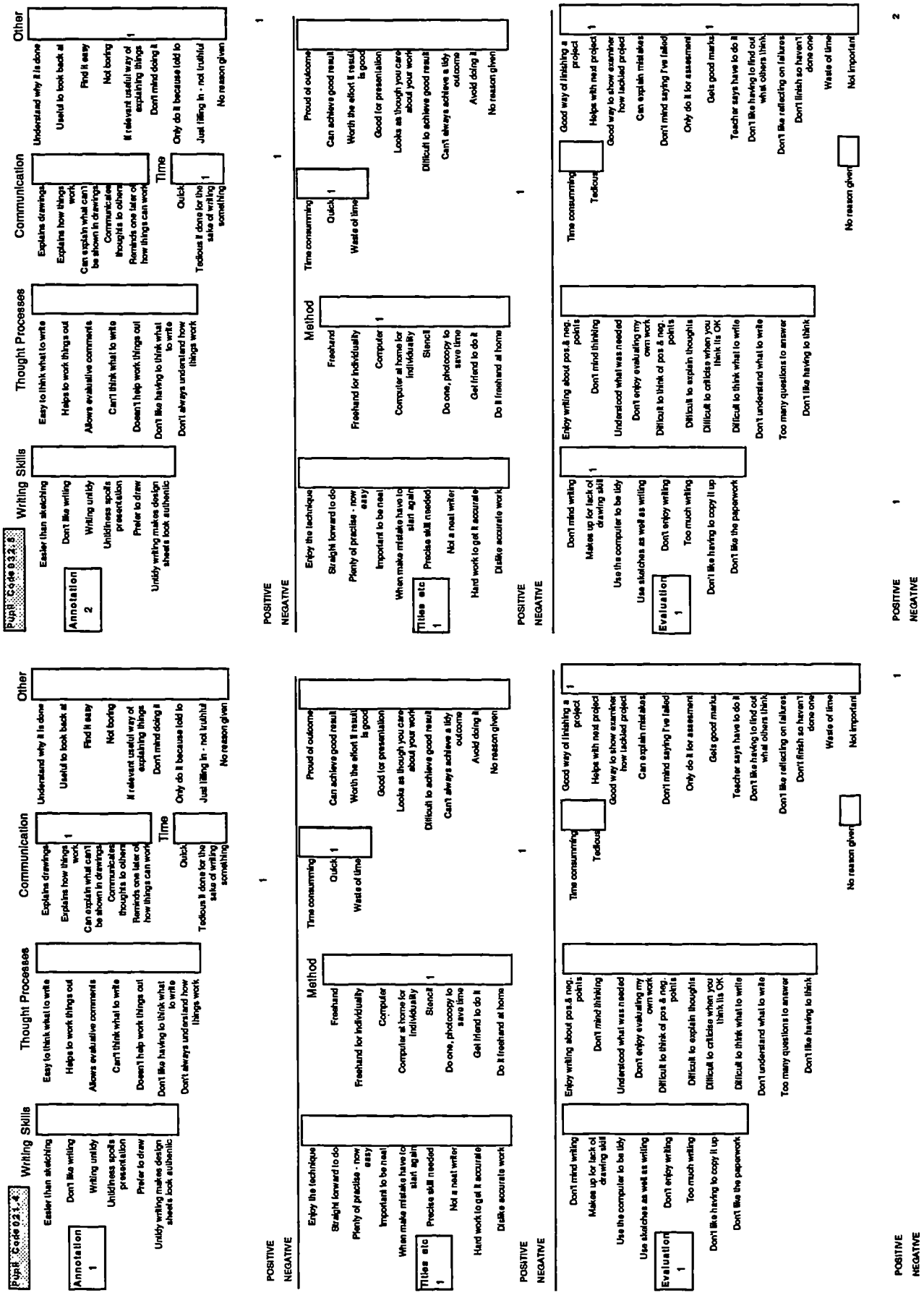




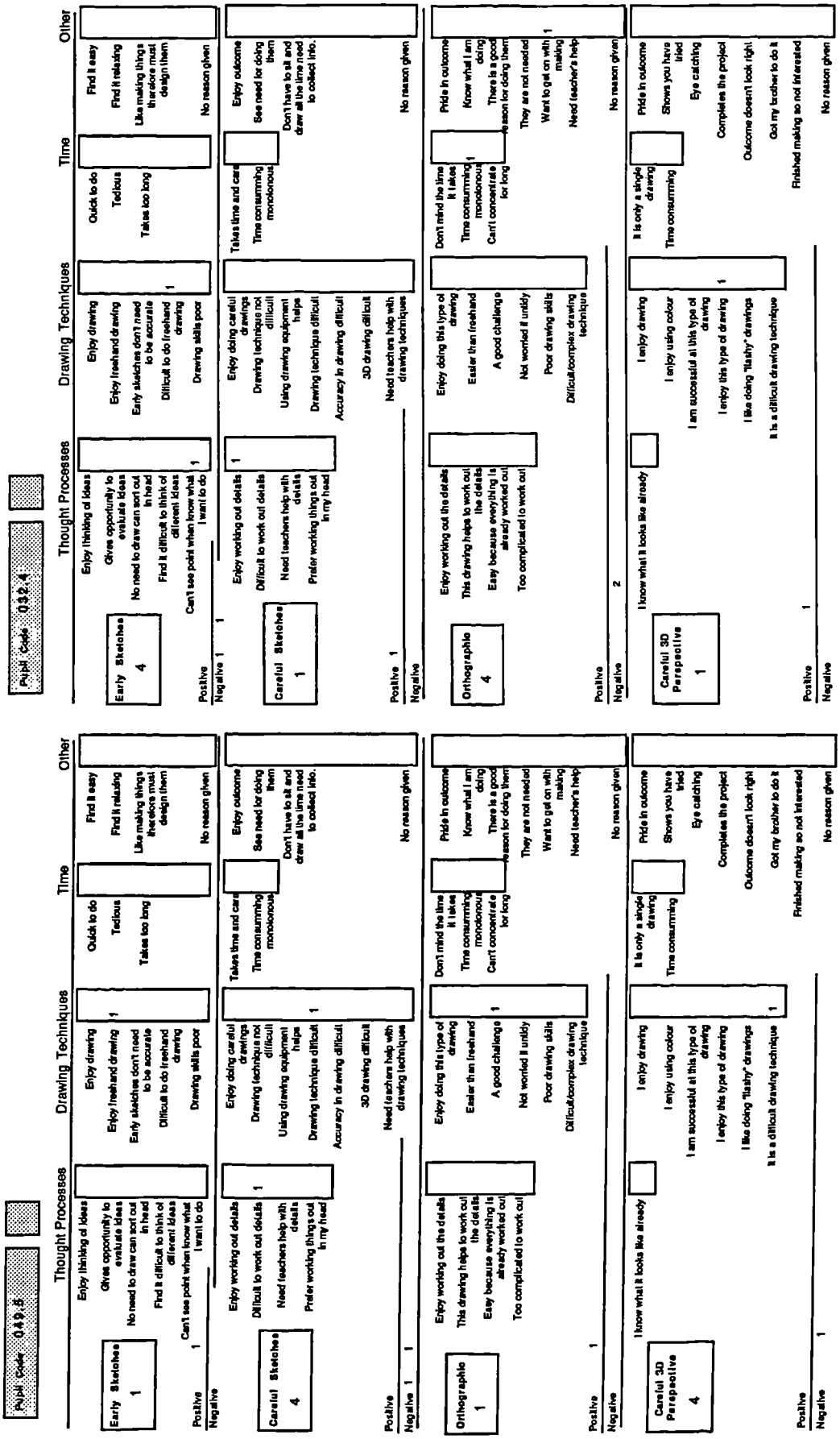




Example of data base showing individual pupil responses to: positive and negative comments regarding the use of written communication during designing.



Example of data base showing individual pupil responses to: positive and negative comments regarding the use of drawn communication during designing.



Example of data base showing individual pupil responses to: whether pupils had enjoyed designing or making the most; whether they were pleased with their design work; information about early ideas; how they developed their chosen idea; whether they used Orthographic drawing; how they worked out their material sizes.

Pupil Code 035.1

Which did you enjoy mostdesigning or making?

A
- Enjoyed making more than designing
- Enjoyed making a lot more than designing
- Enjoyed designing more than making
- Enjoyed designing and making equally
- Disliked designing and making equally 1

Were you pleased with your design work?

- Please with design work 1
- Its OK
- Not pleased with design work
- It's the best set Iv'e done 1
- Only because its for the examination
- Iv'e tried hard
- Wouldn't do it differently
- Teacher thought I could have done better

B
- Wish I could draw better
- I'm pleased with my ideas
- Wish I had had more time
- I would add more colour to my work if I had time
- I have covered all the areas I need to
- I could have done better
- I have been given a poor mark
- The design work is not as good as I did last year

Your initial design ideas

- Only one idea
- Two ideas
- No help from the teacher
- Best set done
- Only because of the examination
- Knew what I wanted to do
- Brother helped
- Four ideas
- Number of ideas 1
- Teacher added some ideas

Negative responses
- Couldn't think beyond one idea
- Teacher helped
- Parents helped
- Peers helped
- Thin on ideas
- Made up ideas to suit final idea
- Did several ideas - waste of time as knew what I wanted to do
- Evidence of design work thin
- Chose wrong project to do
- Didn't bother to keep work

How did you develop your chosen idea? D
- Did a number of drawings
- It was difficult to work out how to make it
- Enjoyed working it all out
- Only did one drawing 1
- Only did one drawing with sizes on
- I haven't done that yet
- Did no drawings I sorted out problems whilst I made it
- Minimal development
- I did no drawing as it was in my head
- I didn't know how to
- Did two drawings
- Negative responses 1

Did you do an Orthographic Drawing? E
- Didn't do any
- Did an orthographic drawing 1
- Only did it because of examination
- worked from dimensioned sketch
- will do it later for extra marks

How did you work out Material Sizes F
- teacher gave me the sizes
- worked them out for myself 1
- measured relevant components
- made a full size template
- made a 3D model to help
- used information from last project
- Worked them out by trial and error
- Looked it up in books

Pupil Code 049.5

Which did you enjoy mostdesigning or making?

A
- Enjoyed making more than designing 1
- Enjoyed making a lot more than designing
- Enjoyed designing more than making
- Enjoyed designing and making equally
- Disliked designing and making equally

Were you pleased with your design work?

- Please with design work
- Its OK 1
- Not pleased with design work
- It's the best set Iv'e done
- Only because its for the examination
- Iv'e tried hard
- Wouldn't do it differently
- Teacher thought I could have done better

B
- Wish I could draw better
- I'm pleased with my ideas
- Wish I had had more time
- I would add more colour to my work if I had time
- I have covered all the areas I need to
- I could have done better 1
- I have been given a poor mark
- The design work is not as good as I did last year

Your initial design ideas

- Only one idea
- Two ideas
- No help from the teacher
- Best set done
- Only because of the examination
- Knew what I wanted to do
- Brother helped
- Four ideas 1
- Number of ideas
- Teacher added some ideas

Negative responses
- Couldn't think beyond one idea
- Teacher helped
- Parents helped
- Peers helped
- Thin on ideas
- Made up ideas to suit final idea
- Did several ideas - waste of time as knew what I wanted to do
- Evidence of design work thin
- Chose wrong project to do
- Didn't bother to keep work

How did you develop your chosen idea? D
- Did a number of drawings 1
- It was difficult to work out how to make it
- *Enjoyed working it all out*
- Only did one drawing
- Only did one drawing with sizes on
- I haven't done that yet
- Did no drawings I sorted out problems whilst I made it
- Minimal development
- I did no drawing as it was in my head
- I didn't know how to
- Did two drawings
- Negative responses

Did you do an Orthographic Drawing? E
- Didn't do any
- Did an orthographic drawing 1
- *Only did it because of examination*
- worked from dimensioned sketch
- will do it later for extra marks

How did you work out Material Sizes F
- teacher gave me the sizes 1
- worked them out for *myself*
- measured relevant components
- made a full size template
- made a 3D model to help
- used information from last project
- Worked them out by trial and error
- Looked it up in books

Example of data base showing individual pupil responses to: whether pupils had finished their project; whether they had enjoyed making it; reasons for enjoyment or otherwise; whether they were pleased with the outcome; what difficulties they had encountered whilst making their project.

Student Code 031.4

Is the project finished?

Finished	1
Almost	
Not nearly	
Not started	
Relying on folio	

Did you enjoy making it?

Enjoyed it	1
Didn't enjoy it	
OK	
Enjoyed more than year10	
Too much drawing last year	
No answer	
Enjoyed last project more	
Enjoyed it till it went wrong	

What reasons given for enjoyment or otherwise

Enjoyed it more than any other project	It looks good now its complete
I chose it	I enjoyed construction - cutting joints
Because it worked	I learnt a lot
Because I needed one	Its better than drawing
I like using the tools	Because of the difficulties I encountered
I like putting things together	I learnt how to use more tools
No reason given	I enjoyed soldering
Enjoy working with wood 1	I enjoyed welding
I like seeing it finished	I enjoyed using my hands
I dislike making	I was proud of it
I enjoy using materials	I find it easy
I enjoy seeing the end product	I had to rush - time management
Exam pressure	I wasn't entered so didn't see the point

Were you pleased with your outcome?

Yes	1
No	
Don't know	
Could do better	
Wish it was better	

What difficulties did you encounter whilst making it

Inaccuracy 1	Timber didn't come
No mention of any difficulty	Change in school - gap in knowledge base
Manufacturing skills - casting	Didn't take enough time and care
Manufacturing skills - wood - chipped it	Not well finished
Could use tools properly	Manufacturing skills - sawing skills poor
Hadn't worked things out carefully	Took too long
Unhappy with outcome	Designing took too long
	Too big a project

Student Code 007.1

Is the project finished?

Finished	
Almost	
Not nearly	1
Not started	
Relying on folio	

1

Did you enjoy making it?

Enjoyed it	
Didn't enjoy it	
OK	
Enjoyed more than year10	
Too much drawing last year	
No answer	
Enjoyed last project more	
Enjoyed it till it went wrong	1

What reasons given for enjoyment or otherwise

Enjoyed it more than any other project	It looks good now its complete
I chose it	I enjoyed construction - cutting joints
Because it worked	I learnt a lot
Because I needed one	Its better than drawing
I like using the tools	Because of the difficulties I encountered 1
I like putting things together	I learnt how to use more tools
No reason given	I enjoyed soldering
Enjoy working with wood	I enjoyed welding
I like seeing it finished	I enjoyed using my hands
I dislike making	I was proud of it
I enjoy using materials	I find it easy
I enjoy seeing the end product	I had to rush - time management
Exam pressure	I wasn't entered so didn't see the point

Were you pleased with your outcome?

Yes	
No	1
Don't know	
Could do better	
Wish it was better	

1

What difficulties did you encounter whilst making it

Inaccuracy	Timber didn't come
No mention of any difficulty	Change in school - gap in knowledge base
Manufacturing skills - casting	Didn't take enough time and care
Manufacturing skills - wood - chipped it	Not well finished
Could use tools properly 1	Manufacturing skills - sawing skills poor
Hadn't worked things out carefully	Took too long
Unhappy with outcome	Designing took too long
	Too big a project

Example of data base showing individual pupil responses to: a summary of positive comments

Pupil Code 035.4	Positive Comments			
General Questions		Pupils own choice	Given context	1
			Would choose D & R again	1
		Pleased with Designing 1	Enjoyed Making	1
			Found it easy to choose a project	1
			Finished making project	1
			Pleased with the outcome	1
Perceived achievement			Very well	
			Well	1
			Average	
			Not so well	
Designing or Making			Enjoyed making more than designing	1
			Enjoyed designing more than making	
Research			Thought research was important	
			Enjoyed doing the research	
Drawing - Initial Ideas			Produced a number of ideas	
			Enjoyed thought processes involved in thinking of ideas	
			Enjoyed drawing technique	1
			Other general positive comments - quick to do etc.	
Drawing - Careful sketches			Did a number of drawings to develop their chosen idea	
			Enjoyed thought processes involved in working out details	
			Enjoyed drawing techniques	
			Other general positive comments - can see the need to do them etc.	1
Drawing - Orthographic drawing			Did an Orthographic drawing	
			Enjoyed thought processes involved in working out details	
			Enjoyed orthographic drawing techniques	
			Other general positive comments - proud of outcome etc.	
Drawing - Careful perspective		Enjoyed drawing techniques involved in careful perspective drawing		1
			Other general positive comments - proud of the outcome etc.	
Writing - Initial ideas			Positive comments regarding writing skills on early sketches	
			Positive comments on thought processes involved when annotating early sketches	
			Positive comments regarding the suitability of communicating by use of annotations	
			Annotating is quick and easy to do	
			Other positive comments regarding annotation on early ideas	
Writing - Careful writing, titles etc			Positive comments regarding the skills involved in producing careful lettering	
			Positive comments regarding the speed at which one could ahieve an outcome	
			Other positive comments regarding producing careful lettering	
Writing - Evaluations			Positive comments regarding the writing skill needed to complete an evaluation	
			Positive comments regarding the thought processes involved in writing evaluations	
			Other postive comments regarding evaluations	

Pupil Code 036.3	Positive Comments			
General Questions		Pupils own choice 1	Given context	
			Would choose D & R again	
		Pleased with Designing 1	Enjoyed Making	
			Found it easy to choose a project	
			Finished making project	
			Pleased with the outcome	
Perceived achievement			Very well	
			Well	
			Average	
			Not so well	
Designing or Making			Enjoyed making more than designing	
			Enjoyed designing more than making	
Research			Thought research was important	
			Enjoyed doing the research	
Drawing - Initial Ideas			Produced a number of ideas	
			Enjoyed thought processes involved in thinking of ideas	
			Enjoyed drawing technique	
			Other general positive comments - quick to do etc.	
Drawing - Careful sketches			Did a number of drawings to develop their chosen idea	1
			Enjoyed thought processes involved in working out details	
			Enjoyed drawing techniques	
			Other general positive comments - can see the need to do them etc.	
Drawing - Orthographic drawing			Did an Orthographic drawing	1
			Enjoyed thought processes involved in working out details	
			Enjoyed orthographic drawing techniques	
			Other general positive comments - proud of outcome etc.	
Drawing - Careful perspective		Enjoyed drawing techniques involved in careful perspective drawing		
			Other general positive comments - proud of the outcome etc.	
Writing - Initial ideas			Positive comments regarding writing skills on early sketches	
			Positive comments on thought processes involved when annotating early sketches	
			Positive comments regarding the suitability of communicating by use of annotations	
			Annotating is quick and easy to do	
			Other positive comments regarding annotation on early ideas	
Writing - Careful writing, titles etc			Positive comments regarding the skills involved in producing careful lettering	
			Positive comments regarding the speed at which one could ahieve an outcome	
			Other positive comments regarding producing careful lettering	
Writing - Evaluations			Positive comments regarding the writing skill needed to complete an evaluation	
			Positive comments regarding the thought processes involved in writing evaluations	
			Other postive comments regarding evaluations	

cont.

Summary of Positive Comments		
General Questions	Pupils own choice 30 Given context	10
	Would choose D & R again	25
	Pleased with Designing 19 Enjoyed Making	26
	Found it easy to choose a project	21
	Finished making project	24
	Pleased with the outcome	23
Perceived achievement	Very well	1
	Well	7
	Average	19
	Not so well	8
Designing or Making	Enjoyed making more than designing	32
	Enjoyed designing more than making	6
Research	Thought research was important	25
	Enjoyed doing the research	20
Drawing - Initial Ideas	Produced a number of ideas	19
	Enjoyed thought processes involved in thinking of ideas	12
	Enjoyed drawing technique	15
	Other general positive comments - quick to do etc.	
Drawing - Careful sketches	Did a number of drawings to develop their chosen idea	21
	Enjoyed thought proceses involved in working out details	3
	Enjoyed drawing techniques	4
	Other general positive comments - can see the need to do them etc.	9
Drawing - Orthographic drawing	Did an Orthographic drawing	20
	Enjoyed thought processes involved in working out details	4
	Enjoyed orthographic drawing techniques	6
	Other general positive comments - proud of outcome etc.	7
Drawing - Careful perspective	Enjoyed drawing techniques involved in careful perspective drawing	11
	Other general positive comments - proud of the outcome etc.	11
Writing - Initial ideas	Positive comments regarding writing skills on early sketches	1
	Positive comments on thought processes involved when annotating early sketches	8
	Positive comments regarding the suitability of communicating by use of annotations	10
	Annotating is quick and easy to do	2
	Other positive comments regarding annotation on early ideas	10
Writing - Careful writing, titles etc	Positive comments regarding the skills involved in producing careful lettering	8
	Positive comments regarding the speed at which one could ahieve an outcome	4
	Other positive comments regarding producing careful lettering	13
Writing - Evaluations	Positive comments regarding the writing skill needed to complete an evaluation	2
	Positive comments regarding the thought proceses involved in writing evaluations	4
	Other postive comments regarding evaluations	14

Example of data base showing individual pupil responses to: a summary of negative comments

Pupil Code 049.5		
	Pupil's own choice 1	Given context
General Questions		Would not choose D&R again
		Not pleased with designing
		Did not enjoy making
		Found it difficult to choose major project 1
		Did not finish major project 1
		Was not pleased with final outcome 1
Perceived achievement		Very well
		Well
		Average 1
		Not so well
		Not well at all
Designing or Making		Enjoyed making more than designing 1
		Enjoyed designing more than making
Research		Did not think research was important
		Did not enjoy doing research
Drawing - Initial Ideas		Negative comments regarding usefulness of drawing initial ideas
		Did not enjoy thinking of ideas
		Did not enjoy drawing initial ideas
		Other negative comments regarding initial ideas - tedious etc
Drawing - Careful sketches		Negative comments regarding usefulness of developing ideas on paper
		Did not enjoy working out details 1
		Did not enjoy this type of drawing 1
		Other negative comments regarding developing ideas - Time consumming etc.
Drawing - Orthographic drawing		Did not do an orthographic drawing
		Do not enjoy the thought processes involved
		Do not enjoy the drawing technique involved
		Other general negative comments - Not needed, time consumming etc
Drawing - Careful perspective		Negative comments regarding its usefulness
		Difficulties with drawing technique 1
		Other general negative comments - time consumming etc
Writing - Initial ideas		negative comments regarding writing skills on early sketches
		Negative comments on thought processes involved when annotating early sketches
		Negative comments regarding amount of time wasted on annotation
		Other negative comments - not truthful etc
Writing - Careful writing, titles etc		negative comments regarding the skills required to produce careful lettering
		Negative comments regarding the time taken to produce the careful lettering
		Other negative comments regarding careful lettering - avoid ding it etc.
Writing - Evaluations		Negative comments regarding writing skills needed to complete an evaluation
		Negative comments regarding the thought processes involved in evaluations
		Negative comments regarding amount of time spent on evaluations
		Other general negative comments regarding evaluations - only do it for assessment purposes etc. 1

Pupil Code 036.1		
	Pupil's own choice	Given context 1
General Questions		Would not choose D&R again
		Not pleased with designing 1
		Did not enjoy making
		Found it difficult to choose major project 1
		Did not finish major project 1
		Was not pleased with final outcome
Perceived achievement		Very well
		Well
		Average
		Not so well
		Not well at all 1
Designing or Making		Enjoyed making more than designing
		Enjoyed designing more than making 1
Research		Did not think research was important
		Did not enjoy doing research
Drawing - Initial Ideas		Negative comments regarding usefulness of drawing initial ideas 1
		Did not enjoy thinking of ideas
		Did not enjoy drawing initial ideas
		Other negative comments regarding initial ideas - tedious etc
Drawing - Careful sketches		Negative comments regarding usefulness of developing ideas on paper 1
		Did not enjoy working out details
		Did not enjoy this type of drawing
		Other negative comments regarding developing ideas - Time consumming etc.
Drawing - Orthographic drawing		Did not do an orthographic drawing 1
		Do not enjoy the thought processes involved
		Do not enjoy the drawing technique involved
		Other general negative comments - Not needed, time consumming etc
Drawing - Careful perspective		Negative comments regarding its usefulness
		Difficulties with drawing technique
		Other general negative comments - time consumming etc
Writing - Initial ideas		negative comments regarding writing skills on early sketches
		Negative comments on thought processes involved when annotating early sketches
		Negative comments regarding amount of time wasted on annotation
		Other negative comments - not truthful etc 1
Writing - Careful writing, titles etc		negative comments regarding the skills required to produce careful lettering
		Negative comments regarding the time taken to produce the careful lettering
		Other negative comments regarding careful lettering - avoid ding it etc.
Writing - Evaluations		Negative comments regarding writing skills needed to complete an evaluation
		Negative comments regarding the thought processes involved in evaluations 1
		Negative comments regarding amount of time spent on evaluations
		Other general negative comments regarding evaluations - only do it for assessment purposes etc.

cont.

Summary of Negative Comments			
General Questions	Pupil's own choice 30	Given context	10
		Would not choose D&R again	11
		Not pleased with designing	13
		Did not enjoy making	4
		Found it difficult to choose major project	14
		Did not finish major project	17
		Was not pleased with final outcome	6
Perceived achievement		Very well	1
		Well	7
		Average	19
		Not so well	8
		Not well at all	5
Designing or Making		Enjoyed making more than designing	32
		Enjoyed designing more than making	6
Research		Did not think research was important	13
		Did not enjoy doing research	17
Drawing - Initial ideas		Negative comments regarding usefulness of drawing initial ideas	26
		Did not enjoy thinking of ideas	9
		Did not enjoy drawing initial ideas	11
		Other negative comments regarding initial ideas - tedious etc	3
Drawing - Careful sketches		Negative comments regarding usefulness of developing ideas on paper	20
		Did not enjoy working out details	11
		Did not enjoy this type of drawing	12
		Other negative comments regarding developing ideas - Time consumming etc.	9
Drawing - Orthographic drawing		Did not do an orthographic drawing	20
		Do not enjoy the thought processes involved	2
		Do not enjoy the drawing technique involved	11
		Other general negative comments - Not needed, time consumming etc	11
Drawing - Careful perspective		Negative comments regarding its usefulness	1
		Difficulties with drawing technique	8
		Other general negative comments - time consumming etc	8
Writing - Initial ideas		negative comments regarding writing skills on early sketches	11
		Negative comments on thought processes involved when annotating early sketches	4
		Negative comments regarding amount of time wasted on annotation	2
		Other negative comments - not truthful etc	9
Writing - Careful writing, titles etc		negative comments regarding the skills required to produce careful lettering	7
		Negative comments regarding the time taken to produce the careful lettering	8
		Other negative comments regarding careful lettering - avoid ding it etc.	6
Writing - Evaluations		Negative comments regarding writing skills needed to complete an evaluation	6
		Negative comments regarding the thought processes involved in evaluations	14
		Negative comments regarding amount of time spent on evaluations	9
		Other general negative comments regarding evaluations - only do it for assessment purposes etc.	19

Example of data base showing individual pupil responses to: was the research stage tackled; where was the research carried out; was it important; was it enjoyed; what sources were used; was analysis carried out.

Pupil Code 031.4

Was the the research tackled?	
Did no research	
Did it because told to	
Did it	1
Did it because it was for the examination	
Mother collected it	
Where was the research carried out?	
School only	
Home and School	1
Home,School and Library	
School, home and club	
Home only	
School and shops	
Shops and Library	
Was it important?	
Thought research was an important part of the design process	1
was un-important	
was a waste of time	
Was it enjoyed?	
Enjoyed doing the research	1
Didn't enjoy doing the research	
Not bothered	
What sources were used?	
Catalogues	
Anthropometric data	
Collected relevant sizes of components	1
Hand outs on manufacturing methods	
Letters to companies	
Books	
Looked at existing products	
Found little information	
Was analysis carried out?	
Did some analysis	
Did very little analysis	
Did no analysis	1
Didn't understand what I had to do	
Didn't enjoy doing it	
I will analyse it when I am completing my folio	

Pupil Code 032.2

Was the the research tackled?	
Did no research	
Did it because told to	
Did it	1
Did it because it was for the examination	
Mother collected it	
Where was the research carried out?	
School only	
Home and School	
Home,School and Library	
School, home and club	
Home only	
School and shops	
Shops and Library	1
Was it important?	
Thought research was an important part of the design process	1
was un-important	
was a waste of time	
Was it enjoyed?	
Enjoyed doing the research	1
Didn't enjoy doing the research	
Not bothered	
What sources were used?	
Catalogues	
Anthropometric data	
Collected relevant sizes of components	
Hand outs on manufacturing methods	
Letters to companies	
Books	1
Looked at existing products	1
Found little information	
Was analysis carried out?	
Did some analysis	
Did very little analysis	
Did no analysis	1
Didn't understand what I had to do	
Didn't enjoy doing it	
I will analyse it when I am completing my folio	

Was the the research tackled?	
Did no research	2
Did it because told to	7
Did it	26
Did it because it was for the examination	5
Mother collected it	
Where was the research carried out?	
School only	10
Home and School	19
Home,School and Library	2
School, home and club	1
Home only	3
School and shops	2
Shops and Library	1
Was it important?	
Thought research was an important part of the design process	25
was un-important	11
was a waste of time	2
Was it enjoyed?	
Enjoyed doing the research	20
Didn't enjoy doing the research	17
Not bothered	1
What sources were used?	
Catalogues	20
Anthropometric data	1
Collected relevant sizes of components	6
Hand outs on manufacturing methods	3
Letters to companies	5
Books	4
Looked at existing products	9
Found little information	2
Was analysis carried out?	
Did some analysis	16
Did very little analysis	14
Did no analysis	6
Didn't understand what I had to do	1
Didn't enjoy doing it	5
I will analyse it when I am completing my folio	1

Example of data base showing individual pupil responses to: questions concerning three dimensional modelling; how well pupils thought they had done; whether they would choose to take D&R again.

Pupil Code 035.5

Did you make models during the design process?		What type of model?	
Made models during the process	1	Card models	1
Didn't make models		Full size models	
Why did you make a model?			
Helped me sort out problems	1	Helped me see how big it was going to be	
Teacher told me to		Forgot to	
Didn't need one very straightforward		It would have helped	
Would't have helped me		No time	

How well do you feel you have done in your final project?		Would you choose to do D&R again?	
Very well		Yes	1
Well		No	
Average	1		
Not so well			
Not well at all			

Why?			
I enjoyed it		I didn't understand the other two	1
Designing didn't put me off		It gives you a chance to make things	
I didn't like the other choices		Possibly D&C - more drawing less making	
I enjoy designing and making		Like making things to take home	
I could have worked harder		Don't like it	
Quite happy with my choice		Good subject - not my scene	
Best lesson in the week		I would take technology	
I'd have taken a language instead		Know more about D&R	
Plus Technology and D&C		Fed up with the work	
I think so		No help from teachers	

Pupil Code 032.3

Did you make models during the design process?		What type of model?	
Made models during the process		Card models	
Didn't make models	1	Full size models	
Why did you make a model?			
Helped me sort out problems		Helped me see how big it was going to be	
Teacher told me to		Forgot to	
Didn't need one very straightforward		It would have helped	
Would't have helped me		No time	

How well do you feel you have done in your final project?		Would you choose to do D&R again?	
Very well		Yes	1
Well		No	
Average			
Not so well	1		
Not well at all			

Why?			
I enjoyed it		I didn't understand the other two	
Designing didn't put me off		It gives you a chance to make things	
I didn't like the other choices	1	Possibly D&C - more drawing less making	
I enjoy designing and making		Like making things to take home	
I could have worked harder		Don't like it	
Quite happy with my choice		Good subject - not my scene	
Best lesson in the week		I would take technology	
I'd have taken a language instead		Know more about D&R	
Plus Technology and D&C		Fed up with the work	
I think so		No help from teachers	

Summary of Results

Did you make models during the design process?		What type of model?	
Made models during the process	8	Card models	7
Didn't make models	32	Full size models	1
Why did you make a model?			
Helped me sort out problems	6	Helped me see how big it was going to be	1
Teacher told me to	1	Forgot to	1
Didn't need one very straightforward	5	It would have helped	2
Would't have helped me	4	No time	2

How well do you feel you have done in your final project?		Would you choose to do D&R again?	
Very well	1	Yes	24
Well	7	No	11
Average	19		
Not so well	8		
Not well at all	5		

Why?			
I enjoyed it	8	I didn't understand the other two	1
Designing didn't put me off	1	It gives you a chance to make things	3
I didn't like the other choices	4	Possibly D&C - more drawing less making	1
I enjoy designing and making	1	Like making things to take home	2
I could have worked harder	1	Don't like it	2
Quite happy with my choice	1	Good subject - not my scene	2
Best lesson in the week	1	I would take technology	1
I'd have taken a language instead	1	Know more about D&R	1
Plus Technology and D&C	1	Fed up with the work	3
I think so	1	No help from teachers	2

Example of data base showing individual pupil responses to: reasons for pupils choice of D & R; whether it had been easy to choose their project; how well they thought they had done in their project.

Pupil Code 032.3

Project Choice

Pupils own choice	Given context	School theme	Examination question
	1	1	

Was project choice easy?

YES	YES,but
personal need	teacher wanted me to do something else
something interested in	slow to think of idea
wide choice	had to change not enough research
parents need	
wrote out list and chose	
exam theme	
copied teachers brief	

NO	1	NO, but
difficult to think of an area	1	better than being told what to make
got idea from catalogue		teacher offered ideas
teacher wouldn't let me do any of my suggestions		
wrote out list but couldn't choose		
difficult to think of project that would get good marks		

Perception of how well they had done

Very well	Well	Average	Not so well	Not well at all
			1	

Pupil Code 007.5

Project Choice

Pupils own choice	Given context	School theme	Examination question
1			

Was project choice easy?

YES	YES,but
personal need	teacher wanted me to do something else
something interested in	slow to think of idea
wide choice	had to change not enough research
parents need	
wrote out list and chose	
exam theme	
copied teachers brief	

NO	1	NO, but
difficult to think of an area	1	better than being told what to make
got idea from catalogue		teacher offered ideas
teacher wouldn't let me do any of my suggestions		
wrote out list but couldn't choose		
difficult to think of project that would get good marks		

Perception of how well they had done

Very well	Well	Average	Not so well	Not well at all
1				

Example of the data base used for the information collected from the attitude questionnaire during Phase One and Phase Two.

1	4	43	1
2	2	44	1
3	2	45	1
4	1	46	1
5	4	47	4
6	2	48	2
7	1	49	2
8	1	50	1
9	2	51	4
10	1	52	1
11	2	53	1
12	1	54	2
13	1	55	2
14	1	56	1
15	4	57	2
16	1	58	1
17	1	59	1
18	4	60	1
19	1	61	1
20	2	62	1
21	2	63	1
22	2	64	1
23	4	65	5
24	1	66	1
25	1	67	1
26	1	68	1
27	2	69	2
28	2	70	2
29	1	71	1
30	1	72	2
31	1	73	1
32	2	74	1
33	1	75	2
34	1	76	2
35	2	77	4
36	3	78	1
37	4	79	1
38	1	80	1
39	2	81	1
40	1	82	1
41	2	83	2
42	2	84	2

Pupil Code 35.17

Recognising Opportunities	11
Setting Goals	11
Brainstorm alternatives	9
Assessing risks	8
Selecting Strategies	17
Getting Act into Gear	12
Organisation	8
Making it happen	10
Pushing on	15
Completing the work	20
Evaluating the process	8

Acting	Planning	Reflecting
65	46	37

Areas of Strength

Completing the work

Pushing on

Weakest Areas

Organisation/Assessing risks

Evaluating the process

Pupil Code 21.12

Recognising Opportunities	32
Setting Goals	28
Brainstorm alternatives	29
Assessing risks	25
Selecting Strategies	25
Getting Act into Gear	32
Organisation	11
Making it happen	21
Pushing on	29
Completing the work	27
Evaluating the process	35

Acting	Planning	Reflecting
102	86	121

Areas of Strength

Evaluating the process

Recognising opportunities/Getting act in

Weakest Areas

Organisation

Making it happen

cont.

1	2	43	2
2	2	44	3
3	3	45	2
4	1	46	4
5	1	47	3
6	3	48	2
7	2	49	3
8	3	50	4
9	3	51	4
10	2	52	3
11	4	53	4
12	1	54	2
13	1	55	3
14	2	56	2
15	1	57	2
16	2	58	3
17	1	59	2
18	3	60	2
19	2	61	1
20	1	62	2
21	2	63	2
22	3	64	3
23	4	65	4
24	2	66	4
25	1	67	4
26	2	68	2
27	3	69	2
28	3	70	3
29	2	71	3
30	3	72	4
31	3	73	1
32	3	74	2
33	4	75	1
34	3	76	1
35	2	77	2
36	3	78	3
37	1	79	3
38	2	80	2
39	3	81	4
40	2	82	1
41	3	83	1
42	3	84	2

Pupil Code 07.14

1	Recognising Opportunities	20
2	Setting Goals	17
3	Brainstorm alternatives	19
4	Assessing risks	14
5	Selecting Strategies	14
6	Getting Act into Gear	18
7	Organisation	21
8	Making it happen	16
9	Pushing on	17
10	Completing the work	21
11	Evaluating the process	18

Acting 68	Planning 73	Reflecting 81

Areas of Strength

Organisation

Completing the work

Weakest Areas

Brainstorming

Assessing risks, selecting strategies

1	4	43	3
2	3	44	3
3	3	45	4
4	3	46	3
5	3	47	3
6	3	48	3
7	3	49	3
8	2	50	3
9	2	51	3
10	3	52	3
11	2	53	3
12	1	54	4
13	2	55	3
14	3	56	3
15	2	57	3
16	2	58	3
17	3	59	2
18	3	60	2
19	3	61	1
20	4	62	3
21	1	63	3
22	3	64	3
23	4	65	2
24	3	66	3
25	3	67	3
26	3	68	3
27	3	69	3
28	2	70	2
29	2	71	3
30	3	72	3
31	3	73	3
32	2	74	3
33	4	75	2
34	3	76	2
35	2	77	3
36	3	78	3
37	2	79	3
38	3	80	2
39	1	81	4
40	2	82	3
41	3	83	2
42	3	84	1

Pupil Code 07.05

1	Recognising Opportunities	18
2	Setting Goals	21
3	Brainstorm alternatives	19
4	Assessing risks	14
5	Selecting Strategies	18
6	Getting Act into Gear	20
7	Organisation	21
8	Making it happen	20
9	Pushing on	11
10	Completing the work	23
11	Evaluating the process	24

Acting 72	Planning 75	Reflecting 77

Areas of Strength

Evaluating

Completing the work

Weakest Areas

Pushing on

Assessing the risks

Examples of the data base used for the information collected from pupils during Phase Two.

Pupil code 21.2.03 Male/Female f WA ratio 1.08 VI ratio 0.97

Enjoyment of Design Process

select a project	3
research a project	4
thinking of a number of ideas	2
working out details of chosen idea	3
making chosen solution	4
making chosen solution work	4
using tools and equipment	4
evaluating the project	2
putting together a folio	4
writing your report	3

Drawing Concepts	11	Total = 30	37 %	
Drawing Skills	71	Total = 100	71 %	2
Time Used	22	Total = 25	88 %	
Writing Concepts	46	Total =65	74 %	
Writing Skills	5	Total = 10	50 %	1
Time used	9	Total = 10	90 %	

B1	0		B25	4				
B2	4		B26	4				
B3	4		B27	2				
B4	5		B28	4				
B5	5		B29	4				
B6	4		B30	4				
B7	0		B31	4				
B8	4		B32	4				
B9	4		B33	4				
B10	5		B34	4				
B11	5		B35	5				
B12	5		B36	4				
B13	5		B37	0				
B14	0		B38	1				
B15	2		B39	2				
B16	4		B40	4				
B17	5		B41	5				
B18	5		B42	5				
B19	4		B43	5				
B20	0		B44	4				
B21	0		B45	1				
B22	4		B46	4				
B23	0		B47	5				
B24	4		B48	5				

Pupil code 21.2.03 f 1.08 0.97 4.56 2.48 98 90

	Rank order of enjoyment	Enjoyment Score	Imager 1.086+	Verbaliser 1.085-	Drawing Ability	Writing Ability	General Design Ability
Research	3	4		*	65	71	68
Design	2	2.5	Wholist 1.08-	Analyst 1.10+	Creativity Score	Complete project	
Make	1	4					
Evaluate	4	2	*		61	U	G

Pupil code 49.2.06 Male/Female m WA ratio 2.44 VI ratio 1.02

Enjoyment of Design Process

select a project	2
research a project	3
thinking of a number of ideas	3
working out details of chosen idea	2
making chosen solution	2
making chosen solution work	2
using tools and equipment	3
evaluating the project	1
putting together a folio	2
writing your report	2

Drawing Concepts	14	Total = 30	47 %	
Drawing Skills	74	Total = 100	74 %	2
Time Used	12	Total = 25	48 %	
Writing Concepts	47	Total =65	72 %	
Writing Skills	6	Total = 10	60 %	1
Time used	6	Total = 10	60 %	

B1	4		B25	5				
B2	5		B26	4				
B3	5		B27	0				
B4	4		B28	4				
B5	5		B29	4				
B6	5		B30	4				
B7	0		B31	4				
B8	2		B32	5				
B9	4		B33	5				
B10	5		B34	5				
B11	0		B35	4				
B12	5		B36	2				
B13	4		B37	4				
B14	4		B38	0				
B15	0		B39	4				
B16	4		B40	4				
B17	0		B41	4				
B18	4		B42	2				
B19	0		B43	4				
B20	5		B44	4				
B21	0		B45	4				
B22	5		B46	2				
B23	5		B47	2				
B24	0		B48	4				

Pupil code 49.2.06 m 2.44 1.02 4.93 2.44 98 100

	Rank order of enjoyment	Enjoyment Score	Imager 1.086+	Verbaliser 1.085-	Drawing Ability	Writing Ability	General Design Ability
Research	2	3		*	56	64	60
Design	3	2.5	Wholist 1.08-	Analyst 1.10+	Creativity Score	Complete project	
Make	1	2					
Evaluate	4	1		*	175	U	E

Refer to Pupil Questionnaire Page 212 for Information regarding Questions B1 - B48

Appendix 4

Examples of other forms of data collection used during Phase One and Phase Two

Examples of two transcripts from interviews with the head of technology in the 8 chosen schools during Phase One.

School 035

Q
Are you affected in this school by falling roles?

A
No, we have actually maintained our numbers quite well. The role has dropped by about one hundred since about the mid seventies. We have not really been badly affected by it. We are having to make some moves to make sure that we maintain our sixth form members, by tuning the courses and making sure that the school is more attractive in the sixth form.

Q
I understand yes. What type of catchment area would you say the school is in?

A
Middle-class. Deprived middle-class. Actually I think some of the children have actually suffered quite a lot from middle-class deprivation, which is a peculiar picture.

Q
Yes I understand what you are saying. What about parental support? Do you think you have good parental support , if we take things like parents' evenings as an indication?

A
It is very, very marked the differences where you get parental support it is very strong. It actually is probably only over a band of about 40 or 50% of our students and then you get a band of parents who are very capable of blaming the school for everything, for giving us no support at all.

Q
What about things like school uniform and discipline, is it easy to maintain in the school?

A
No.

Q
Would you think why?

A
Lack of direction from the top.

Q
I was just going to say have you got a support of management structure that actually organises things nicely? You don't want to say?

A
The management structure are aware of their deficiencies, and I think that we are changing the pastoral system to try and make the discipline tighter.

Q
The pupil groupings at the moment are they in vertical groupings?

A
For pastoral purposes we have just moved to a horizontal system.

Q
You have just moved horizontally from a vertical, literally in this last.....

A
It started last academic year so we have just finished in the first year.

Q
What about the organisation of subjects, setting, mixed ability, streaming, this is across the whole school?

A
It varies from department to department. Maths certainly is set in teaching both groups. We don't get the option quite as much, although we do where possible make broader bands of higher abilities and lower abilities. That is certainly our intention with the National Curriculum. We are intending to teach the higher faculty groups together with the standard and basic tier groups together. So again we are sort of going for a 2 level of setting, bearing in mind that these things are notoriously inaccurate.

I have a lovely case of a kid who is a very successful local businessman with quite a good qualification in electronics, and he came from our notorious 3p.

Q
Yes, yes. Well it is the same at degree level you get people with us that have struggled to get in to the university and so on, so yes.

Thinking of the cohort that is now year 11, or has just finished being year 11, when they had their option choices can you remember what sort of things, whether technology was in all the blocks that they could choose between or what was it set against? Or any affects that would be felt

A
We have a practical block, however, (or we had at that stage) and within that practical options block there would be food, textiles, technology, design and realisation and then the theory in all of the real practical subjects side business studies. One of the good things about National Curriculum Technology is that the debate has not been thrown out of the window yet. Now all of the kids are going to have to do real practical work.

Q
How do they select between shall we say the 3, D&C, D&R and Technology, how did the pupils go about choosing which of those they would opt for?

A
They were given a free choice. Our year 9 course was strictly structured to try and give them a flavour of each of them because the skills which are used in each of them are actually applicable in all to a great extent. We offered advice to the year 9 students as to where their choice might be directed if they had set careers in mind, but at the end of the day it was a free choice on behalf of mostly the parents and then the students.

Q
Do you think that the majority of the pupils got their first choice?

A
I think most of the parents got their choice.

Q
Most of the parents but not necessarily the pupils. I understand. Girls in the 3 areas?

A
We did not actually turn anyone away from Technology, D&R or D&C.

Q
So they aimed it correct. Okay. What about numbers of girls in the 3 areas? Which has got the most in?

A
Technology.

Q
And that has about - percentage wise?

A
In single figures I think we have 3 out of 30 in Technology. Poor response from the girls. We have actually taken some fairly positive steps to try and make that better. This last year we have been involved with the press, we had 2 groups down to Skegness, and we still after all that lot only got 12 girls who opted for what I would call the male dominated side of Technology, and the rest have gone into food and textiles. So even with a huge input they are still poor. So I think that actually suggests that their decisions have been made else where.

Q
Departmental organisation. How are your examination syllabuses chosen?

A
By consensus within the department. Originally we chose LEAG Technology simply because it fitted the resource that we had to teach it. Having started with that one we liked the look of D&R and then finally it made sense to make go for the full suit as it were.

Q
How are your teaching groups organised within the department. Do you as head of Technology get a block of time and then you have to work out how many staff you have got to deal with that number of pupils or are you given right 4g is coming to.....

A
We are told that 4g is coming to at the moment and we organised that within where possible to (pledge/play) through our own strengths. However, that has just changed and we will get half a year group in a block, and then we will just sort it out ourselves.

Q
It also gives you a better flexibility.

A
So long as you have a staff mixture of trades and a resource area which fits?

Q
What about resources (space/materials/staffing) are they readily available?

A
Space and the appropriate equipment being available is always a problem, by comparison with colleagues elsewhere in the country we are fairly well resourced by our Authority in the school. I would never ever pretend that it is ample and if somebody came along to me and said here is £100,000 I would have to choose where to spend it. If they gave me £200,000 I would still have to choose.

Q
And staffing, have you ever had any cut-backs in the department?

A
They have gone through a period where there have been cut-backs we went from 5 down to 3 and now we are on the up again and we are grateful.

Q
As far as the department is concerned do you encourage homework with all groups?\

A
To a limited extent with year 9 there are a number of tasks that are appropriate for them to do at home. We try to make sure that their homework is regular when they are in the GCSE sets. It is much more difficult to set realistic homeworks with D&R sets than any other

Q
Do you encourage pupils to do extra work in school?

A
Oh yes extra lots of 'over time'.

Q
What is the departmental policy regarding pupils working on your subject in other peoples lesson time - when they should be in French or whatever?

A
It used to be looked on quite positively at one time we were able to make arrangements but the school policy now is, that we must not do it.

Q
I presume there are times when it does get done. Would you say it is more boys who tend to do it or girls?
A
The numbers and balance that we had it was inevitably boys that did it , but I could not say.

Q
When this year 11 were year 9, because obviously they were not 7 or 8 at this school how was it organised. You suggested that they did things in areas so that they could get a feel for it. Was that in a carousal system or with one member of staff who did lots of different tasks?
\
A
It was with one member of staff who did lots of different things. We tried to avoid the carousal idea because it creates an impression that we have got a whole variety of subjects, but in actual fact it is different aspects of the same thing.

Q
How much time did they have in a week?

A
Two periods.

Q
Which is?

A
Two times 40 minutes.

Q
And they only came in for that one time into Technology.

A
There would be 2 periods of CDT and 2 periods of food/textiles in UNI.

Q
What about the allocation of time in years 10 and 11, how much time do they have then?

A
Four periods of 40 minutes.

Q
How is the timing of course-work assignments organised because there is a number of you teaching?

A
We all set our own deadlines for the course-work we will schedule the practical examinations through negotiations to a suitable time, we then schedule the marking so that we have a time when we can actually moderate between the groups.

Q
How do you choose who will and will not be entered for the exam, or will they all be entered?

A
The school has a policy that we will enter everyone, however, if someone does not submit any course-work then they have absented themselves.

Q
Usually is that because of non-attendance or absolutely slow, slow working.

A
Usually non-attendance.

Q
How long are you able to give pupils to do their major projects?

A
We usually start them shortly after Christmas with the design examination and they have to be completed by the end of May - the end of the spring term.

Q
Now that is as far as D&R. Technology is that just about the same, and D&C?

A
Just about the same sort of deadlines. The deadline with our board is normally the 1st May depending when the Easter holiday occurs, we set a deadline to give ourselves a reasonable time to do the assessment and marking. Usually about a fortnight.

Q
Do you think that in general the pupils have the capabilities to do the task by the time it comes up to it. In other words are you getting enough time to do the ground work to give them enough capabilities to do it, in each of the areas.

A
We are better in Technology than in D&R because of the range of different skills that we require. I think we are probably best of all in D&C.

Q
So in other words you are saying D&R you feel the least well prepared for tackling it? What do you think it is that they're least well prepared in?

A
Well I think it is the actual practical aspects, and I think that is brought about by, in general, the ability of the student to tackle D&R is lower than that for Technology.

Q
And D&C would you put D&C and Technology about the same or D&R below, or would you put Technology D&C.....

A

I would say Technology, D&C, D&R. But D&C is still very close it is a big overlap.

Q
Do you think that is a big overlap in intellectual capability in the pupils that are doing it?
A
Yes.

Q
How do you cope with fairness and compatibility between staff in the amount of help that they give in the exam board or do you just ignore it and hope that it is okay?

A
The latter. To be fair in the moderating process I think we all acknowledge we recognise in the marking how much help has been given.

Q
What about parental help with financial and resources in their major projects. Which you may not have all the major resources to fulfil them. What is it like?

A
It does not happen that often because in most cases we are resourced okay.

Q
Because of course the exam board you do sets an exam question so you are slightly more targeted than the free choice.

A
Yes indeed.

Q
Right. What do you think about parental help with project work. Do you think there is much?

A
We have had some examples where the project has suddenly appeared at the end and we knew that it wasn't the student's work.

Q
What parts of the design process do you think parents are able to help with?

A
I think that they can actually make a positive contribution at the early stages, in the ideas termination stage and evaluating some of those. It is not wrong I think that the sort of discussion they can take is actually very useful and beneficial.

Q
Yes good. Design projects in D&R. This is particularly looking at D&R. Do you think that the long design projects de-motivate or motivate pupils?

A
I think it motivates them. I think they see it as a test. This is something that is going to be examined externally.

Q
The exam is really like a little bit of a carrot?

Q
How many projects have you done with years 10 and 11 this time particularly in D&R?

A
Vary between 4 and 5 I think.

Q
Do you have to impose a limit on the size and type of projects?

A
Yes we do. We target specific skill areas and particular material areas so that we can guarantee that we have cover.

Q
So there is slight freedom within .....

A
The range of project but it is very much a focused task.

Q
Do you think that given a choice in a project would help in the long-term or short-term?

A
Hopefully the project when it is set by the board will allow some choice, and that is one of the things that we do look for that everybody is not making the same thing.

Q
They are not all ending up making a bird-table?

A
No the way that we do that - it does enable us to have a range of outcomes from the same brief. That is one of the things that we are pleased with actually. They actually have a choice of 3 different things and within each of the briefs there is the ability to have a range within those. There is quite a bit of choice.

Q
Do you think there is a willingness to complete projects?

A
Yes

Q
All of them or just the exam one?

A
Mostly the exam one.

Q
Why do you think projects aren't finished when they are not?

A
Lack of time. Lack of motivation. Lack of realistic choice.

Q
Do you think this is a problem with the very few or a large number of pupils, thinking particularly of D&R?

A
I think it is a problem with a bigger number than it should be, because I think one of the important pictures of our making is the joy they actually get from making something work, and that is

something that is unique to our subject. And if we don't do that we actually lose the whole point of doing the subject.

Q
Lets talk lastly about design process itself. Can you put these into a rank order of the amount that pupils enjoy;.research, design, make and evaluate - what order would you put those in starting with their most enjoyable?

A
Making, designing, researching then evaluating.

Q
So why do you think evaluating is coming out at the bottom?

A
Because everything is finished when I get to that stage they think that is it they don't actually realise that they evaluated a lot as they wade through. It is boring writing.

Q
And they are really wanting to do the making bit. So you think definitely they enjoy the making bit. Do you think there is any difference with girls? Mind you haven't got any this year have you?

A
Our experience in the past is that girls are more meticulous, more careful and generally their project folders are much more adequately presented. So I would say that they do actually enjoy it more.

Q
So even if they don't enjoy it they actually go through the hooks?

A
Yes, yes I think that is true.

Q
Do you think this list you gave me in the rank order ties in with their successful/unsuccessful outcomes. So that they are best at the making?

A
Oh yes. I can recall a case just recently - fairly low ability child made a vehicle that actually works, drives along the floor brilliantly. Works perfectly. But on the marking scheme when it was applied he got just over half marks, because he had scored nearly half marks on the making and practically zero on the rest.
Q
Which aspects of the design process do you think you have the most difficulty in teaching as a department?

A
That is a difficult one. I think probably the worst bits to teach are the research and designing stages.

Q
Why would you think that of the research stage?

A
Because they all have an idea that they want , and they don't really want to go out and do the research and find things out.

Q
Would you say that that was the area that you find most difficult to resource, or is there one of the other areas?

A
Well it probably is actually. I mean we have not..... my ideal as a resource for that will always be an achievement. I have only ever seen one room nearly properly equipped to do that and that was at the CTC.

Q
But even then you can't possibly have all the resources you can't have all the measurements and sizes.

A
No we used to have a room and then next door there was virtually a library with a set of tables where people could work quietly.

Q
Rather than in a workshop situation. Yes I understand.

Q
Which aspect of the design process do you think you have to give most help to?

A
That is quite difficult. I help them all the time. I would not pick any out.

Q
What about those that are de-motivated which areas would you pick- out?

A
I think with the lower ability students you probably have to give the most help in the early stages of making.

Q
When they are just planning it all and making sure they have got the right things for it.

Q
What about the changes that are coming in key stage 3 and 4? Do you think that it is going to help?

You don't know yet?

A
I heard on Sunday that new orders are going to be held back for another year or so.

Q
Well I heard that this was the case but it is nothing official.

A
I think the new orders look more encouraging than the current ones, but I wait with baited breath.

School 032

Q
Are you affected by falling roles in your school?

A
Not at all rising roles.

Q
What type of catchment area would you say the school is in?

A
It is mixed catchment area on the service it looks like a prosperous middle-class catchment, but we do have pockets joining the school and elsewhere which balance things somewhat. Without a doubt though we are secured in the direction of middle-class catchment. It is not average but it is secured upwards.

Q
What about parental support if we take say things like parents' evening as being an indicative?

A
Parental support we invariably get a lot of support as a school at parents' evening, at meetings of parents prior to children joining the school likewise.

Q
What about things like school uniform and discipline are they easy to maintain?

A
Probably lets just say that if we can't maintain discipline with these kids we can't maintain discipline anywhere. These kids are very good, we have our naughty ones we have our rogues, to some extent we have clever rogues, but no we do very well, if we want them to do something, if we want them to wear a uniform we can achieve it without too much bother.

Q
What about the management structure is that supportive towards work, discipline and I mean does it work well?

A
I don't know of any school in which people believe that things are working well at the moment in which there isn't a lot of chaos around, it is to some extent down to moral, external influences, political influences, but we have a management structure which is effective. I think it works as well as it can work under the circumstances.

Q
How are the pupil groupings organised this is pastoral, are they vertical, in houses, or are they horizontal in years?

A
They are vertical in houses.

Q
What about the organisation of subjects are they set, streamed, mixed ability? This is across the school not just your department.

A
That differs from subject to subject, most subject departments have settings, smaller departments or departments dealing with smaller numbers don't really have a lot of choice in that matter. In terms of technology it is just arising that we have an opportunity to set if we wish to use it, but there is a variety of different methods used at the moment.

Q
Now option choices, if we can look at a slightly different memo but look at the year eleven that have just finished now, can you remember how their option choices were organised. In other words was technology opted against something, did they all get the chance to do a technology subject etc - those types of things?

A
Yes think back to what they had in the form of choices weren't absolutely sure but there were one or two things set against technology which obviously have been removed. Music I think and a second foreign language had something to influence it, drama, there were one or two more in what we always had as a basically a technology column, but there were one or two none technology areas who were drawing students away.

Q
Did they get a choice to opt for a second subject as well in technology or just the one?

A
Technically they could have but had they opted for a second technology subject they would have opted for single wood science which is considered a low ability science option.

Q
How did the pupils select which of the design and technology subjects they would do between the three D&C, D&R and technology?

A
They were offered the three on paper in a column against others such as art, food, textiles and they could simply tick the one they most liked.

Q
But how would they make the choice?

A
We would provide them with a brochure with information on all of the subjects, we had parents' evening at which they were invited to join us to discuss the courses, and have any questions answered, and on the strength of that if there were any further questions they could come back individually. But on the strength of that they made the decision with the children.

Q
What would you say in percentage wise of pupils that got their first choice?

A
I think one hundred per cent would get their first choice.

Q
Can you remember in years ten and eleven approximately the numbers of girls that did each of the three subjects?

A
How would you guess what average? As a number or a percentage?

Q
I don't mind which it is?

A
We probably get something like twenty to thirty per cent of a group in graphics in design and communication would be girls. In technology very low numbers if we had one or two in a group we were very lucky. In design and realisation unlikely to be more than three in a group. D&C was more balanced.

Q
Departmental organisation - how were your examination syllabuses chosen the boards etc?

A
By discussion. We have certainly discussed key stage four courses. Going back a long long time that and I suspect it was because when six years ago GCSE first arrive we pulled in the services I already had experience of some of the examining group as an examiner and a moderator, and we adopted say design and realisation, design and communication because we were comfortable with it we had used their papers before. NEEB attracted us with technology because of the modular nature of the course they produced, they produced quite an imaginative course, which you could play right into the hands of ..... students who are very good at course-work and all work diligently at such things.

Q
How are your teaching groups organised - in other words when it is timetable time what happens? Do you get okay you have got half a year sort it out with the staff you have got or do you get four-g will come in and do such-and-such at such-and-such a time?

A
I am provided with a list of classes to be time tabled or teachers to be time tabled, no that is not right. If we are thinking of year nine I will be told which of my teachers are available having considered the rest of the timetable. So I will have a set of teachers on each occasion and I am provided with a long list of children and I will have to break those down, and I tend to do it by ruling lines through them, they are in alphabetical order or whatever. They are simply randomly placed in the groups with teachers. In years ten and eleven since they have selected their subjects, in the unlikely event that we have enough to make two groups then I have to apply the same procedure but in most cases there will be a group for CDT, technology, a group for design and realisation and a group for design and communication.

Q
Would you say that resources as far as space, materials and staffing are readily available?

A
Staffing we are now finding we have had to shrink our year nine course to cope with the expansion in year ten, so though staffing is now under severe pressure our... there is something about time lag in a school which is expanding acquiring new staff, so that time lag and that financial-lag means that for the next year we are going to be struggling we may well be able to recruit after that time, but we will have to struggle for a year to cope with that. In terms of other resources, financially our school has a policy of trying to keep as many teachers in the classroom as possible which means that our teaching resources are, we are unable to replace furniture we are unable to replace an awful lot of the materials which we would like, and the range of materials would mean the children now becoming very, very limited. It is becoming more difficult as the number of children arises.

Q
So in fact space as well will become tighter?

A
That is correct the school was built for seven hundred we are now dealing with approximately thirteen hundred. We can't get them down the corridors getting them into classrooms because you are dealing with numbers our management have accepted a limit until this year they have stuck to that limit of twenty in a group. We are not sure that we can adhere to that limit for very much longer but we are trying.

Q
As a department do you encourage homework?

A
We do in deed. As appropriate and as required and we try very hard to ensure that we are not putting more pressure on the kids than they put on themselves, because you get an awful lot of them are quite diligent. I have seen situations in the past in which students will work because they are interested in the design and technology, very, very hard but sometimes at the expense of other subjects. So I bare that in mind we provide homework but unfortunately not in a balanced form, during investigation their is an awful lot of homework during the ideas stages, they develop their ideas etc at home once they have started working drawings they can complete working drawings at home, if they have the facilities. The do letter writing for research purposes at home. So yes there are stages during, which they are very busy working at home but there are other occasions when things are very much quieter, we then patch in notes on the theory, but it goes up and down.

Q
What about encouraging pupils to do extra work in school?

A
We have quite a lot of students who travel to the school and as with most schools that are in that situation we try not to encourage them to stay after school, particularly during the winter we want them to get home before it gets too dark and too nasty. But despite that they invariably as we approach project completion times when they really need our facilities they invariably come in as they are today, lunch times and after school to complete projects.

Q
What is the departmental policy regarding working on your subject during other lessons?

A
Working on our subject during other lesson times really crops up on. Oh I see the student might arrive when we are teaching another group to complete some work. We try very hard to prevent that we make the point to other subject teachers that we don't do it to them so we would rather they didn't do it to us, even though our students might feel that they need time to complete their projects. It invariably applied to projects and I don't think we will ever change the fact that students are not at their young age, they are not able to plan as they might at A-level they struggle to plan they are not sure of the complexities, they always expect to be able to do more in the time available and they will put some things off that they are not very keen on. It is not a problem that is going to change it is all to do with youth.

Q
Now obviously you do not have years seven and eight, but in year nine can you remember back to what year eleven were doing then - how it was organised when they were year nine? What sort of things did they get involved in?

A
We have always been involved with the principle of design and make tasks, it is a new term D&T to use but I am quite proud of the fact that twenty years ago when I started teaching my head of department was an author on the subject of design education and I got a good start, and I was shown how students can be encouraged to design and how they can organise themselves, and how to organise such activities, and a long long time ago we were involved in what we would now call D&T's as we've re-drafted schemes for the future we have not have to adjust the D&T's an awful lot to bring them in line with National Curriculum subject. We may have pulled a particular task out and replaced it with another as we did with this years long task but the children wouldn't spot the difference, they don't notice the change. A project I would have done eight or nine years ago having that along side a project which we have just introduced them to such as the long task project they simply see it as another medium.

Q
So did they get a chance to do the variety of technology subject areas so that when they came to years ten and eleven they could make a judgement about which subject to do?

A
We try very hard to do that yes. We tried to ensure that every year nine child had experienced a short graphics course, and likewise they have been involved with a technology task which involved a little science and maths. I don't think they are really fully aware about what the electronics and engineering elements might be, but they have had a taste of certainly a full taste of designing and making. They want to experience strong media and in years seven and eight they certainly didn't. I would perhaps criticise our middle schools for interpreting the original orders in a way that they now discover weren't suited to what they have. In fact they are adopting, all three of them will be adopting one of our projects, next year so they give us a head start.

Q
How much time did they have for technology in year nine?

A
In year nine, I am still referring to the design and technology in one breath, as what other people would call CDT, they had two fifty minute periods per week of design and make tasks in CDT areas. The have had two periods per week of home economics and home economics are doing their very best to come to terms with design and make work. They find that something of a radical change, but they are trying very hard to come to terms with it and they have had two periods of that and likewise to periods of art.

Q
Throughout the whole year?

A
Yes throughout the whole year. They will not be so lucky next year because we have had to shrink that to cope with the initial numbers in year ten.

Q
Years ten and eleven how much time was allocated for years ten and eleven this last?

A
Every student on each of the courses will have had three fifty minute periods per week.

Q
And how is the timing of course-work/assignments organised did you have more than one group for each of your exams or did you just have the one group for each?

A
We could of had one or two groups each as teachers of the department. That really depends on how much commitment they have in the sixth form etc. How much commitment the teacher has in the sixth form, but in terms of co-ordinating the assessment of it we for all three courses have a common deadline for project for final project work, and we work as ones or twos on course-work assessment. So we have a team approached to that. It usually takes us two days plus to mark and moderate major projects, and that is round about the Easter holiday time just before or just after.

Q
How do you choose who will or will not be entered for exams?

A
I suppose two ways if a student has worked diligently throughout the course and has tried very hard to meet the course-work requirements, whether they are able or particularly weak we think they are deserving of an entry in the examination. If on the other hand they opt out of subject entry that is really their business if they decide for example that they want to concentrate on other subjects, which is quite rare but does happen, I think sometimes children approaching final examinations realise they haven't done very well throughout the course and are looking for an escape route, rather than, they would rather escape than fail. So they will on occasions try to opt out. If they have not been deserving of an examination entry because they have not tried

throughout the course we contact parents around Christmas, we inform them of our concern we ask them if they would like to discuss it with us, but they have the final say if they insist we enter despite our better judgement.

Q
Would you say that attendance then plays a large part in whether a pupil is entered or not?

A
Only in as much as whether the attendance prevents the student from producing the course-work which would allow that student a reasonable chance of achieving a grade.

Q
Once the decision has been made does this have motivational problems with those students, or what do you do with them?

A
They are rare we tend to encourage them to complete their projects but by rare I mean perhaps three students per year will be in that category. So it is not the sort of thing we encounter very often. Very often the students are in that category because they are truant so they continue to truant. It rarely causes a problem, they will either be with us or they won't be with us. By past experience.

Q
With the final project the long project how long are you able to give the pupils to complete their tasks?

A
We have expanded that element as much as we can as much as we dare, and because of the nature of the assessment we have even started major projects before the end of year ten. We have expanded and expanded even when, at the very start of GCSE six years ago we spotted it really with technology with which the boards guidance suggested that a term and a half was what they recommended for major projects. We decided because of the mathematics of the assessment that we would shrink the module times and increase the project time as much as possible, because we, I do what I do to the children what I advise the children to do in an examination. They look at the assessment and they work out how to spend their time to do the best they can to get those marks. So wherever the marks lie that is where we use the time.

Q
Do you feel that the pupils when they come to this, their long task have got the capabilities to fulfil it? If we take each of the areas D&C, D&R and technology?

A
We are in danger of dropping back into a very, very old argument which perhaps our old woodwork and metalwork teachers would of delivered, in that until children have the skills to produce you can't ask them to design. Likewise we can't hope that they are going to produce anything of quality, unless we have taught them skills, but because we are committed to the idea of designing and making within D&T's we know that any task takes a long time as a result, it takes us quite a period to start a project, encourage the children to be brave to allow them to tackle a problem with the confidence that they know the teaching will guide them through it, the teaching will guide them to manufacture whatever they have agreed is to be manufactured. Giving them that confidence and then guiding them through it takes an awful long time. As a result I would be foolish to say that in what would be a short period in year nine and then most of year ten if we perhaps for design and make tasks during that time if we do four full design and make tasks during that time then even if they are in total different media they are still not going to cover a vast range of skills and processors so they are not confident starting projects they do need guidance. Where I think we may get problems is if we draw the distinction between what syllabuses and resource tasks and assessment tasks, but if they are using assessment tasks and not providing teacher guidance within those assessment tasks, or not providing teacher information I tend to see the teacher has resource, and if the teacher can't be used as a resource through those tasks I am not confident that ..... students will be adequately prepared to meet them.

Q
As far as the exam course-work is concerned do you think that you as a department address the fairness and compatibility between staff regarding the help that is given to pupils in a fair way, or do you hope that it is and ignore it?

A
Help provided to students we don't have any restrictions we all accept that whatever is manufactured should be essentially the students work. It is quite acceptable within our department, and we have discussed it, for lets say there are four similar joining operations to be carried out on a project, it is quite acceptable for the teacher to do the first one as a demonstration, for the teacher to supervise the second one as it is being done, and we get the child to carry out the third and fourth. It is not something on which we have hard fast rules. We are happy to provide as much guidance as possible at the back of it there is always a safeguard if any of us tried to do the work of any student or students we would simply run out of time. We are not physically capable of doing it all for them, we expect to simply keep them rolling as fast as we can and as effectively as we can.

Q
Would you say that during assessment you know personally how much help and, therefore, that tends to flavour the way that your marking anyway or not?

A
Yes certainly with GCSE assessment we must write on the assessment form a brief count of the help that student was given, and if there is a considerable amount of help it is always in the back of your mind as you are marking it or as you are remarking it. I found as a moderator this to be quite an enlightening experience when approaching a piece of work which initially looks very strong which has been marked a little low, the explanation that the teacher had to provide quite a lot of help and guidance tends to be the explanation.

Q
What about parental help if we take things like the exam itself, the exam projects themselves financial and resource wise - have you got supportive parents from that point of view?

A
Yes we have got fairly demanding students in terms of what they require. We do have a highly amusing example, two weeks ago one young man who insisted that his father stopped work at lunch time took him over to the Metrocentre to Maplins insisted that he bought him some new components and brought him back and when we are talking here of the son of our Headmaster, if he is influenced in that way then I expect that a lot of our parents are being bullied similarly. The parents support and the children demand, we have had to establish a policy on this because projects, I have found that children can struggle to stop their limitations they are not always good at revising how much time the project will take in terms of manufacture, we find that introducing a cost limit has two benefits: a it limits the cost to the department but it also ensures that they don't over design things they don't manufacture something which is huge and we are just introducing that at the moment the cost limit. But they are entitled to go out and obtain additional materials if required.

Q
What about parental help with projects does that.....

A
That worries us somewhat. It rears it's head from time to time. The latest legislation received suggesting that all students must do all course-work under our guidance is worrying us somewhat in that we depended on homework to complete tasks, to extend tasks and so on. Yes we have been surprised from time to time when something comes back into school so much better than when it went out, but we have the additional problem of resources, which may be available at home particularly high technology resources which are available in some homes which don't necessarily match our own. So we are in a difficult area I think, if we prevent students from using information technology particularly which they have at home which we do not have in ..... School in quite the same form but which we are very familiar and they can produce very good results, we are

going to limit their results greatly as I understand it we must now ensure that any project work which is produced and assessed must have been overseen by us.

Q
What aspect of the design process do you feel parents are helping them with most?

A
I don't think parents are very good at helping with very many elements of the design process. I spend most parents' evenings explaining the design process to parents. They are most uncomfortable with it because they haven't experienced it themselves, perhaps that generation is about to come through school, if that generation experienced what ..... children were experiencing. They are not very able to help but equally the children are not very good at talking about their problems, their design project to their parents. So I often send children as I did this week with nine children home to discuss their ideas with their parents, and I am very surprised that they come back having discussed them with their parents. Most parents' evenings the parents are pleading with me to give them information because I have got some children who are not very good at communicating with their parents.

Q
If we can look at some questions regarding design projects specifically with D&R in mind. Do you feel that the long design projects demotivate or motivate the pupils?

A
Having been involved with them for so long I personally find that they are pretty good at motivating kids as long as they are approached the right way. As long as they can, particularly for weaker children, they can't cope with something that is going to take a full year they need shorter spells they need achievable targets in a time scale they can cope with, and as long as they have achievable targets as long as they know that this week we are doing that part of it and as long as it is structured, it may not be the way a working designer would work but it is a structure that allows us to go one step at a time through a very long project. Because they start to see the results building and as they start to approach the manufacture of their prototype they know because they have seen previous years manufacturing similar items, they know that at the end of the day they have got time to produce a quality product, and it is really down to, it has a settling influence on them because they know it is entirely down to the amount of effort they put into it. They are told on many occasions that we can provide the expertise, we can provide the guidance all they have to do is use it. It is not down to academic excellence it is down to diligence it is down to effort.

Q
As far as projects in D&R are concerned how many have years ten and eleven this time through done altogether in years ten and eleven?

A
My year ten group and I think most year ten groups this year as we are approaching the end of this academic year will of tackled two reasonably sized design and make tests.

Q
And so they will of done three by the end of year eleven?

A
Yes.

Q
And you were going to answer this next question. I was going to ask do you oppose any limit on size and type of projects? You have virtually answered that one by telling me about the cost as you have just introduced.

A
Some projects do embarrass us slightly because they do insist that it has to be.... We had one recently which was a home for rabbits. A mobile home for rabbits I might add, so they could take

them around the grass area and eat. Something of that nature is difficult to make on a small scale we are not making mini rabbits so we are not making mini homes. No we can't always limit them but there has to be a good reason why we don't know.

Q
Do you give years ten complete freedom of choice as to what projects they do or is it targeted so that they are tackling certain areas?

A
No it is a guided choice because we tend to focus on the range of materials and processors for the early tasks, and for example we may decide that we want to teach them skills associated with plastics, so we will introduce a project which we are restricting our time on plastics but we may follow with a project which is based entirely in metals, and restricted to those.

Q
Now the exam board that you use does it set questions or does it give complete freedom?

A
It give entire freedom.

Q
Do you think that giving freedom of choice helps motivate?

A
I was going to say the less end of students find it very difficult to focus on a problem area but it is not necessary the less able, most children that age find it very difficult to do what we probably do subconsciously and that is decide as they are working that there is a problem area that they can move into and they are genuinely going to investigate, and genuinely come up with new ideas. I suspect that we do that we actually have one or two safety fall back positions. We know that we have experience in that area and we have one or two preconceived ideas even though we may not confess them. So we could actually, if all else failed we could come up with something in variation on a preconceived idea, because students don't have that much experience I think that they are very slow to commit themselves to a project area because they are not confident about where it may lead them. Even though we tell them as we start projects that they are welcome to change their minds and draw back on that decision and start again on another area.

Q
Do you think that the exam itself acts as a carrot and motivates pupils just it being for the exam or do you think that their is a difference.

A
For the majority of ..... School students academic success is very important they want examination success. For some of our students and it is a diminishing number they do still think that they want a product at the end of the day. They want a go-cart, we still have the stubborn one that wants to design a go-cart and we have to gradually work that out of the system. They, any parents, we haven't had anyone coming in suggesting that my dad says we need a new wardrobe so I have to design and build a wardrobe. We haven't had that for a long time. It could still happen.

Q
What about the willingness to complete projects?

A
In most cases as they gather momentum they are more and more determined to complete what they have started particularly as they see it is achievable. Very often a long project the manufacture stage in you go through a slow patch in the middle when you are losing, not perhaps losing interest, but they are losing confidence things are a little bit more difficult than they imagined, particularly if they've been stuck up a bank with the scale of the project and the complexity of the project and if they, lets say they are careless of the other person and lose a piece, for any reason

things go through a quiet patch. They lose the momentum and then need motivating and that is the difficult part.

Q
Why do you think the projects don't get finished? You said it only happens to a few but why do you think, what do you think the main reasons are?

A
Again I think it's a variety of reasons. We have some students who will attend on an erratic rate if they are not here there is not a lot we can do. There are some who, and I make it clear to most of our students at the beginning of the course if they choose to do as little as possible during the design and technology lesson then because the teacher is working from project to project to project along with the time they will have an ideal opportunity to achieve very little. If they are not at all motivated to succeed then they are able to relax and are able to achieve very little and there are a small minority who will make that choice and they will achieve very little, and at the end of the course will wonder what on earth they were doing during out lessons. As we get past the half way stage in year eleven I openly admit to my students, and some of my other staff do likewise, that I have to give help according to how much effort they apply, and the more they are doing the more help they will receive because they will need more help to get through the various stages, and if they choose the easy route in the short term the easy route, and achieving very little, in the way we work there is not an awful lot we can do about it.

Q
Just a few more questions now about the design process itself. We have got research, design, make and evaluate, if we lump them into those terms. Can you put those into the rank order that you think pupils enjoy the most.

A
I think make is probably the most enjoyable stage, evaluate is something which can be fun but I think at a younger age and with less able students evaluation is not easy its something which I tend to do in a fairly short time of space, making it interesting making it exciting and a bit of fun is the difficult thing with evaluation, but it can be or it might not be depending on how I present it. Sorry how did you break the other two down?

Q
So we have got research, design, make, evaluate. So we have got make first.

A
Okay. So your research I don't normally find children very enthusiastic as compared with the others about the research. The design stage some for the design stage, the ideas are, they will if they are reasonably confident with a pencil in their hands they will willingly come up with ideas. Children find the development of ideas stage difficult. The development stage to some teachers I still find absolutely unbelievable that the teachers do not understand the development stage within design, and they seem to think that it is producing the working drawings still. Or the other very common misconception is explaining what we did, a story of how we manufactured it, is development, and because I am not convinced that the development stage is not very well taught, I suspect an awful lot of children in schools don't enjoy the evaluating stage. The design stage to our students isn't as much fun as the making stage to most of them.

Q
So what would you put them in as order. One would be make?

A
I think so yes.

Q
Two?

A

For most of our students, yes for most of our students the design would probably be before the evaluate and last research.

Q
Why would you put research last, why do you think they don't like research?

A
Sometimes it is because they perhaps we are asking an awful lot of some of them we are asking them to use their initiative, we will guide them in a direction and ask them to go out and collect information, an awful lot of that research has been done in the day-time. I think it is like punishment to some of them. Homework is the least exciting part, so perhaps for that reason if we were able to allocate time within lessons when we could go out and about and get some of our research done, but we still have in the back of an awful lot of minds the idea that what I really want to do is design and make things. That seems like a hurdle to them something that they have to cross before they ever get any interest in this. It is just followed perhaps identifying the problem and that can be dry, so if you get past that dry stage and then you are asking for research, I try to integrate research with coming up with ideas and needing the research.

Q
Do you think girls are any different, is there any difference between them as to whether they enjoy one of those areas more than boys or do you think it is.....

A
I suspect that there are more girls who enjoy the design stage than there are boys but I don't have figures on that, but I have a feeling that there are more girls who perhaps get stuck by choice in the paper, perhaps lacking confidence in terms of getting to the manufacturing stage. I certainly had one good example of that in year nine of this year. A young lady who was quite able and producing wonderful design work could easily of gone on much earlier to make and she tried to keep a low profile hoping that I wouldn't ask her to get involved with any of the real materials.

Q
Do you feel that their success or unsuccessful outcomes whichever it might be coincide with the areas that you have identified as enjoying and not enjoying?

A
Not necessarily no. Perhaps a good example has been the long task which we are involved with, I wanted to ensure that they pursued each of those stages thoroughly but I had a time limit of a very very short space of time with working and although research we didn't really prolong to hard the design stage I wanted to ensure that they had up to a high standard because we were going to depend on many of those skills in future projects, and I wanted to ensure that they had produced quality paper work to record their ideas and developments. As I say in development they are not naturally very good at. So we did a lot of work on development and background work. They may not of found it the most exciting part but the results were very good. The manufacturing stage they most of them enjoyed went very well but the results because of the shortage of time were not quite to the high standard we would of had.

Q
Do you think that there is any truth in this that they thought that girls are willing to carry on and tackle things that they don't necessarily enjoy but are happy to go through the hoop to get to the next stage, in comparison to boys who if they don't enjoy something don't want to do it?

A
I don't spot that. My most reluctant student, reluctant in terms of questioning what we were doing so perhaps reluctant is not the right word, very able girl wasn't really sure of what an earth we were doing this for but no she wanted a good reason why we had to do things as we were doing them, as most of the boys this year just quite happily got on with it.

Q
Which aspects do you think that as a department you have the most difficulty in teaching? If we are thinking of research, design, making and evaluating.

A
Teaching I suppose you are back to research. We guide children through research rather than teach it, we teach them where they can gather information how they can gather information but we put a lot of onus on them to do it. The design stages there are no good reasons nowadays why teachers can't teach those, the range of texts are excellent nowadays and that is where I sympathise with my home economics colleagues because they as yet do not have any of these. The making that that comes down to past experience of the teacher. Some teachers will find that difficult nowadays and again evaluation shouldn't be a problem.

Q
Okay what about resources. Which areas do you find the most difficult to resource?

A
All the areas nowadays. Keeping as we feel we must a wide range of resources to allow children to work in what is an expanding area it is becoming more and more difficult and resources take quite a consumable resources are not outrageously expensive, and I do not understand why it should be so we are very good at protecting our resources at controlling the resources as they go from input to output, such things as I would imagine that electronic components when I started teaching electronics would be quite expensive, they are not they are pennys. The materials we now buy are not as expensive in real terms as they used to be, metals are now very inexpensive, plastics have tumbled quite a lot recently, timber is still rather expensive, but the range of resources all of them are difficult to provide purely because our budgets are so limited. Furniture, I said earlier, really we should of replaced an awful lot of our furniture and if we a TS High School can't afford to you cannot think.

Q
Last question, which areas/aspects of the design process do you think that pupils need the most?

A
I think each for a different reason. An awful lot of help to get started, I really couldn't break it down to one area to get started to identify problems that children find very, very difficult and alone I don't think they could get started. Ideas not so much, developing those ideas. The making there are very few children who enter ..... School really make in anything other than timbers, our Middle Schools tend to concentrate most of their making in timbers. Put the amount of time that they have to teach and the staff who openly admit that their past experience hasn't left them with enormous skills, a range of skills, they know they have limitations in terms of time, resources, materials likewise. We find it very difficult to say which areas they need most time in.

Q
Final one, do you think the changes are coming with key stage three and key stage four, are they actually helping to improve and stabilise everyone?

A
They are certainly not stabilising anything. I think most teachers could implement most interpretations of design and technology or technology, if only anyone was brave enough to clarify them, and I think we are lack of clarification as I told Lady Parkes when she visited us something like eighteen months ago or two years ago, when she was on a fact finding tour. Until they harden up what they are expecting teachers to do there will be no confidence, there will be no success and that message seems to of been reinforced by engineers, they put their own particular bias on it. Whether or not they really can put together a workable scheme and deliver it in a way which teachers can, try to address the scheme, that is what we need. Key stage three and key stage as they stand now are not going to help they should help but they don't at the moment. I am hopeful that having set enormous tasks in delivering design and technology the Government will have to rationalize it and I am hopeful that they will draw back from some of the assessment. The GCSE boards are very, very good at assessing success themselves they don't have to be dictated as to

how it is to be done they have done it superbly for a very long time. At key stage three a watered down system reflecting the GCSE system would do nicely but the attainment targets and the levels of attainment and so on have caused confusion within teaching, rather than give a direction to it.

Examples of the databases used for data given by the eight teachers of design and technology responsible for the sample used in Phase Two. The data concerned the teachers' perception of the pupils with regard to their enjoyment of the process, their ability to work independently and their ability to achieve satisfactory results

School Code 32 — Total Score 77 / 120

AVERAGE PUPILS

SP1	2	SP2	1	SP3	4	Selecting project
RP1	2	RP2	2	RP3	4	Researching project
TS1	3	TS2	2	TS3	3	Thinking of solutions
WI1	3	WI2	2	WI3	2	Detailing chosen idea
MS1	3	MS2	2	MS3	2	Making final solution
MW1	3	MW2	2	MW3	2	Making solution work
UW1	3	UW2	2	UW3	3	Using tools and equipment
EP1	3	EP2	2	EP3	3	Evaluating project
PW1	3	PW2	3	PW3	4	Putting together folio
WR1	2	WR2	3	WR3	2	Writing report
	27		21		29	TOTALS / 40

DEMOTIVATED PUPILS — Total Score 57 / 120

SP1a	2	SP2a	1	SP3a	2	Selecting project
RP1a	2	RP2a	2	RP3a	2	Researching project
TS1a	2	TS2a	2	TS3a	3	Thinking of solutions
WI1a	2	WI2a	1	WI3a	2	Detailing chosen idea
MS1a	3	MS2a	2	MS3a	2	Making final solution
MW1a	3	MW2a	2	MW3a	2	Making solution work
EP1a	3	EP2a	2	EP3a	2	Using tools and equipment
UW1a	1	UW2a	1	UW3a	1	Evaluating project
PW1a	2	PW2a	2	PW3a	3	Putting together folio
WR1a	1	WR2a	1	WR3a	1	Writing report
	21		16		20	TOTALS / 40

School Code 43 — Total Score 66 / 120

AVERAGE PUPILS

SP1	2	SP2	1	SP3	2	Selecting project
RP1	2	RP2	1	RP3	2	Researching project
TS1	3	TS2	2	TS3	3	Thinking of solutions
WI1	3	WI2	2	WI3	3	Detailing chosen idea
MS1	4	MS2	1	MS3	3	Making final solution
MW1	3	MW2	1	MW3	3	Making solution work
UW1	3	UW2	2	UW3	2	Using tools and equipment
EP1	2	EP2	2	EP3	2	Evaluating project
PW1	3	PW2	2	PW3	3	Putting together folio
WR1	1	WR2	1	WR3	2	Writing report
	26		15		25	TOTALS / 40

DEMOTIVATED PUPILS — Total Score 52 / 120

SP1a	1	SP2a	1	SP3a	1	Selecting project
RP1a	1	RP2a	1	RP3a	1	Researching project
TS1a	2	TS2a	2	TS3a	2	Thinking of solutions
WI1a	2	WI2a	2	WI3a	2	Detailing chosen idea
MS1a	4	MS2a	2	MS3a	3	Making final solution
MW1a	3	MW2a	2	MW3a	2	Making solution work
EP1a	3	EP2a	2	EP3a	2	Using tools and equipment
UW1a	1	UW2a	1	UW3a	1	Evaluating project
PW1a	2	PW2a	1	PW3a	2	Putting together folio
WR1a	1	WR2a	1	WR3a	1	Writing report
	20		15		17	TOTALS / 40

School Code 07 — Total Score 80 / 120

AVERAGE PUPILS

SP1	4	SP2	2	SP3	3	Selecting project
RP1	4	RP2	2	RP3	3	Researching project
TS1	4	TS2	2	TS3	4	Thinking of solutions
WI1	3	WI2	2	WI3	3	Detailing chosen idea
MS1	4	MS2	2	MS3	3	Making final solution
MW1	3	MW2	2	MW3	2	Making solution work
UW1	4	UW2	2	UW3	3	Using tools and equipment
EP1	2	EP2	2	EP3	2	Evaluating project
PW1	2	PW2	2	PW3	3	Putting together folio
WR1	2	WR2	2	WR3	2	Writing report
	32		20		28	TOTALS / 40

DEMOTIVATED PUPILS — Total Score 60 / 120

SP1a	1	SP2a	2	SP3a	1	Selecting project
RP1a	4	RP2a	2	RP3a	2	Researching project
TS1a	1	TS2a	2	TS3a	1	Thinking of solutions
WI1a	3	WI2a	2	WI3a	1	Detailing chosen idea
MS1a	4	MS2a	2	MS3a	3	Making final solution
MW1a	1	MW2a	2	MW3a	1	Making solution work
EP1a	4	EP2a	2	EP3a	3	Using tools and equipment
UW1a	1	UW2a	2	UW3a	1	Evaluating project
PW1a	2	PW2a	2	PW3a	3	Putting together folio
WR1a	1	WR2a	2	WR3a	2	Writing report
	22		20		18	TOTALS / 40

Key Max score 4 per entry
Column 1: Enjoyment of project
Column 2 : Independence from teacher
Column 3 : Ability to achieve a good result

Example of pertinent notes made from the tapes of the interviews with the 40 pupils in the eight chosen schools during Phase One.

School 035
Pupil 1

Q Do you take either Technology or Design and Communication as well as D&R?

A Only D & R.

Q In your design and realisation project work you have been involved in a lot of drawing and writing. There are several types of drawing you may have used.

Early Sketches
Q Are they important?

A Yes but I don't think we need to think of a lot of ideas. I don't like thinking of a lot of ideas

Careful Drawings
Q Did you do this?

A Yes, in the form of a sketch with dimensions on it.

Working drawings
Q Did you do this?

A Yes. ...enjoyed the working out of details 'improving it'.

Careful Perspective
Q Did you do this?

A ...quite happy to do this when I am finished.

Q In your design and realisation project work you may have been involved in several types of writing.

Writing beside your sketches to explain your ideas and thoughts
Q Do you like doing this?

037 A Don't mind writing. ...it helps to explain things.

Careful lettering for headings, title sheets and on working drawings
Q Do you like doing this?

040 A Don't like doing this, ...it goes on and on

A written evaluation
Q Do you like doing this?

047 A Sometimes you cannot draw and writing helps.
048 I have some difficulty in making drawings explain thoughts.

Q What did you tackle as your final project for D&R?

A Bird Table. ....exam question 3 or 4 to choose from.

Q Did you do any research?

A Yes.

Q Did you think it was an important part of your project?

A I did it because I had to.
Teacher and my Dad thought of areas to research.
It did help with a few ideas.
071 Didn't enjoy finding out where bird box to go or how high up it must be. ...it just went on and on.

Q's About designing?

A I completed the project.
080 I was pleased with it ...one of the best pieces of design work I've done. I had to sit down and get on with it all at once. One and a half hours.
089 I had to work to my drawings. ...if mistakes I had to put them in my evaluation.

Q How many ideas?

A 4 - 5.
099 Went into the examination knowing what I was going to do.
I included sketches in my research.
107 I did a working drawing.
111 I had idea before exam on sizes and materials.
Used ideas from other projects for materials and joints.

Q's about Making

I finished it.
I was pleased with it.
I enjoyed it.
121 I enjoyed making more than designing, unless not interested in what we are making. Then I don't want to make a good job of it.
I didn't find anything difficult in the making.

Q Did you ever have to make 3D models whilst you were designing?

A No.

Q's about Evaluating
Q Did you do it?

A Yes.
135 It's OK. I can say if its turned out the way I wanted it to.

Q How do you feel you have done in your project?

A Well.

Q Why?

..... A Because it is for my examination and we had a bit of a choice.

Q What will you be doing next year?

A Hoping to stay on to do A levels.

Q If you were given your Option choices again would you choose D & R?

A I would choose Electronics and technology but quite enjoyed D & R.

School 031
Pupil 1

06 Q Do you take either Technology or Design and Communication as well as D&R?

A Only D & R.

Q How many D & R projects did you do?

A 4 or 5.

013 Q In D&R which of the following aspects have you done: Design and Make projects; Theory; Theory homework; Project work homework?

A Theory - infrequently, no theory homework, some project work at home.

Q In your design and realisation project work you have been involved in a lot of drawing and writing. There are several types of drawing you may have used.

Early Sketches

022 Q Do you like doing early sketching?

A No don't enjoy doing it. Find it difficult to come up with ideas to draw. School give help but I still do not understand how to do it.

Careful Drawings

026 Q Do you enjoy doing careful drawings?

A Can't enjoy doing careful sketches with sizes on. I find it difficult.

Working drawings

030 Q Did you do this?

A Yes but don't enjoy doing working drawings. Its even worse than the previous two. I have been taught technical drawing but I haven't sorted out how to do it.

Careful Perspective

040 Q Did you enjoy this?

A Don't dislike this quite as much.

042 Q In your design and realisation project work you may have been involved in several types of writing.

Writing beside your sketches to explain your ideas and thoughts

Q Do you like doing this?

A yes, don't mind this as much. I can certainly do the writing.

Careful lettering for headings, title sheets and on working drawings

Q Do you like doing this?

A Don't mind that, its basic and doesn't cause me difficulty..

A written evaluation

048 Q Do you like doing this?

A Rarely get to that stage.

Q Do you enjoy making your projects?

060 A I have no idea how to join materials, change of school, gap between what I was expected to know when I came and what I'd been taught at my old school was enormous. At the old school I was told what to do, never allowed to go off and design.

Q What did you tackle as your final project for D&R?

A Basket ball ring ....I started but never finished.
075 It was way out of my depth. I chose it .....it was the only thing I could think of.
078 Easy to think of, difficult to do.

080 Q Did you do any research?

084 A Yes. I did some research, looked at height and how they were made.

Q Did you think it was an important part of your project?

Research is definitely important if you are going to be successful. Suppose research wasn't a bad part ...better than the other aspects.
086 It was a relief after struggling with drawings.
095 Did research at home and at basket ball club.
If all my design work could be writing I'd get by.

Q's About designing.

100 A Yes I did it.

103 Not at all pleased with the designing.
105 Ran out of steam once I had got the basic ideas. Got plenty of help from school.

Q How many ideas?

107 A Drew up a number of ideas. ...5 of them.
112 Needed help checking that I was on right track. Uncle and teachers helped.
121 Did enjoy going further, developing the solution. Started to come unstuck. Because I didn't have an understanding. I maybe knew how to design it but I didn't know how I was going to relate it to how I was going to make it.

126 Q What about materials?

A I had a rough idea of the materials. *I didn't enjoy doing a working drawing. I only* briefly touched on it. Lack of technique.

Q's About Making.

134 A I didn't finish it.

Q Do you feel frustrated by that?

A If I was being quite honest I feel frustrated that I made the decision to take it in my options. Not because it was a bad subject but because it is definitely not my scene.

145 Q's About Evaluating.

Q Did you do it?

A No didn't do that. It would have been a good way of finishing off the project if I'd been capable of doing the rest of the project.

School 007
Pupil 1

06 Q Do you take either Technology or Design and Communication as well as D&R?

A Just doing D & R.

Q Did you do projects

A Yes

013 Q In D&R which of the following aspects have you done: Design and Make projects; Theory; Theory homework; Project work homework?

A Theory - yes. Read, but no written work. Didn't do any theory homework. No project work at home at all.

Q In your design and realisation project work you have been involved in a lot of drawing and writing. There are several types of drawing you may have used.

Early Sketches

021 Q Do you like doing early sketching?

A That's the bit I like.

Q Why?

A Relaxing and free and easy.

Careful Drawings

029 Q Do you enjoy doing careful drawings?

A I get it wrong ...putting the numbers on the wrong side of the line.

Working drawings

030 Q Did you do this?

A No didn't do working drawings. No good at it.

Careful Perspective

040 Q Did you enjoy this?

A It's alright

043 Q In your design and realisation project work you may have been involved in several types of writing.

Writing beside your sketches to explain your ideas and thoughts

Q Do you like doing this?

A OK. I like it because it shows how it works. It is good to communicate to other people.

Careful lettering for headings, title sheets and on working drawings

Q Do you like doing this?

048 A Takes too long. ...looks neat but takes too long. Don't like doing it. Don't like doing accurate, detailed work.

A written evaluation

050 Q Do you like doing this?

A Don't enjoy doing written evaluations. Boring. Because it takes too long and I have to think about what I have done.

062 No not been successful in project therefore don't like writing about it.

Q What did you tackle as your final project for D&R?

A Cassette holder and CD holder

Q Did you finish your project

A No. Because I got it wrong three times and ran out of time. When I'd made it, it didn't look right, it was dead untidy, I made it again and did some corrections.

Q Did you choose the project?

072 A I chose the project. I spent a day looking at what project to choose. School gave us ideas of what other people had done.

Q Did you do any research?

A Yes.

Q Did you think it was an important part of your project?

080 Didn't feel it was an important part of the process or relevant. Just looked at catalogues and cut bits out. School suggested going to town.
I did all my research in the classroom. ...I didn't write about what I collected.

Q's About designing.

103 A I enjoyed the designing more than the making because I got the making wrong a few times.

105 Wasn't pleased with the design work. Compared with other people 's it wasn't very good. Sketching was OK, ...not enough, people had done lots of different areas. If project had been more dynamic than a cassette rack, I might have done better.

Q How many ideas?

121 A Drew a number of different ideas on paper. ...can draw so I like drawing.

Q What help did you have?

What help? ...no help just got on with it.

Q Did you do drawings to develop chosen ideas?

A Yes.

Q Did you enjoy doing them?

A OK

Q What help did you get?

A Techniques, in terms of communication.

Q Did you do working drawings?

A No, didn't do an engineering drawing.

Q How did you work out the sizes?

A Used a CD.

Q How did you work out the joints?

A Looked in a book and chose one. Discussed it with teacher.

Q Were they successful?

A The last ones were.

Q's About Making.

155 A I didn't finish it.

Q Why didn't you complete?

A Not enough time, made it then had to re-make it.

Q Why?

A Because I cannot use the tools properly. Enjoyed it until I had to go back. Not pleased with the final outcome. It wasn't what I wanted. Ended up making something to hand in.

174 Q Did you do any three dimensional modelling?

A No, others did. I don't think it would have helped me.

145 Q's about Evaluating

Q Did you do it?

A No, didn't want to do it. I don't mind writing but don't like D&R.

Q Why?

A Because I can't use the tools properly. Nor can I use the machines properly. Don't think evaluation is a good way to finish a project just want to stop at the making stage.

School 047
Pupil 1

05 Q Do you take either Technology or Design and Communication as well as D&R?

A Just doing D & R.

Q Did you do projects?

A Yes - three.

Q In D&R which of the following aspects have you done: Design and Make projects; Theory; Theory homework; Project work homework?

027 A Theory - enough. Theory homework one hour per week. Design folder work taken home too.

Q In your design and realisation project work you have been involved in a lot of drawing and writing. There are several types of drawing you may have used.

Early Sketches

029 Q Do you like doing early sketching?

A Yes, done it - didn't enjoy it really as I am not a good drawer. Although there is the satisfaction of seeing what my ideas look like.

Careful Drawings

Q Do you enjoy doing careful drawings?

A That's alright.

Working drawings

037 Q Did you do this?

040 A Did them but don't enjoy doing them. Couldn't draw them, it was hard. Didn't understand the technique even though we were taught.

Careful Perspective

Q Did you enjoy this?

044 A Enjoyed presentation drawings. See what it looks like - a flashy drawing.

Q In your design and realisation project work you may have been involved in several types of writing.

Writing beside your sketches to explain your ideas and thoughts

Q Do you like doing this?

A Yes, it's OK.

Careful lettering for headings, title sheets and on working drawings

Q Do you like doing this?

048 A Enjoyed doing titles. Made my sheets look good. Gives me pleasure.

A written evaluation

050 Q Do you like doing this?

061 A Alright. Don't mind saying I failed to do this etc..

Q What did you tackle as your final project for D&R?

A A blanket chest.

Q Did you choose the project?

065 A I didn't find it easy to choose a project.

Q Didn't your teacher help?

068 A No. He just went round the class and asked what we were doing. It was embarrassing - I got my idea for a project from a magazine.

	Q	Did you do any research?
071	A	Yes.
	Q	Did you think it was an important part of your project?
		It was an important part of the process. I enjoyed it. I went to different shops. Got leaflets. Did research everywhere.
077		It was alright having to write up about research.
079		Didn't know what to write but school gave me help.
	Q's	about designing
080	A	I enjoyed making more than designing. Definitely.
084		Pleased with designing. My drawing because I didn't think my work would be good as that but it came out OK. Frustrating getting it right.
090		Enjoyed thinking of several ideas. Got help from school on how to put the folio together.
	Q	What help did you have?
	A	Help from teachers and friends.
	Q	Did you do drawings to develop chosen ideas?
098		I enjoyed working out details better.
	Q	Did you do working drawings?
101		Didn't enjoy doing working drawings. Too hard to get it exactly right.
	Q	How did you work out the sizes?
	A	Teachers helped.
	Q's	About Making.
107	A	Just finished making it. I enjoyed it definitely. I enjoyed everything about making it.
111		I was pleased with it. The way it looks, I didn't think it would turn out like that. It worked like I drew on paper.
116	Q	Did you do any three dimensional modelling?
	A	Didn't make any models. I don't think it would have helped.
119	Q's	about Evaluating
	Q	Did you do it?
	A	I wrote an evaluation.
	Q	Did you enjoy doing it?
	A	It was alright. Good way to finish the project because if you did it again you could correct the mistakes you made.

Example of completed observation sheets for 6 pupils from th 50 observed during Phase Two of the project

School 032 Pupil 09 (m) Code 032 | 09 | 3

PROJECT

BIKE STAND.

Needs stand to mend & service his own mountain bike.

Date started: SEPT'94

Context given .

Free choice ✓

3RD OCT

Aspects tackled (since last meeting)

Has produced own personalised boarder for his design sheet. Well designed, interesting lettering.

Sheet 1:

Situation — He worked this out from the prompt sheet handed out by teacher

Sheet 2.

Analysis — written in rough then discussed with teacher & then carefully copied up.

No. of sheets 2

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

~~OTHER~~ photocopy.

~~COLOUR~~

crayons marker pens

paints

WRITING

Annotations notes

Careful lettering

Report

DIFFICULTIES ENCOUNTERED

Thoughts Drawing Writing

School 032 Pupil 09 (M) Code 032 | 09 | 3

Aspects tackled (since last meeting)

Research-

Collected pamphlets. Sent away to firms. Got replies back. Written letters using word processing

Sheet 1.

5 ideas on one sheet. Pin drawings with no thicknesses. One annotation to explain velcro straps. Ideas not explained but thought out in his head.

Will be drawing up each idea using isometric paper to get accurate drawing.

Using rules as well as pencil not pen for drawings. Uses rule to get drawing "correct".

Drawing not started. Seeking teachers advice to see how to draw what he wishes to represent.

No. of sheets 1

3D models .

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

~~Report~~ Computes.

Date 17th Oct.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 032 Pupil 09 Code 032/09/3.

Aspects tackled (since last meeting)

Continues to design his bike stand.
One careful drawing of his bike stand. + two close up drawings of details with labels (w explanations.)
Ideas for methods of holding bike onto frame taken from existing products.

VERY LITTLE WORK DONE.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

~~Report~~

labels

word processing

Date 7TH NOV '96

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 032 Pupil 09 (M) Code 032/09/3

Aspects tackled (since last meeting)

Left folder at home.
Says done 6 ideas on 4 sheets.

writing information about Good points & critical aspects of the designs. and will copy it up when appropriate.

Careful drawings using rule & pencil. details showing how bike frame will fit into support carefully drawn in 3D's. Annotation no more than labels or drawings Good points are answering PDS. Poor points-what may not work. Ask about the user interface with the product.

No details of materials or sizes. Says a development sheet of chosen idea is done - but at home.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective **isometric**

elevations **sections**

2D INSTRUMENTS

perspective **isometric**

elevations **sections**

INSTRUMENTS MEASURED

perspective **isometric**

elevations **sections**

OTHER

COLOUR

crayons **marker pens**

paints

WRITING

Annotations

Careful lettering

Report

labels

notes.

Date 5TH DEC 94

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing **Writing**

School 032 Pupil 09 (M) Code 032/09/3

Aspects tackled (since last meeting)

Absent — At Art Mock exam.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

Date JAN 16TH

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 032 Pupil 09 (M) Code 032|09|3

Aspects tackled (since last meeting)

PRACTICAL -

Cutting out pieces of metal - says knows how it will all fit together but drawings do not show how this will happen.

No more design work completed.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

Date FEB 13TH

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 032 Pupil 09 Code 032/09/3

Aspects tackled (since last meeting)

Frame coming together. Welding had help from the technician.

Has altered design of frame as frame was not going to be strong enough.

Took advice from his teacher & will put changes & improvements into his evaluation — will not re-do design sheets to fit. — "that would be cheating ...."

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

Date MARCH 6TH.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 032 Pupil 09 Code 032/59/3

Aspects tackled (since last meeting)

At CAREER'S INTERVIEW

Missed lesson altogether.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective **isometric**

elevations **sections**

2D INSTRUMENTS

perspective **isometric**

elevations **sections**

INSTRUMENTS MEASURED

perspective **isometric**

elevations **sections**

OTHER

COLOUR

crayons **marker pens**

paints

WRITING

Annotations

Careful lettering

Report

Date MARCH 2=TH

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing **Writing**

School 032 Pupil 09 Code 032/09/3

Aspects tackled (since last meeting)

Finished project. practical & fairly sound nature but doesn't conform to the designs established in design sheets.

Finished off the fitting for his sheets at last minute.

But on the whole a conscientious worker although not very creative.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons **marker pens**

paints

WRITING

Annotations

Careful lettering

Report

Date APRIL 24TH

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 032 Pupil 02 (M) Code 032 : 02 : 3

PROJECT

DRINKS HOLDER FOR CAR

Inspired by need within his own family.

Date started: Sept 1994

Context given ☐

Free choice ☑

Aspects tackled (since last meeting)

Found it easy to think of project over Summer holidays.

STREET 1.

Situation - At home bringing it in next lesson.

STREET 2.

Brief & analysis.

Design of border for all sheets based on bottles & page no. & his initials. His own design. Drawings & lettering V. poor.

Found it easy to write as had prompt sheet from school.

Didn't mind having to copy out words carefully "... as it will look better."

Weak drawing & writing skills.

No. of sheets 1

3D models ☐

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

(perspective) isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

(Careful lettering)

Report

DIFFICULTIES ENCOUNTERED

(Thoughts) (Drawing) (Writing)

School 032 Pupil 02 Code 032:02:5

Aspects tackled (since last meeting)

Ideas Sheet-

First idea drawn on rough sheet. Coloured in & cut out ready to stick onto final sheet of ideas.

1. Rough sheet of ideas

a) An attachment on car door with hinge. Annotation to explain drawing & how it would work. V. Simplistic drawing no details worked out part pers/part side elevation.

b) round drinks holder. 2 drawings to explain idea & how it will hold the drinks can.

No. of sheets 2

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

(perspective) isometric

(elevations) sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

(crayons) marker pens

paints

WRITING

Annotations

Careful lettering

Report

Date 17th october.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 032 Pupil 02 Code 032/02/3

Aspects tackled (since last meeting)

① Situation, brief & analysis sheet copied up.

② finished off sheet 2

③ Second idea. perspective drawing & plan.
Wires explaining "... difficult to make." & what views are shown on sheet.

④ third idea. ⬡ shape -
front elevation & plan with explanation of differences.
Explain how could be difficult to open.

⑤ Started rough sheet on idea 4. Little freehand drawing.

V. simplistic drawing & wires little evidence of teasing out details

No. of sheets 5

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

(perspective) isometric

(elevations) sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

(crayons) marker pens

paints

WRITING

Annotations

Careful lettering

Report

Date 7th Nov '94

DIFFICULTIES ENCOUNTERED

(Concepts whilst drawing) Concepts whilst writing (Drawing) (Writing)

School 032 Pupil 02 Code 032/62/3

Aspects tackled (since last meeting)

Completed all the writing he wishes to do on each sheet.
Explains what is in the drawing except in idea 5. In this case he explains that this shape would be difficult to make.
Started Idea 6. but explained sheet needs plan view as well.
It is a totally different idea but there are no explanations either drawn or written on how it would work.
Idea 7. in the process of doing sheet with a seventh idea on it. Drawing poor. but writing explains how it will work. Although no thought has been given to sizes & material or the size of the whole item. "I will think of these later on."

No. of sheets 2

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

~~Careful lettering~~

Report

Date Dec 5th.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 032 Pupil 02 Code 032/02/3

Aspects tackled (since last meeting)

Finished design sheet which illustrates what he believes will be his chosen idea. *

Produced sheet which has sizes of wood for his chosen idea.

PRACTICAL.

Cut out template of sizes of holes for can & food.

Stuck together two pieces of timber so that he can make the 'tray'.

*. perspective drg of idea with simple annotations. Plan view showing positioning of holes for can & food but no dimensions on any drawing.

No. of sheets 2

3D models 1

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

(perspective) isometric

(elevations) sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

(Annotations)

Careful lettering

Report

Date 16th NOV '95

DIFFICULTIES ENCOUNTERED

(Concepts whilst drawing) Concepts whilst writing (Drawing)

Writing

School 032 Pupil 02 (M) Code 032·02

Aspects tackled (since last meeting)

Lost work —

DONE NOTHING to CATCH UP.

VERY DEMOTIVATED.

WANDERING AROUND — NOT A NUISANCE BUT NOT GETTING ON.

Halfway through lesson.
Starting practical work again
Having to re-cut out template for drinks mat.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

Date FEB 13TH.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 032 Pupil 02 (M) Code 632/02/3

Aspects tackled (since last meeting)

BEEN ABSENT SINCE LAST TIME I WAS IN.

Still planning up end of his piece of wood (a 10-20 min job taken him 2 weeks.)

Believes he will finish "easily" as he hasn't much to do.

No design work done at home - NOT done during lesson time now.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

Date MARCH 6TH.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 032 Pupil 02 Code 032/02/3

Aspects tackled (since last meeting)

Has bought the cushion but hasn't made cover yet.

Hasn't done anything since I was last in except sand down the two ends of his single piece of wood.

Spent 15 mins. getting the technician to get him the router.

Getting another pupil to attach his work to the bench with a G. cramp as he doesn't know what to do. Has admitted to his teacher that he is afraid of the router. Teacher doing his work for him.

No Designwork done.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

Date MARCH 20TH

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 032 Pupil 02 Code 032/02/3

Aspects tackled (since last meeting)

Writing up evaluation (not finished (to!) Still got to attach cushion (cover made by mum) to backboard.

Did some extra work after School yesterday to try to catch up.

But deadline is now upon him so must hand in project as it is. — UNFINISHED.

No. of sheets 1

3D models

Modelling methods used:

2D FREEHAND

perspective **isometric**

elevations **sections**

2D INSTRUMENTS

perspective **isometric**

elevations **sections**

INSTRUMENTS MEASURED

perspective **isometric**

elevations **sections**

OTHER

COLOUR

crayons **marker pens**

paints

WRITING

Annotations

Careful lettering

Report

Date 24th April

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing **Writing**

School 035 Pupil 11 (M) Code 035·11·3

PROJECT

Toy — (To be realistic.)

Date started: Sept 1994.

Context given ✓

Free choice

4th oct.

Aspects tackled (since last meeting)

Decided on a Police car. (basically because made one already in yr8.) "A safe project"
Already done Brief, Analysis & Specification by the time of my first visit.
(3) design sheets.
(1) Police car.
(2) Boat for navy
(3) Robot.
(4) Final sheet of what car will look like. drawing of side view but not to scale.
Carefully drawn & coloured in.
Doesn't enjoy perspective drawing
Has no idea how car will be made. Detailed models will be used.
Seen vacuum forming & knows needs mould. Says not worried that he doesn't know how it will be made.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

DIFFICULTIES ENCOUNTERED

Thoughts Drawing Writing

School 035 Pupil 11 (M) Code 035 · 11 B

Aspects tackled (since last meeting)

Practical.

Produced vacuum formed 'car' but it has 'stuck' because of lack of draw on mould.

Sanded mould down & will re-vac. next week.

Design work — No more drawn images.

Printed out :—

1. Brief.
2. Spec
3. Analysis
4. Research
5. Evaluation begun but can't finish it as NV finished product — but IT lesson so must do it!

Still got electronics to design & make.

No. of sheets 5

3D models ✓

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

Computer presented

Date 16TH oct 94

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 035 Pupil n (M) Code 035.11.3.

Aspects tackled (since last meeting)

Designing

Begun to produce sheet on manufacturing process. — how he went about making wood.

Practical.

Cut out form I can but still needs angles correct for Vacuum forming.

No. of sheets 1

3D models ✓

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

(perspective) isometric

(elevations) sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

(Annotations)

Careful lettering

Report

Date 2.11.94

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 035 Pupil 11 (M) Code 035·11·3

Aspects tackled (since last meeting)

① Evaluating process written out in rough

② Research from catalogues pulled together but not stuck down or written about yet.

③ Cutting list based on help from teacher. Sizes all worked out by teacher – doesn't understand where they come from.

PRACTICAL

Been given block of wood & working out design from work NOT from his drawings.

No. of sheets 4

3D models

Modelling methods used:

2D FREEHAND

perspective **isometric**

elevations **sections**

2D INSTRUMENTS

perspective **isometric**

elevations **sections**

INSTRUMENTS MEASURED

perspective **isometric**

elevations **sections**

OTHER

COLOUR

crayons **marker pens**

paints

WRITING

Annotations

Careful lettering

~~Report~~

Rough written notes

Date 19th NOV.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 035 Pupil 11 (M) Code 035·11·3

Aspects tackled (since last meeting)

Should have handed work in but not finished.
Depends on how complex teacher makes the circuit design as to whether he will finish on time.
About 2 weeks ago he gave up.
Then realisation that not that much left to do so is now making effort to try to get it all done.
However he will not manage unless his teacher solves his unsolved design problems — mainly in the area of circuitry.

No. of sheets ☐
3D models ☐

Modelling methods used:

2D FREEHAND
perspective isometric
elevations sections

2D INSTRUMENTS
perspective isometric
elevations sections

INSTRUMENTS MEASURED
perspective isometric
elevations sections

OTHER

COLOUR
crayons marker pens
paints

WRITING
Annotations
Careful lettering
Report

Date 30 : 11 · 94.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 035 Pupil 11 (M) Code 035·11. 3

Aspects tackled (since last meeting)

WORK HANDED IN.

1. COVER – Toy Survey
2. Contents page
3. Brief.
4. Spec.
5. Analysis.
6. Research
7. Evaluation
8. 2nd design idea.
9. 3rd design idea
10. 1st design idea
11. How I made my mould.
12. Materials & parts drawn.
13. Final idea drawing
14. Toy Survey
15. Analysis of Survey
16. pictogram of survey results.
17. " " " "
18. pie charts
19. Bar charts
20. Research conclusions hand written
21. Research of cut & paste variety.

VERY LITTLE DONE IN SCHOOL.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

(perspective) isometric

(elevations) sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

(crayons) (marker pens)

paints

~~WRITING~~

(Annotations)

(Careful lettering)

~~Report~~

(Computer)

Date 30 : 11: 94

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 035 Pupil 14 (F.) Code 035 | 14 | 3

PROJECT

INFORMATION MAP FOR THEME PARK

Date started: SEPT 1994.

Context given ✓

Free choice

4th oct 94.

Aspects tackled (since last meeting)

3 Designs on three separate sheets. very basic.

Analysis, brief and the specification written out in rough. To be copied up in IT lessons.

No. of sheets 2

3D models

Modelling methods used:

2D FREEHAND

(perspective) isometric

(elevations) sections

2D INSTRUMENTS

(perspective) isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

(crayons) marker pens

paints

WRITING

(Annotations)

Careful lettering

Report

DIFFICULTIES ENCOUNTERED

(Thoughts) (Drawing) Writing

School 035 Pupil 14 (F) Code 035 | 14 | 3

Aspects tackled (since last meeting)

(1) Sheet. With final idea on.
A carefully drawn 3D perspective drawing. With measurements & a basic explanation of how the user would interface with the product.

(2) Cutting list for the box part of the product. Doesn't have any relationship to product designed on last sheets.

It is how a box with a map on the top to work as the 'real board' would work. But Board too big & complex to make.
Sizes worked out in head & straight onto cutting list.

PRACTICAL STARTED.

Says will do extra work at home to fill up aspects of design work not already tackled.

No. of sheets 2

3D models beginning

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

(perspective) isometric

(elevations) sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints (pencil shading)

WRITING

(Annotations)

Careful lettering

Report

Date 19th October

DIFFICULTIES ENCOUNTERED

(Concepts whilst drawing) (Concepts whilst writing) (Drawing) Writing

School 035 Pupil 14 F Code 035·14·3

Aspects tackled (since last meeting)

Practical work -

Glued and tacked 4 pieces of hood into a box form.

Going to cut out perspex sliding lid but not got that far yet

Design work

Done the drawing of the box but left this at home.

No. of sheets –

3D models ✓

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons **marker pens**

paints

WRITING

Annotations

Careful lettering

Report

Date 2·11·94.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 035 Pupil 14 (F) Code 035·14·3

Aspects tackled (since last meeting)

Folders must be handed in today

Research collected.
Some information from police. But nothing analysed or anything done with that information or the other pamphlets collected.
(1.) 3 ideas drawn in perspective but only scribbled notes in the corner.
(2) Rough copy of a timeplan & costing for product.
(3) Brief & specification still rough & marked by teacher.
(4) Drawing of box. For perspective with sizes written on it. Notes explaining how user will interface with product & the way the box will be made is discussed.
(5) Idea One - A school map. Plan view not perspective. Materials mentioned. Colour used on sheets.
Print out of Brief, spec, Analysis, time plan, & cost. Where it will be used, by whom.
Plastics all stuck together. Going to go to electronics to complete in own time.
Still got map to draw & perspex lid to do.

No. of sheets
3D models

Modelling methods used:

2D FREEHAND
perspective isometric
elevations sections

2D INSTRUMENTS
perspective isometric
elevations sections

INSTRUMENTS MEASURED
perspective isometric
elevations sections

OTHER

COLOUR
crayons marker pens
paints

WRITING
Annotations
Careful lettering
~~Report~~
Computer presentations

Date 16·11·94.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 035 Pupil 14 (F.) Code 035·14·3

Aspects tackled (since last meeting)

Done some written work on computer at home.

Got a map from home — one of Alton Towers — (nothing to do with school)

Circuit has been made in own time — going to extra session tonight to complete.

Needs to add it to map.

Box made & 'finished' but still has to figure out how to put map & electronics together.

Evaluation still to do.

Nine sheets finally handed in & a half made product.

No evaluation.

No. of sheets

3D models ✓

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

~~Report~~ Computer

Date 30 Nov 94

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 049 Pupil 06

Code 049 | 06 | 3

PROJECT

Brief 1.

Advertising with a physical outcome

Date started: Oct 7th.

Context given ✓

Free choice

Oct 7th

Aspects tackled (since last meeting)

No sheets produced during the first session.
Thinking about it. Suggests historical research will be important.
Avoided working all lesson but not a nuisance, just wandered from friend to friend, helping one on the computer, discussing another's project,

No. of sheets 0

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

DIFFICULTIES ENCOUNTERED

Thoughts Drawing Writing

School 049 Pupil 06 Code 049 06 03

Aspects tackled (since last meeting)

plan of action – only near sheet so far. Other 2 sheets in rough brief, & identification of need.
For Research
Started looking at Christmas & Easter. But these were suggested by the teacher so he has decided doesn't want to do those will look at Halloween instead. – wants to be different.
Gone to library to write notes on the definition of Halloween.
Suggests he has a box full of ideas at home on pieces of paper.
Very capable boy – looking up encyclopedia on CD room.

No. of sheets 1

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

(WRITING)

Annotations

(Careful lettering)

Report

Date 21 · 04 | 95

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 049 Pupil 06 Code 049 | 06 | 03

Aspects tackled (since last meeting)

Still no work done.

Says he has finished collecting information regarding Halloween.

Has had plenty of thoughts about his ideas but has put nothing down on paper. Says done rough ideas on paper stored at home.

When discussed – ideas and reasoning very sound.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

Computer printouts.

Date 11.11.95

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 049 Pupil 06 Code 049 | 06 | 03

Aspects tackled (since last meeting)

Re-cap on work done so far
(1) Plan of Action sheet.
(2) Design ideas on A4. Going to re-draw them onto one A3 sheet.
(3) Tried to do them on A3 but messy and wants to do them again
(4) Leaflets collected from technology exhibition which he is going to stick onto a sheet.

Still not sure what type of model to make.

Typed (+ word processed) a questionnaire about festivals but not filled in by anyone yet.

Spent whole lesson chatting to friends & wandering around classroom.

No. of sheets ☐
3D models ☐

Modelling methods used:

2D FREEHAND
perspective isometric
elevations sections
2D INSTRUMENTS
perspective isometric
elevations sections
INSTRUMENTS MEASURED
perspective isometric
elevations sections
OTHER

COLOUR
crayons marker pens
paints
WRITING
Annotations
Careful lettering
Report

Date 2 · Dec '95

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 049 Pupil 06 Code 049/06/3

Aspects tackled (since last meeting)

Absent.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

Date 20 · JAN 95

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 049 Pupil 06 Code 049/06/3

Aspects tackled (since last meeting)

Absent.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

Date 3RD FEB 95

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 049 Pupil 06 Code 049·06·3

Aspects tackled (since last meeting)

WAY BEHIND.

Started making although no design work done — expects to get organised by next week — !!

Been sent to get bulbs from Science as none left in D&T.

Once back — playing on computers & wandering around to see his friends.

No work done.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

Date 17 Feb 95.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 049 Pupil 06 Code 049 | 06 | 03

Aspects tackled (since last meeting)

Trying to do a pie-chart on the computer of the results of his questionnaire — which he got his family & his class friends to fill in. Can't get programme to work. Uses his peers to do it but they can't get into the programme either.

Has produced the inside of his project in the past two weeks. All sheets are done on the computer at home. 3 ideas drawn with lots of thought & analysis. 99% of this is written.

Done folder at home, done practical at school. Re-doing written report as he feels English not good.

No. of sheets

3D models

Modelling methods used:

2D FREEHAND

(perspective) isometric

(elevations) sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

(Annotations)

(Careful lettering)

(Report)

(Computer presentation)

Date 10 · MARCH 95

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 049 Pupil 09 Code 049|09|3

PROJECT

Chosen Brief 1.

Promote shop or

Promote sheet

Date started: 7th oct.

Context given ✓

Free choice

7TH OCT

Aspects tackled (since last meeting)

Rough of Identifying the need. which she says she will copy up.

Begun some design ideas on one sheet.

Begun Action planning sheet.

Doesn't believe she can draw.

Perspective simple but O.K.

Colouring well executed.

No. of sheets 3

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

DIFFICULTIES ENCOUNTERED

Thoughts Drawing Writing

School 049 Pupil 09 Code 049 09 3

Aspects tackled (since last meeting)

Finished identifying needs sheet. Used blue pencil, carefully lettering.

Design Brief – re-doing it to incorporate the theme of a museum.

Very careful lettering, well laid out Heading in large capitals.

Now doing:

Research – on mechanisms.

Copied some mechanisms in rough from information given by teacher. Now drawing them out carefully. Using felt pens to colour them in.

No. of sheets 2

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

(elevations) sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons (marker pens)

paints

(WRITING)

(Annotations)

(Careful lettering)

Report

Date 21 · Oct.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

Richard

School 049 Pupil 09 Code 049 09 3

Aspects tackled (since last meeting)

Has completed some research on CDRom.

① definition of automation

② example of how to go about programming (which she will need later.)

Teacher has been given new information from examboard. This has meant that whole class have had to re-do their design brief sheet & change their 'identifying needs' sheet.

About to start a sheet on evaluation of research.

No more design work done at all.

No. of sheets 4

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

presentation written work

Date 11.11.94

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing

Writing

School 049 Pupil 09 Code 049 | 09 | 3

Aspects tackled (since last meeting)

No. of sheets 3

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

(1) Research now includes a ticket from Technology Exhibition visited by the whole class. — She found it most interesting.

(2) Sheet on materials & costs. using written information given by teacher.

(3) Sheet on detailed costing & materials that will actually be used in the design.

No more designing done. — Avoiding drawing.

Date 2:12:94.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 049 Pupil 09 Code 049 09 3

Aspects tackled (since last meeting)

Gone back to design sheet produced in early weeks — chosen the first idea drawn down.
PRACTICAL
Drawn the image out onto plywood without template or measurements considered. No details worked out on paper at all. Had some discussions with teacher who knows what she should be doing.
Using a mould made by school to vacuum form the base. Has no idea how she will attach the 'Santa' to it. Will use base to hide mechanism & electronics.
Sanding down the plywood figure will then paint it to look like a Santa.
Then Sir will work out how the arm will move!

No. of sheets 0

3D models ✓

Modelling methods used:

2D FREEHAND

perspective **isometric**

elevations **sections**

2D INSTRUMENTS

perspective **isometric**

elevations **sections**

INSTRUMENTS MEASURED

perspective **isometric**

elevations **sections**

OTHER

COLOUR

crayons **marker pens**

paints

WRITING

Annotations

Careful lettering

Report

Date 20.1.95

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing **Writing**

School 049 Pupil 09 Code 049/09/3

Aspects tackled (since last meeting)

PRACTICAL.

Painted 'Santa'. Has attached the arm to the Santa and the Santa to the base – ' with the help of Sir '

Now Trying to drill out a slot for the mechanism. Realises it should have been done before as it would have been easier but ' Sir didn't tell me to '.

No. of sheets 0

3D models ✓

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

Date 3.2.95.

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing Writing

School 049 Pupil 09 Code 049 09 3

Aspects tackled (since last meeting)

Has been down to the workshops at lunchtimes to get extra hours & help.

Has fitted led eyes & wiring.

Has got a motor fitted and a cam made so that the arm will move up and down.

Spent more lesson helping her friend to complete her model.

No. of sheets 8

3D models ✓

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons **marker pens**

paints

WRITING

Annotations

Careful lettering

Report

Date 17:2:95

DIFFICULTIES ENCOUNTERED

Concepts whilst drawing Concepts whilst writing Drawing **Writing**

School 049 Pupil 09 Code 049/09/3

Aspects tackled (since last meeting)

Done many extra hours at lunchtimes.

Finished the modelling.

finished the programming.

Design folio work.

(1-3) Has added in three sheets on materials.

(4) Has done a sheet on programing

(5) Added some research on Sensors.

(6) Evaluation of research now finished.

(7-11) Done 4 sheets on the process she has completed.

Now has 20 sheets and has checked them off against the teachers list of what must be there & thinks she has 15 more to do over the weekend in time to hand it in.

No. of sheets 11

3D models

Modelling methods used:

2D FREEHAND

perspective isometric

elevations sections

2D INSTRUMENTS

perspective isometric

elevations sections

INSTRUMENTS MEASURED

perspective isometric

elevations sections

OTHER

COLOUR

crayons marker pens

paints

WRITING

Annotations

Careful lettering

Report

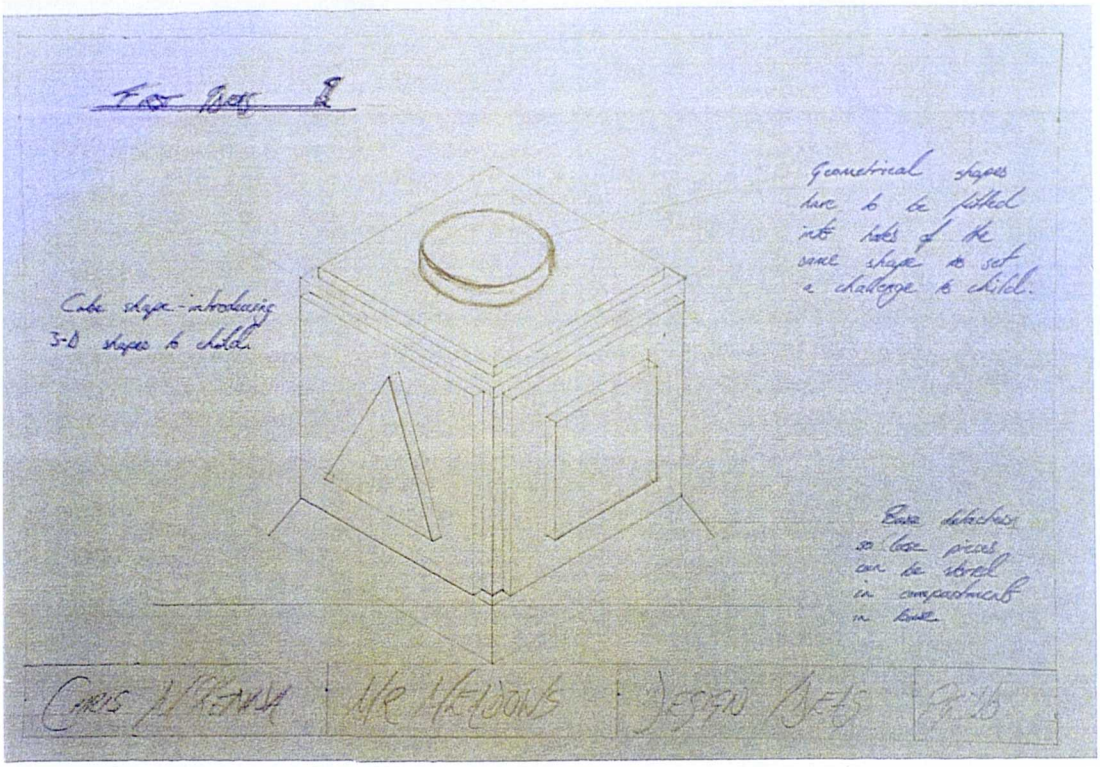
Date 10.3.95.

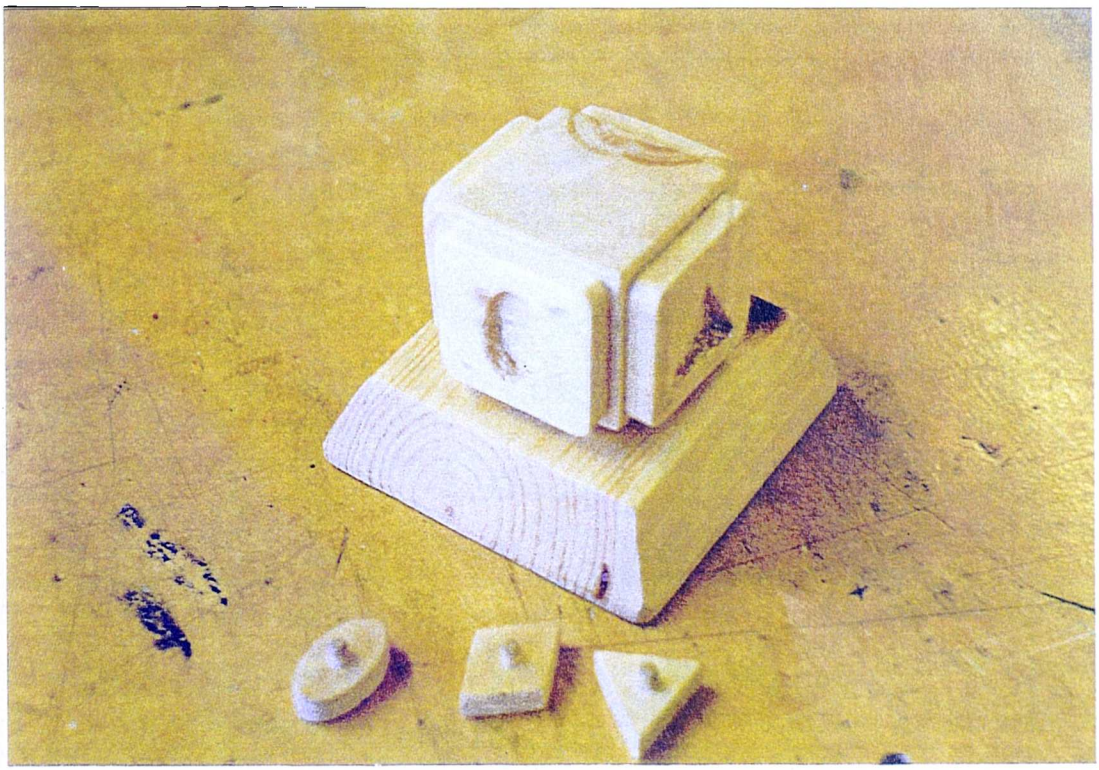
DIFFICULTIES ENCOUNTERED

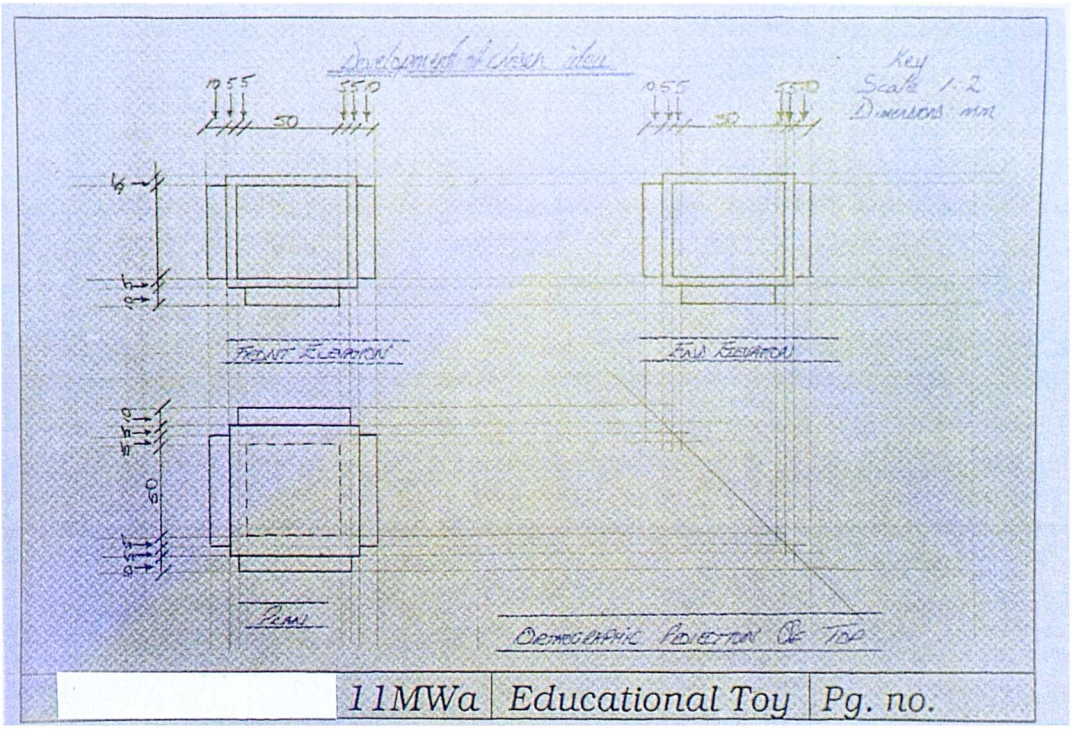
Concepts whilst drawing Concepts whilst writing Drawing Writing

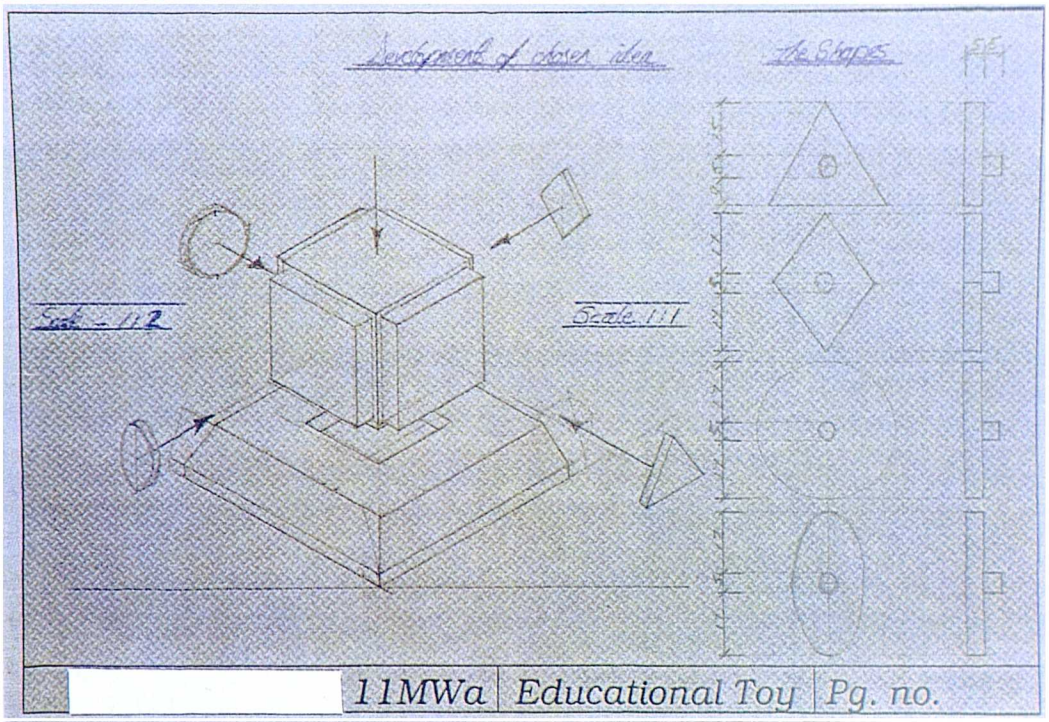
Photographic evidence of some of the project work carried out by the selected fifty pupils during Phase Two.

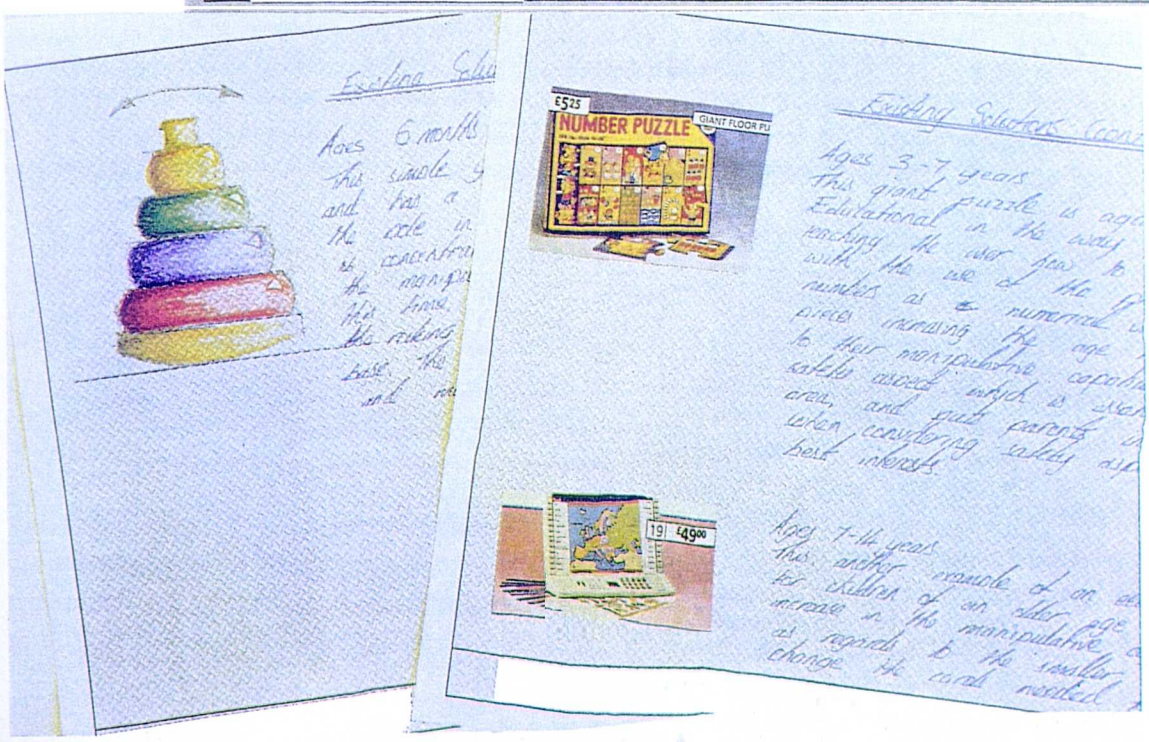
Example of the work produced by one pupil. The two photographs on this page show his first design sheet and his 'finished' practical work. The next three photographs show design work which was carried out after the practical work was done in order to complete his design folio. This pupil gained a mark of 78% for his project work - a childs educational toy.





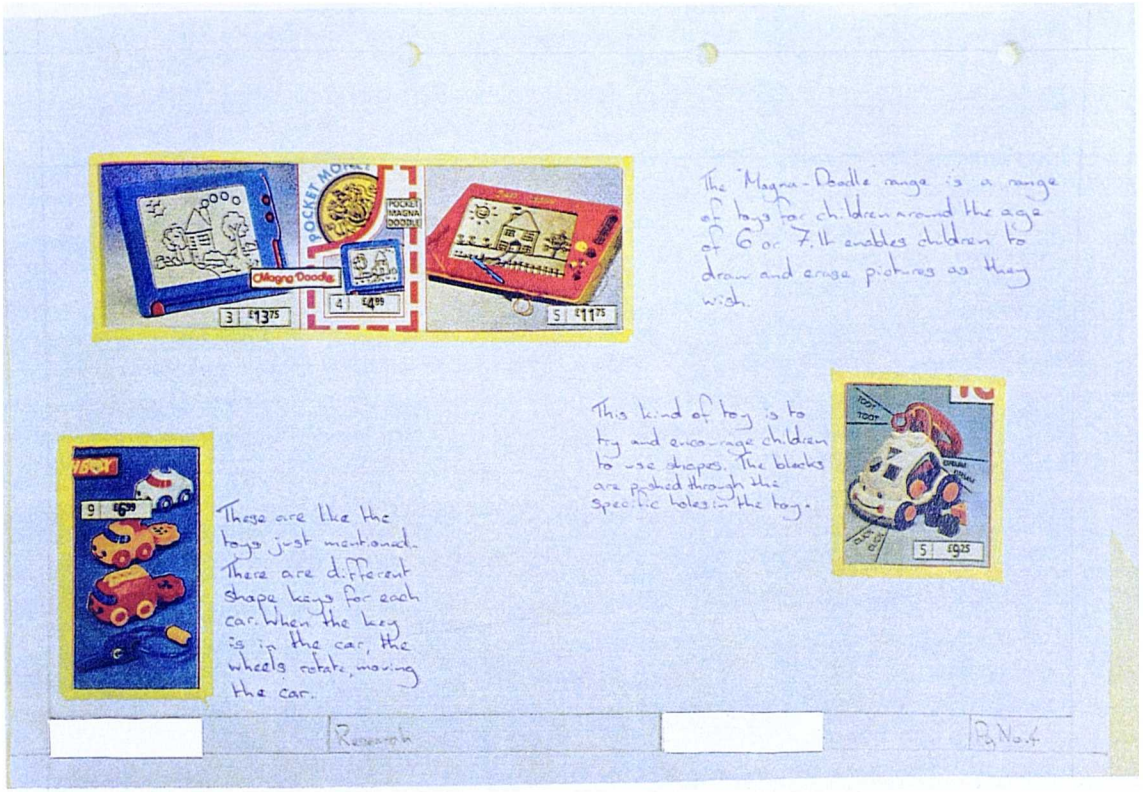

Development of chosen idea
Key
Scale 1:2
Dimensions mm
FRONT ELEVATION
END ELEVATION
PLAN
ORTHOGRAPHIC PROJECTION OF TOP
11MWa
Educational Toy
Pg. no.

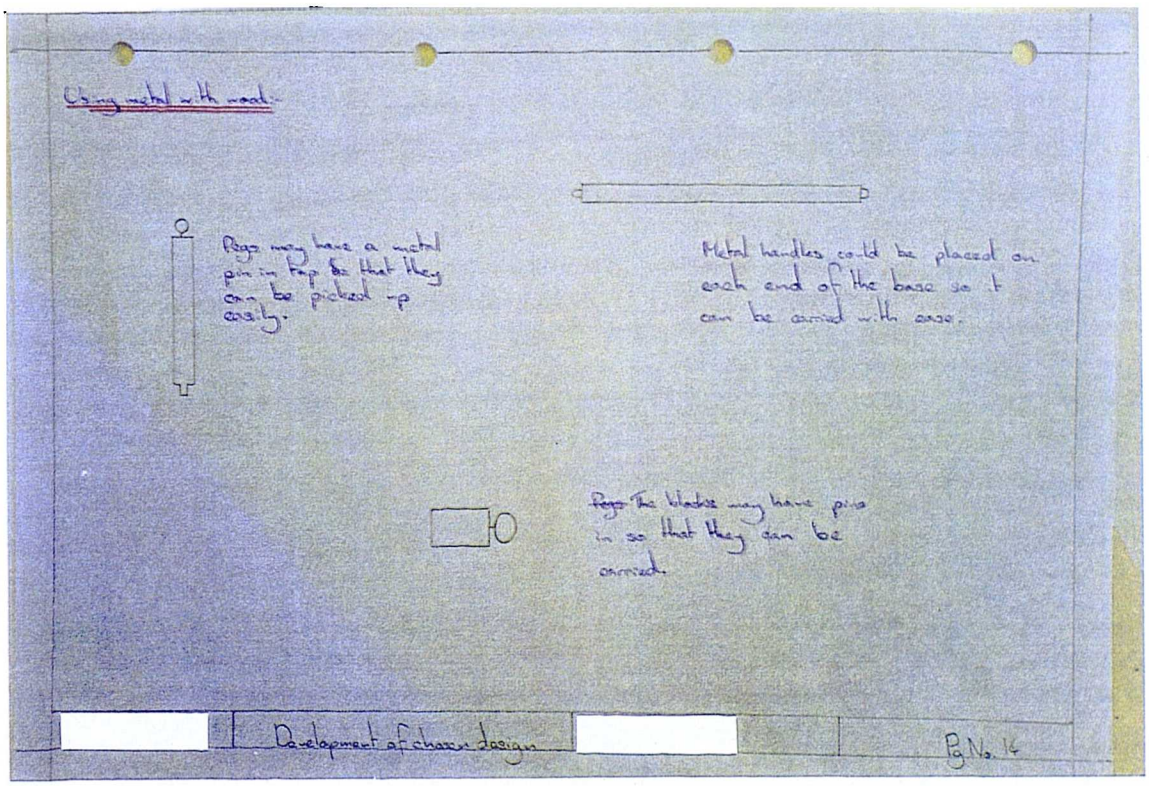

Development of chosen idea
the Shapes
Scale 1:2
Scale 1:1
11MWa
Educational Toy
Pg. no.


£525
NUMBER PUZZLE
GIANT FLOOR PU
£49.00

Photographic evidence of some of the project work carried out by the selected fifty pupils during Phase Two.

Example of the work produced by one pupil. The four photographs illustrate: a page of research work (one of three); two pages of the development of his chosen ideas; and a photograph of his product. This pupil produced 21 pages in his A4 folder and gained a mark of 64% for his project work - a childs educational toy.





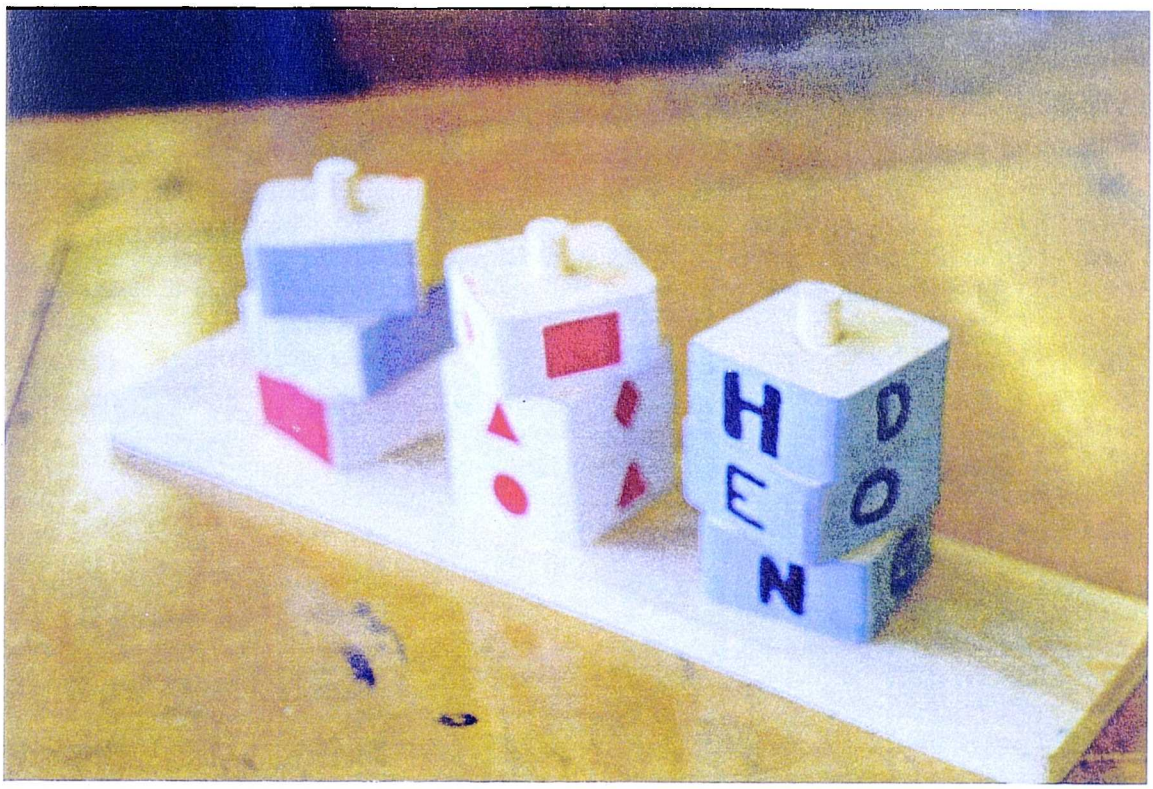
Step by Step

1. A length of wood 550 x 120 ins cut.
2. Nine blocks, 80x80x40, were cut.
3. The four corners of the length of wood for the base, were rounded off using the electric sander.
4. The corners of the blocks were sanded in the same way.
5. Three lengths of mould were cut. Each measuring 180x25 square.
6. The centre of the wood was found by drawing the following on each end.

7. The above lines were then slightly cut into using a Tenon Saw.
8. Using the Lathe the wood was spun to a dimmeter of 15
9. The width of the base was then measured.
10. That length, 20, was marked up from one end of the cylinder.
11. Then that section of the cylinder was spun on the Lathe to give a diameter of 12.
12. The base is divided into three equal parts. The centre of these parts are found.

BNo. 12

Development of chosen design



Photographic evidence of some of the project work carried out by the selected fifty pupils during Phase Two.

Example of the work produced by one pupil - a girl. Page six from her design folio illustrates her reasoning behind why she did not chose to continue with her 'cooker idea'. Page 8 illustrates the only drawing of this idea and the detail to which she had solved the design.

Proposed Solutions

Design 1

This first design, the cooker idea, is a reasonable design but might pose as a bit of a problem as it would be hard to simulate heat produced by an oven and rings. It would be unsafe for children to play with due to risk of burns and scolds. Also it would be extremely complicated to make. Due to these reasons I would not be able to incorporate complicated heat programs. However if I was to market a product which didn't simulate a cooker without heat, it would not sell and not compile with the brief and specification. Therefore it is not practical to develop this design further.

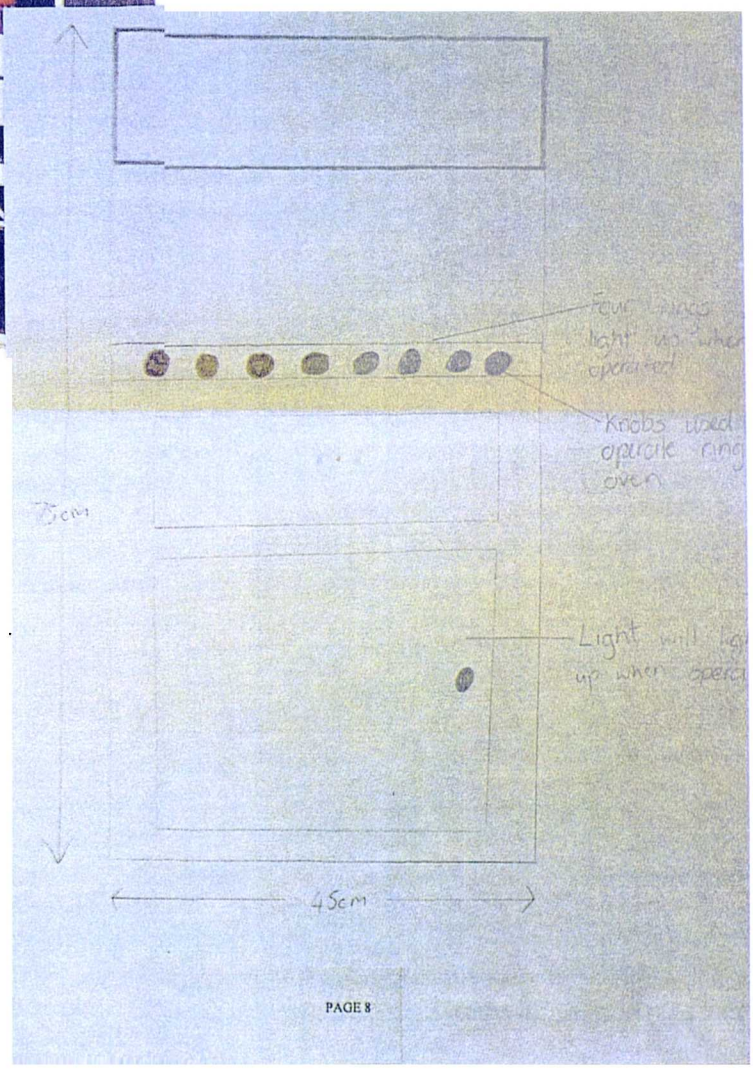
MODELS 6142, 6122

Can be built into a tall housing unit, Fig. 1, or built under a worksurface, Fig. 2.
Dimensions same for both. Connector unit must not be more than 100 mm above the base of the oven.
Supply 240 V AC. Must be earthed. Can be connected to a 13amp socket if installed alone. However we recommend installation via a double pole isolating switch located in a readily accessible position.
Total Rating: 2.8 kW
Oven Element: 2.8 kW
Fan Element: 2.4 kW
Grill Element: 2.8 kW
Inner Element: 1.7 kW } Model 6142
Outer Element: 1.1 kW
Additional 'Stay Clean' liners available as optional extra as follows:
Model 6122 Roof only (Part No. 6003)
Model 6122 Oven Sides and Roof (Part No. 6002)
Weight: 53 Kg
Made for Hotpoint in Germany. BEAB Approved.

Fig. 1

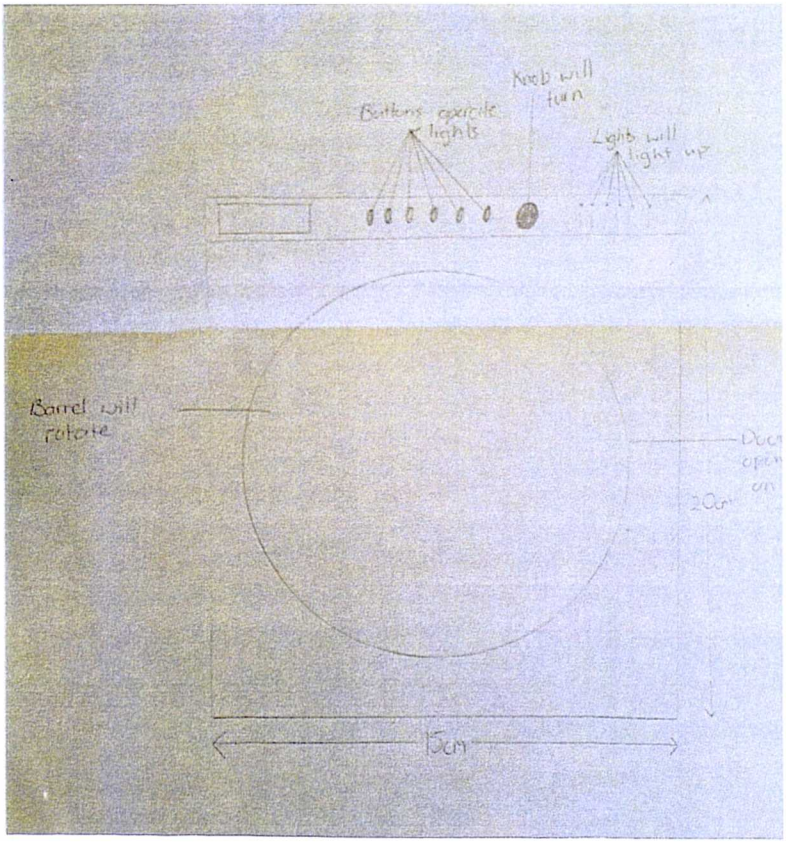
Fig. 2

PAGE 6



PAGE 8

These three photographs illustrate the only design sheet of the chosen idea produced by this pupil, the final product and her evaluation. Her design folio consisted of sixteen A4 pages the majority of which were word processed. Her mark for her project work was 51%.



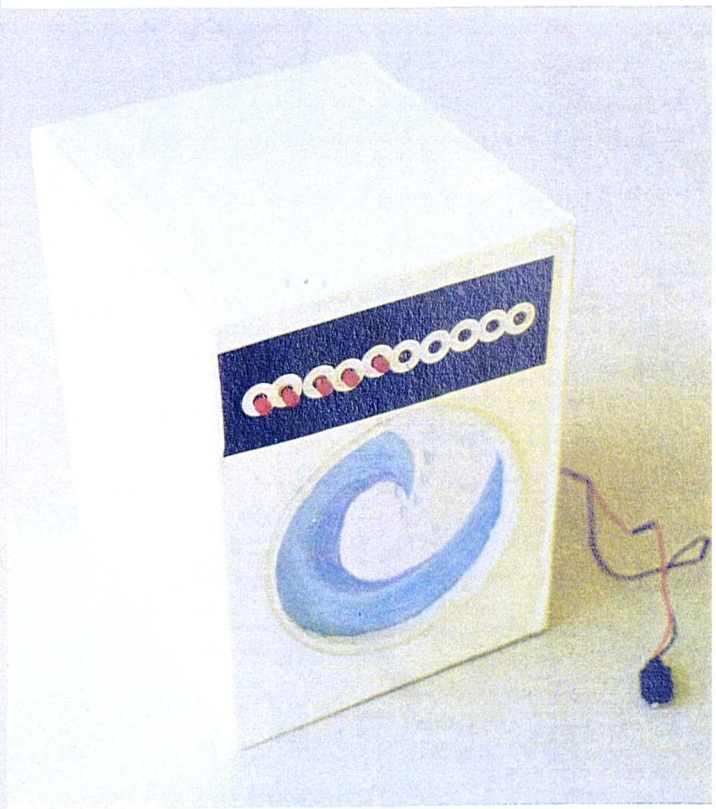
Evaluation

I am quite pleased with my finished product, although it did take a lot of hard work and time to complete The circuit works exactly how I wanted and is effective. The basic structure of my toy is satisfactory. The one thing that has not complied with my earlier designs is the door of the machine. I had planned for it to open but as I approached the deadline I realised that there wouldn't be enough time to fix on a hinge and magnet so I compromised and stuck the door to the washing machine so as there was no chance it would be able to be opened. Although this is less realistic I feel that it is safer and more convenient.

Given the chance to do my project again I think that I would be able to complete it in half the time as I have learned by my mistakes. I got off to a slow start not totally comprehending the project outline. I could have used my time a lot more productively.

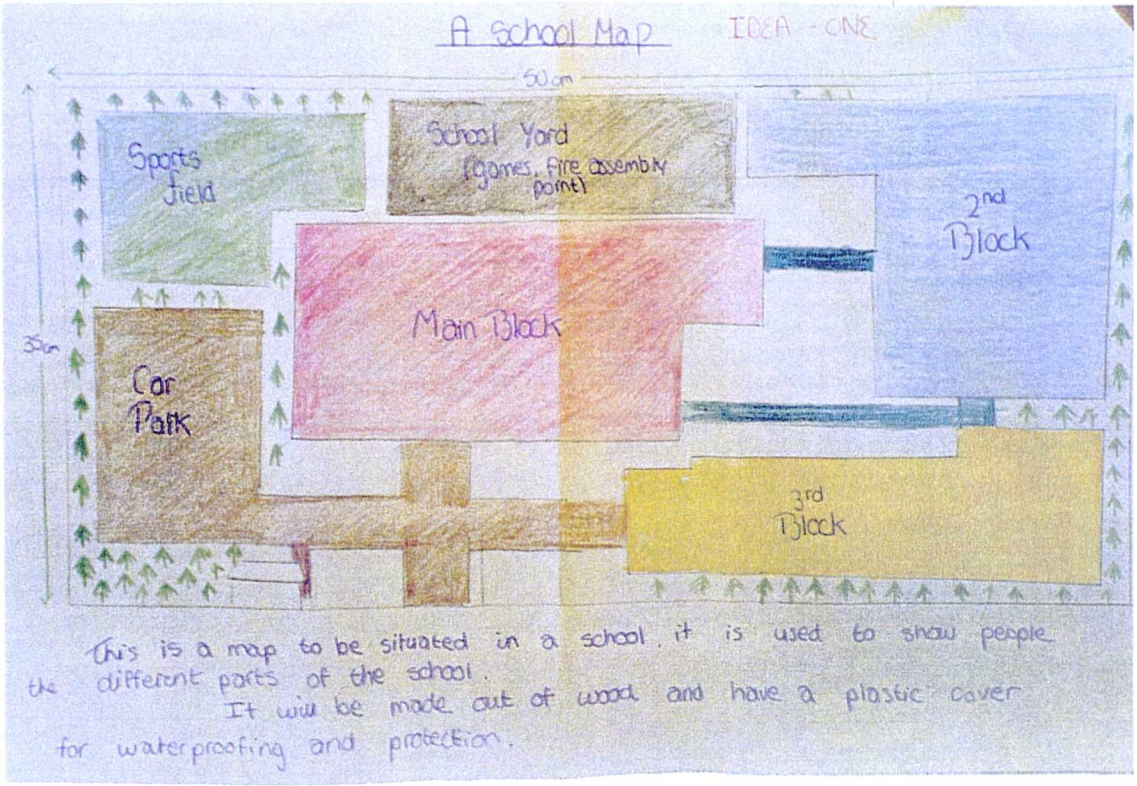
On the whole, given my initial understanding, I think I have done well to meet the deadline with completed work.

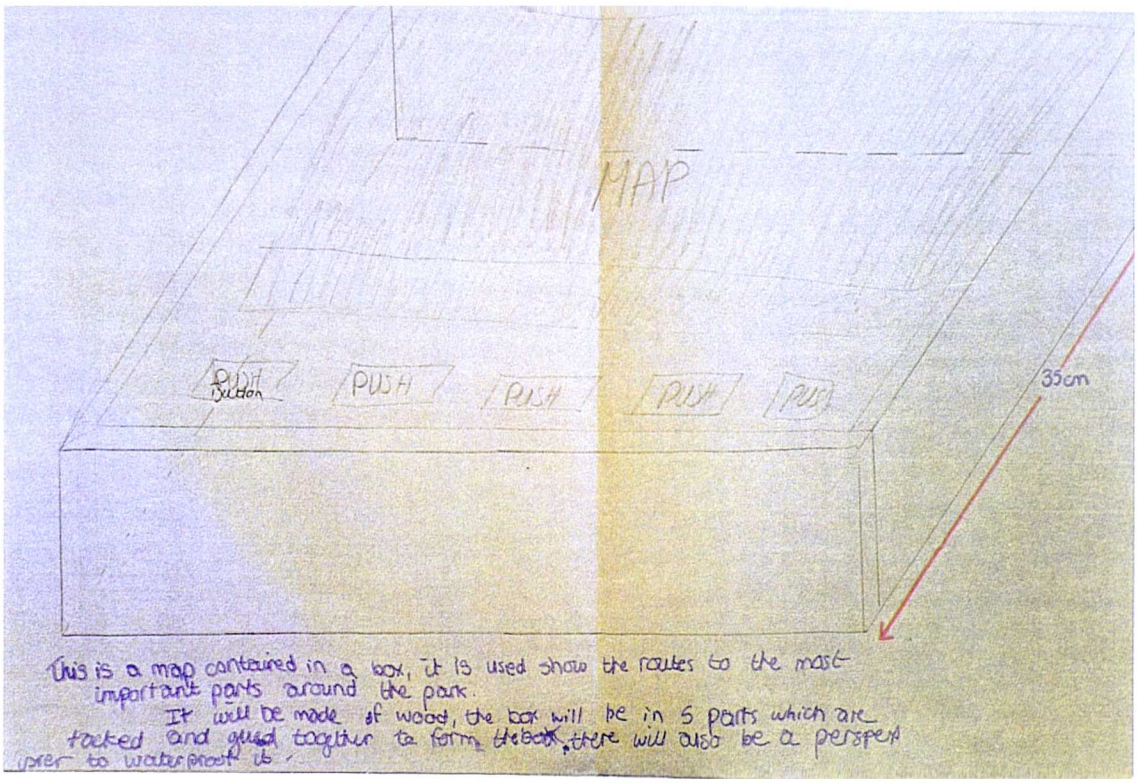
PAGE 16



Photographic evidence of some of the project work carried out by the selected fifty pupils during Phase Two.

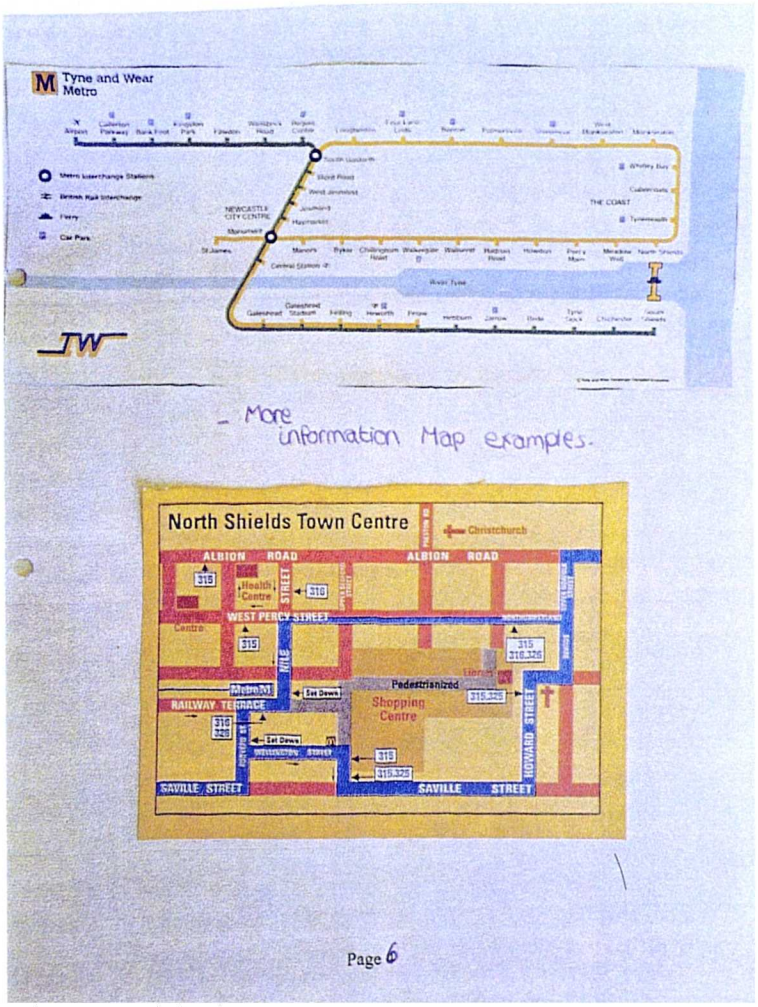
Example of the work produced by one pupil - a girl. Photograph 1 shows the first idea drawn out on one of three drawn design sheets in the folio of nine sheets. Photograph 2 shows the only drawing of the product which was eventually made.

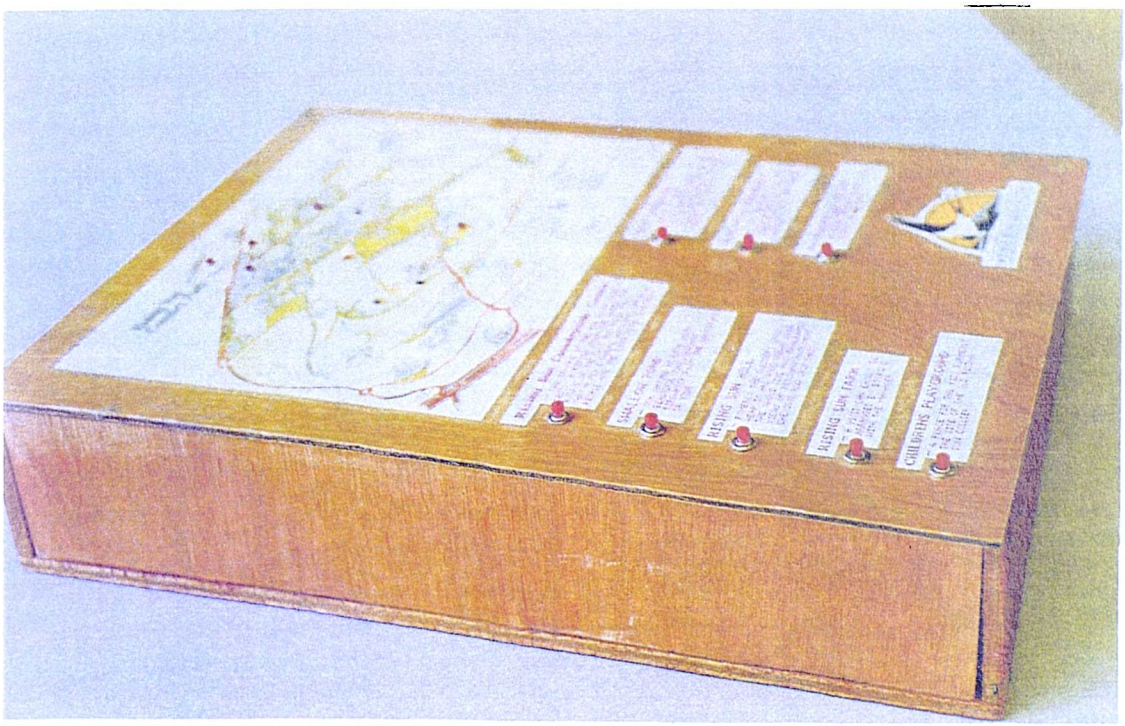




con

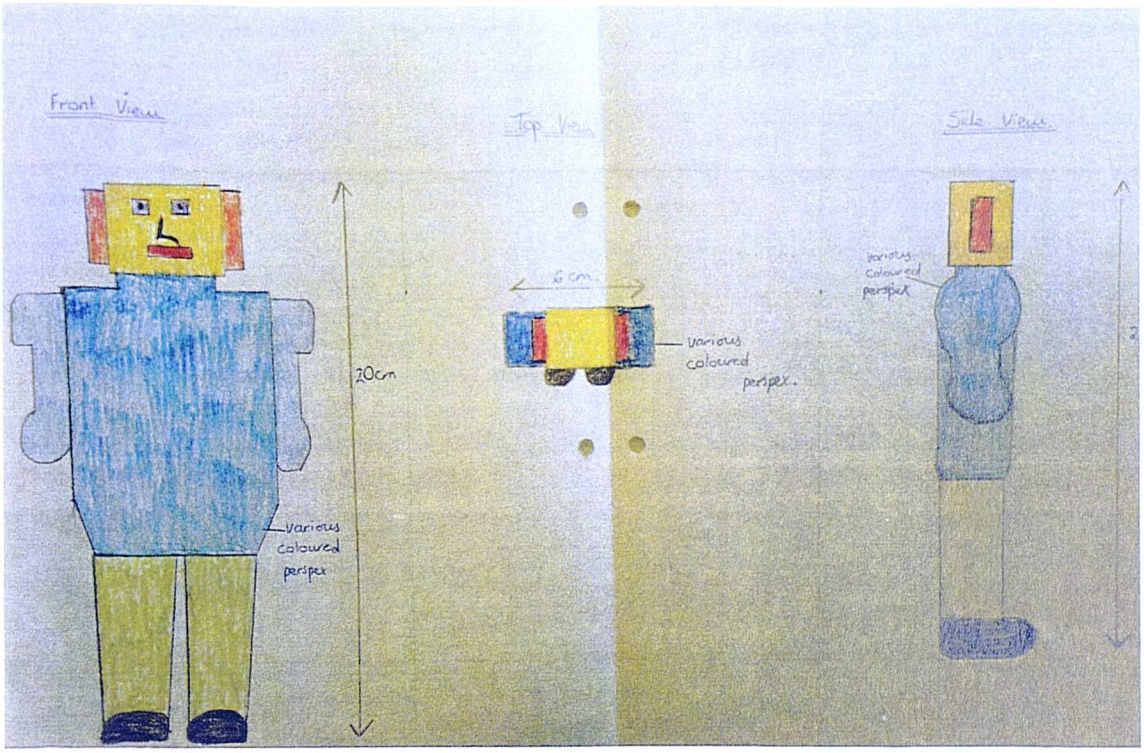
These two photographs show one of two pages of research and the product as it was handed in. The electronics inside were not made. Her mark for her project work was 32%.

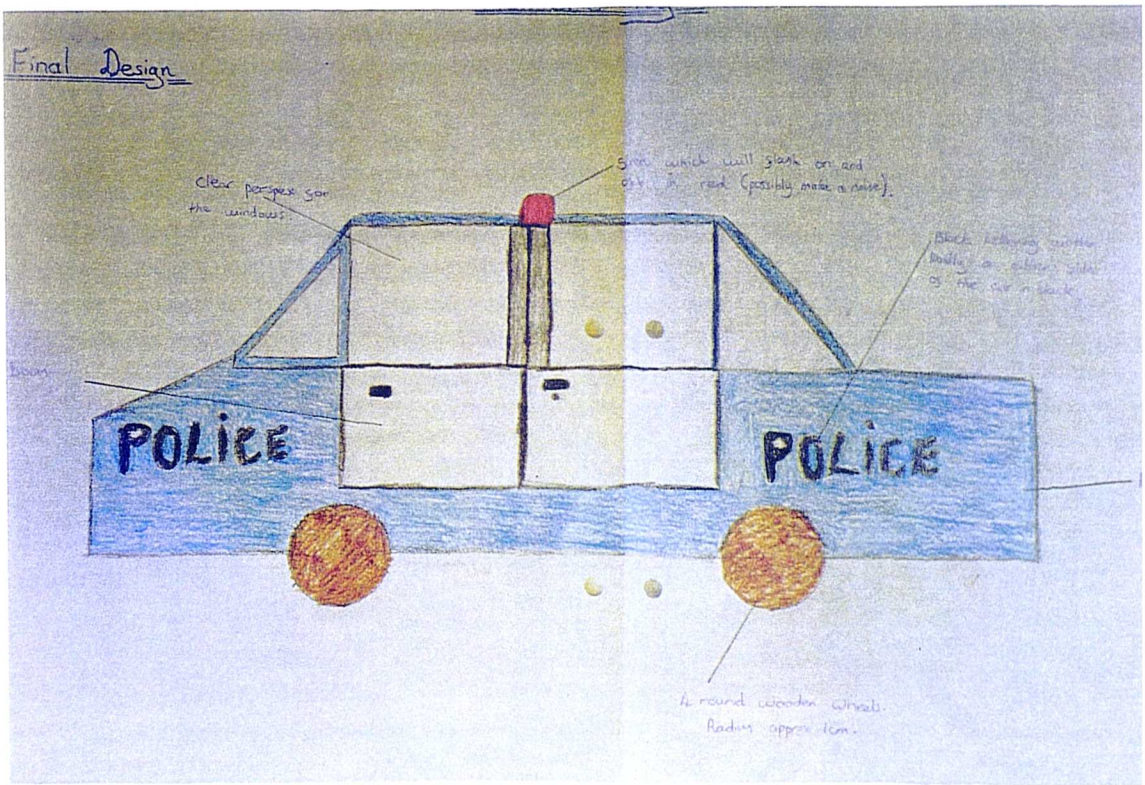




Photographic evidence of some of the project work carried out by the selected fifty pupils during Phase Two.

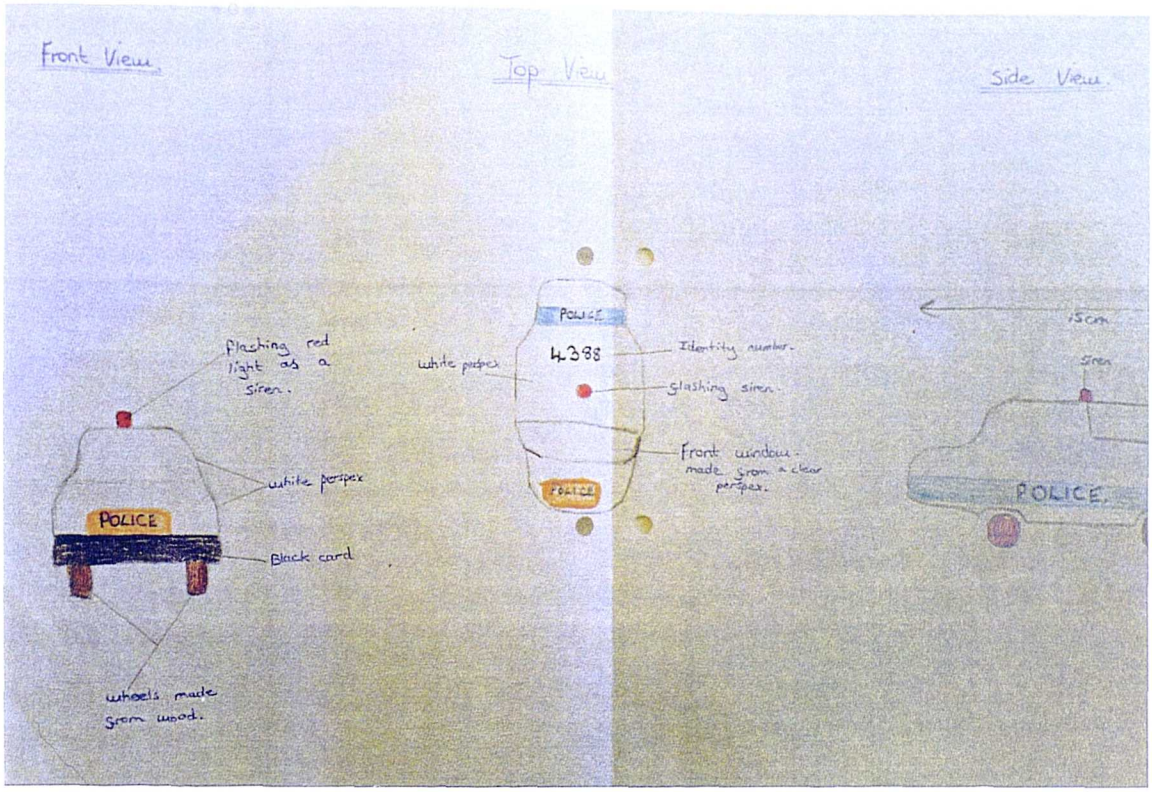
Example of the work produced by one pupil - a boy. Photographs 1 and 2 illustrate two of the three ideas that this pupil designed in his folio.

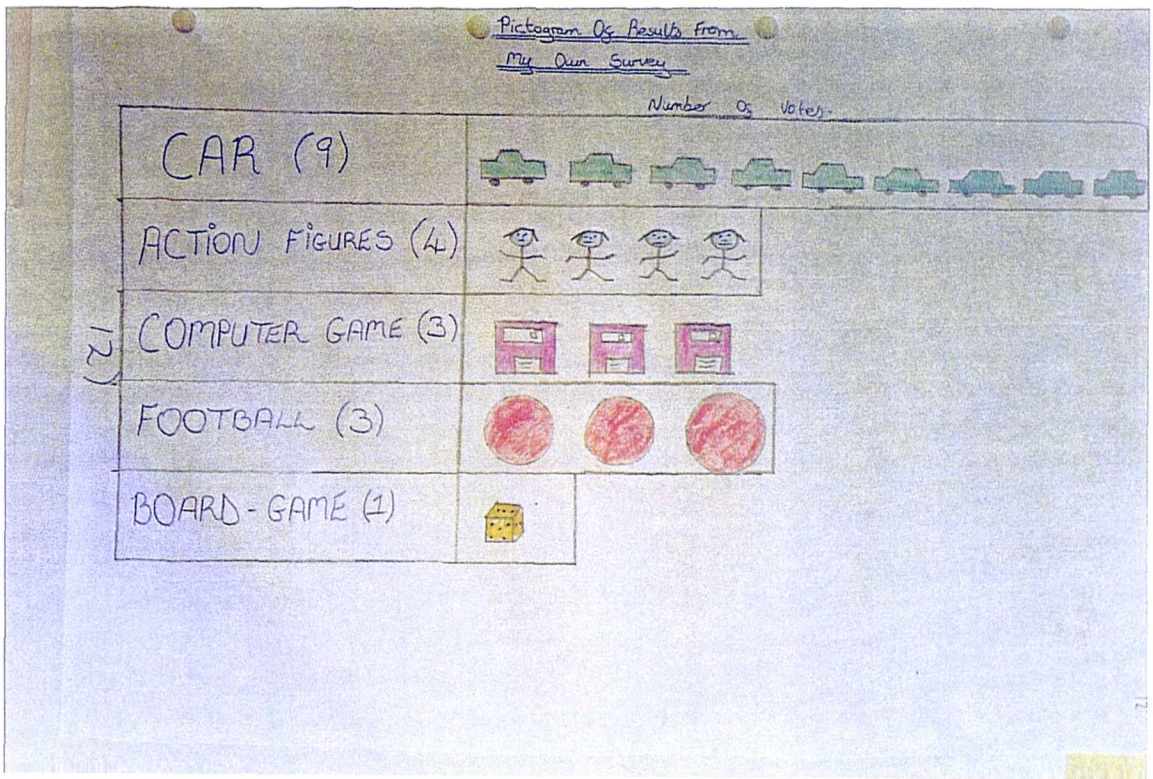




cont

These two photographs show the final drawings of the police car to be made and the results of his survey into the most popular games for children.





con

These two photographs illustrate an evaluation of 'his car', and the car itself as it was when it was handed in for marking. This pupil achieved a mark of 21% for his project work.

that all the cars were fairly fancy . The more detailed the car was the more expensive it was . All the cars looked good and were not at all basic . My car mould is looking very basic and will not be impressive when compared to the cars in my catalogue . As far as a price is concerned, I have realised that I will have to be extremley reasonable if anyone were to want to buy it . The prices range from about ten pounds to fifty pounds which I feel is a bit steep considering what the limitations of cars themselves .

EVALUATION OF MY CAR

When evaluating my final design of my car I have to take a lot of aspects into consideration . The actual mould of the car has proved to be most difficult so far . I did not mind the designing part of the work but I did not care for the making side of it . I have a feeling that the hardest part of my work is still to come .

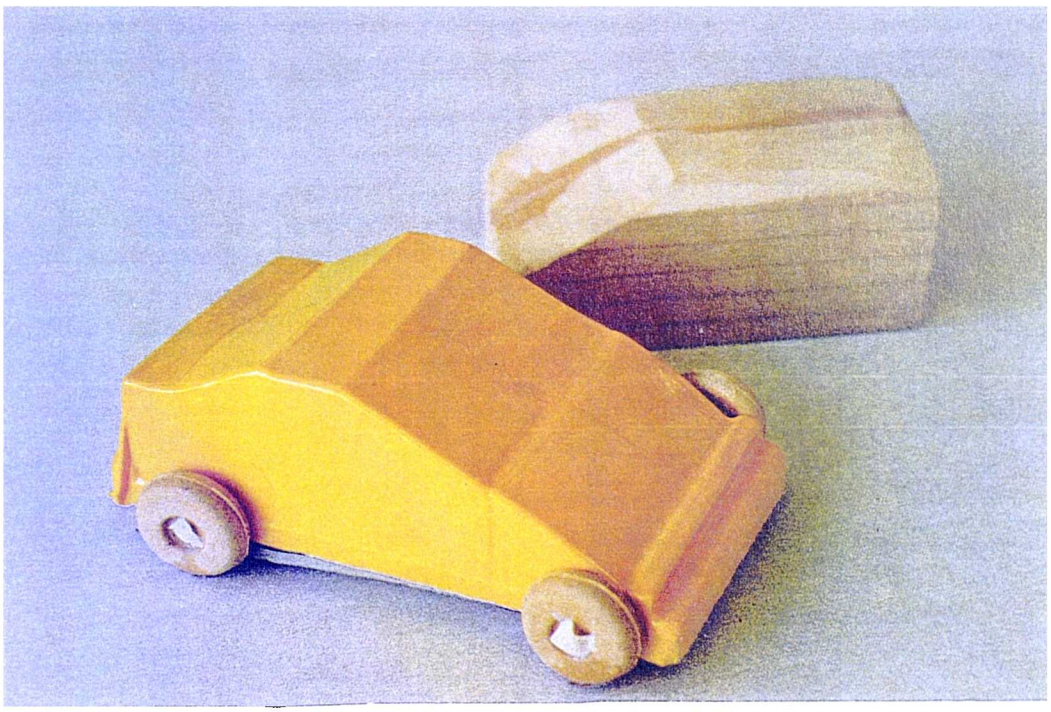
Over the last week I have changed my mind considerately about how diffficult I thought constructing the car would be. I have found assembling my car fairly straight forward and in the last week I think I've made great progress. The only problem I came across was when I vacum-formed my mould ..... it took me about ten attempts for some reason.

By the end, my police car ended up being yellow instead of blue due to the resources of P.V.C. My car therefore will look a bit foreign but at least its original!

I have yet to construct my circuit but with any luck it won't take too long to finish.

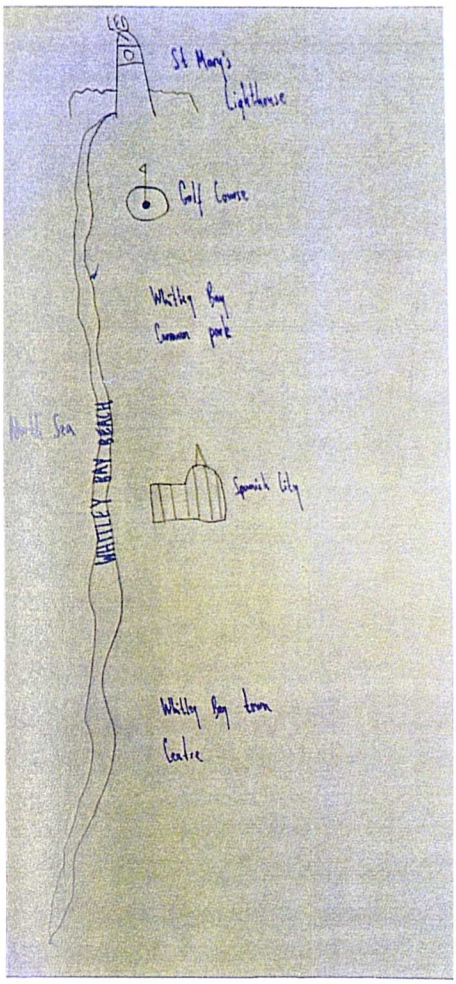
..... In the end I was unable to construct my circuit!

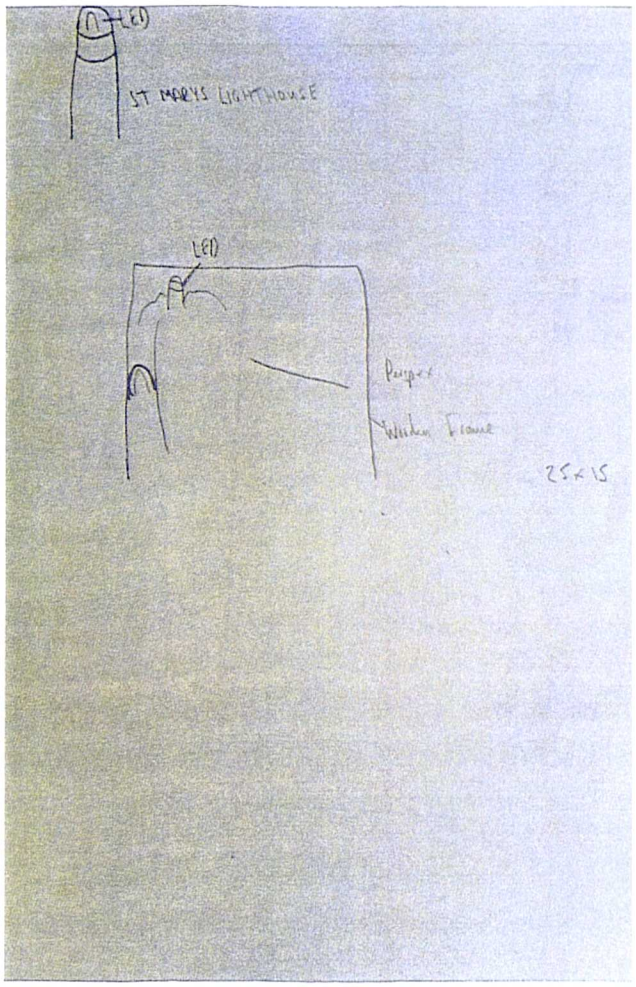
Page 2



Photographic evidence of some of the project work carried out by the selected fifty pupils during Phase Two.

Example of the work produced by one pupil - a boy. Photographs 1 illustrates the only sheet of initial ideas for the information map that he was designing. Photograph 2 shows the only drawing that provided evidence of teasing out the details of his idea before the manufacturing stage of the project. Photograph 3 illustrates the IT input in his project - the specification (as can be seen the depth of analysis at this stage was thorough although formulaic). His practical work when handed in consisted of a piece of white perspex cut to size and four pieces of MDF(Medium Density Fibreboard). The mark achieved for this project was 7%.





Specification

I must draw designs to show the components and materials I will be using, including the possibilities of computer control. I will then choose the best design of the three and develop it, I will also give reasons for my choice. I shall include in design instructions for the end user, so it will be easy to use. I will test the computer system and the made parts to make sure they work correctly. Next I will do a cost modelling exercise using a spreadsheet programme and a survey to get the publics opinion. I will then modify my design to coincide with the things I learnt from the survey. Next I will plan the making of the model, giving time allocation for when certain parts as well as ordering and preparation. I will then make my information map.

After my map has been made I will find ways of testing, evaluating and improving my product. This will tell me weather my map is an effective information system. I will use a computer to produce graphs and charts to show the results of my evaluation of my project.

I will then write an evaluation of my project commenting on its working capabilities, appearance and the appeal. I shall find the results by writing a questionnaire and giving it to people to fill in. Finally I shall suggest modifications and improvements to my design.

To make my project a successful one I must consider the following things;

1/ It must be water proof.
2/ It must be vandal proof.
3/ It must be hard wearing.
4/ It must be easy to use.
5/ It must be attractive.
6/ It must be accurate.

Six examples of the completed creativity test produced by pupils from the selected sample of fifty pupils during Phase Two.

These have been reduced from A3 for the purposes of reproduction in the Appendices.

CREATIVITY TEST

031/10

Name: .....

Please can you complete the following two tests to show me how creative you can be

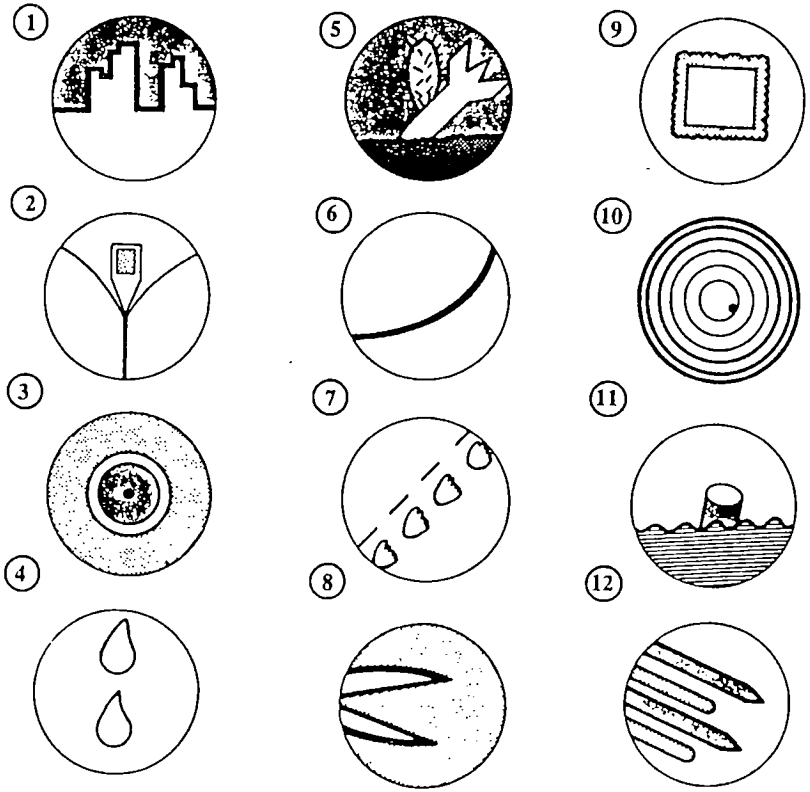
TEST ONE

The twelve circles illustrated below all contain images for you to interpret

There are no 'right' answers. I am looking to see how many interesting or unexpected interpretations you are able to think up.

Write your suggestions on the sheet facing next to the appropriate number.

Example 



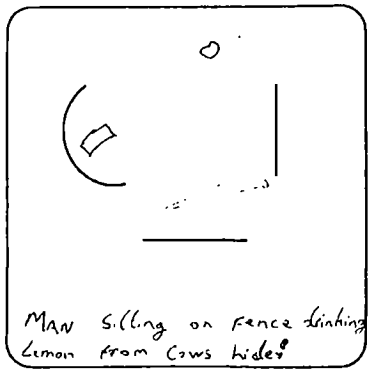
1. A crocodile eating cream, sprayed black, while singing
2. Front vein of someone being chopped in half
3. The vein of a dart that is traveling towards a dart board on a game of 'bullseye'
4. Blood driping from a rancid mound
5. Nuclear attacks on planks
6. Curved line rapping itself around an eyeball
7. Wallpaper in a hippy community
8. Claws of a white beast
9. House for the golf ball people
10. Vortex of unfesscribable power
11. Martian space vessel slowley sinking into a bucket of scum
12. Long poley things

Including these three lines in your work, produce 12 different images or pictures. Your drawings can be either either abstract or representational.

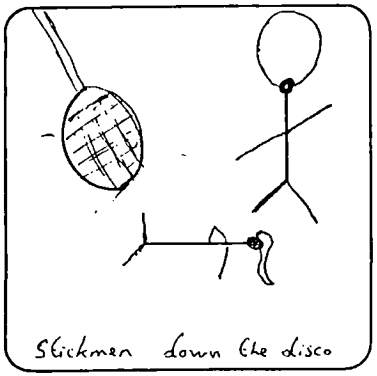
Remember that it is the variety that is important not the quality of drawing.
Give titles if appropriate.

031/10

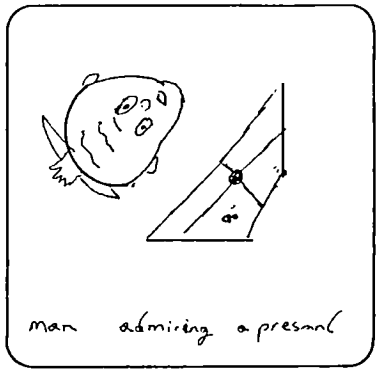
13



16



19



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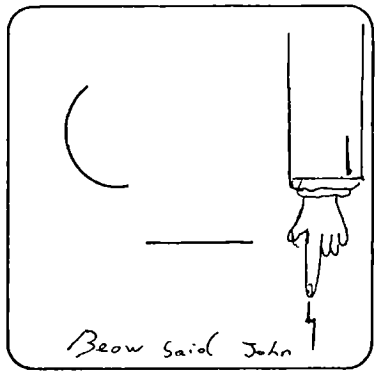
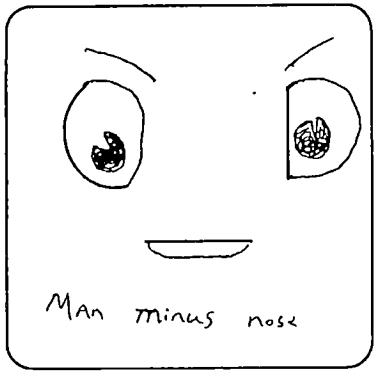


14

17



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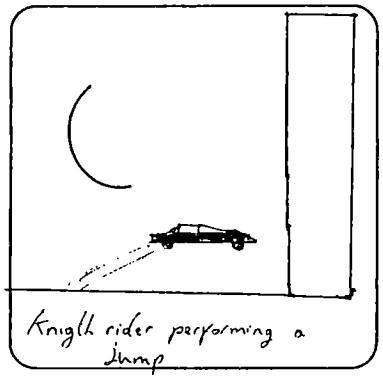
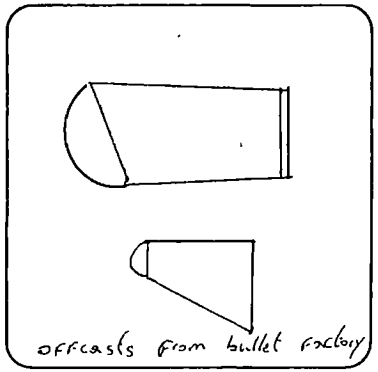


23



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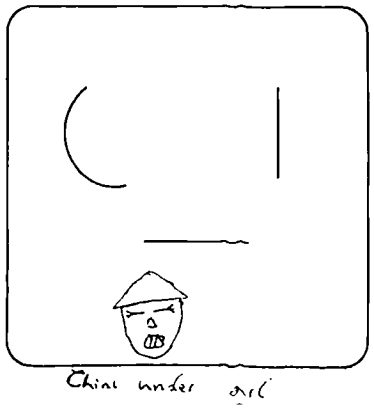

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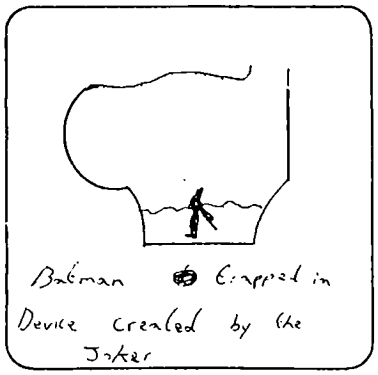
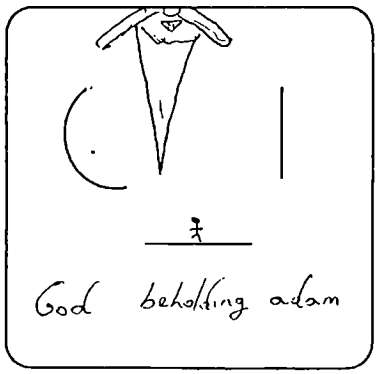
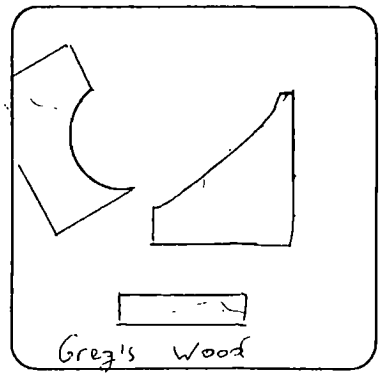


21



24



CREATIVITY TEST 047/09

Name: .....

Please can you complete the following two tests to show me how creative you can be

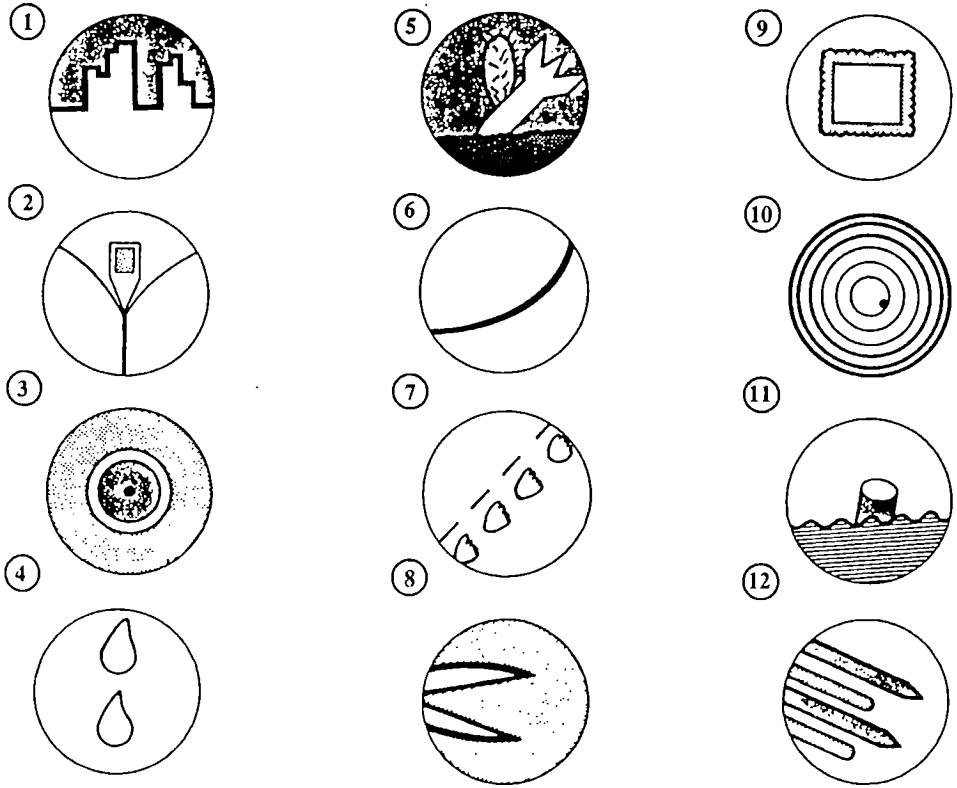
TEST ONE

The twelve circles illustrated below all contain images for you to interpret

There are no 'right' answers. I am looking to see how many ~~funny~~ interesting or unexpected interpretations you are able to think of.

Write your suggestions on the sheet facing next to the appropriate number.

Example 



1. a city skyline
2. Boy on a kicker
3. birds eye view of a planter pot with a hole in it.
4. someone crying
5. rocket landed in the grass in front of a cactus
6. a skipping rope, hung.
7. footprints at a distance from inside the middle of the road
8. a racket on its side.
9. a picture frame with a picture of snow.
10. Someone with black hair looking at the bottom of a spiral staircase
11. Tin can in the sea
12. Cricket stumps and [illegible] the air.

TEST TWO

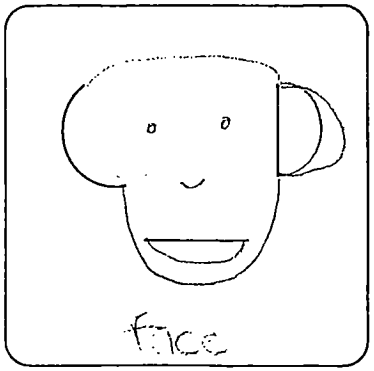
Including these three lines in your work, produce 12 different images or pictures. Your drawings can be either either abstract or representational.

Remember that it is the variety that is important not the quality of drawing. Give titles if appropriate.

049/09

(13)

(14)



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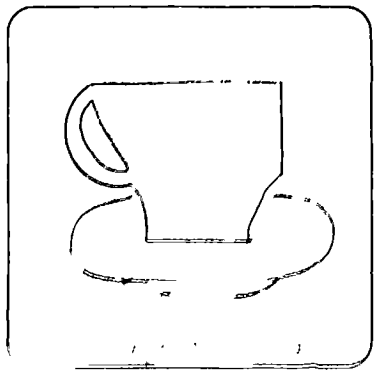

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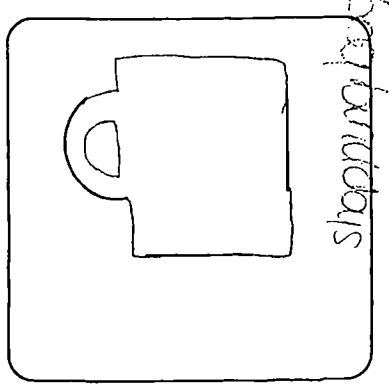

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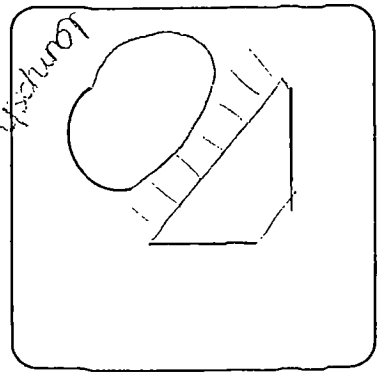

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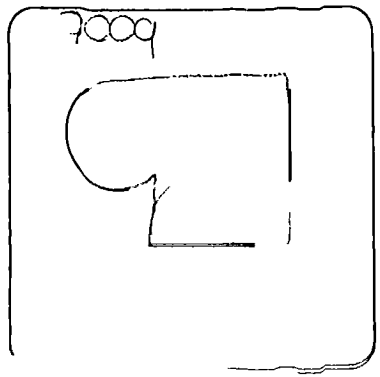
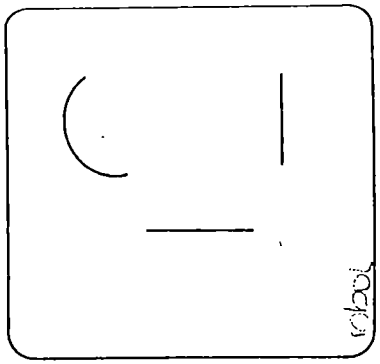


(19)



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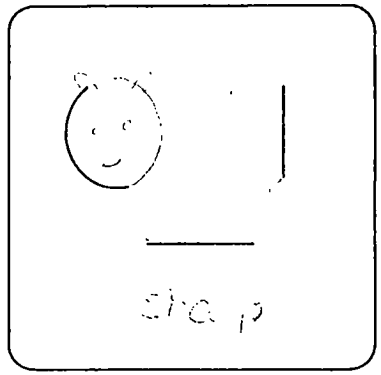

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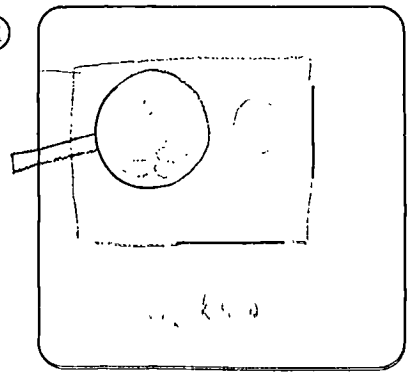

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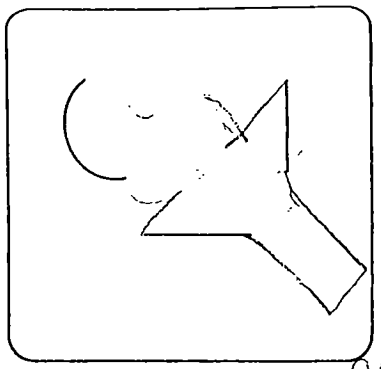

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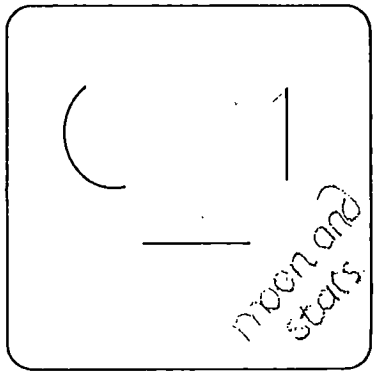

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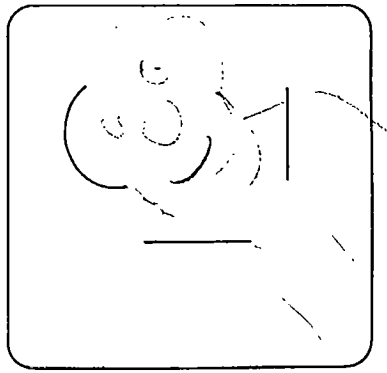


CREATIVITY TEST 07/4

Name: ....

Please can you complete the following two tests to show me how creative you can be

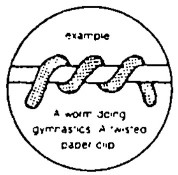
TEST ONE

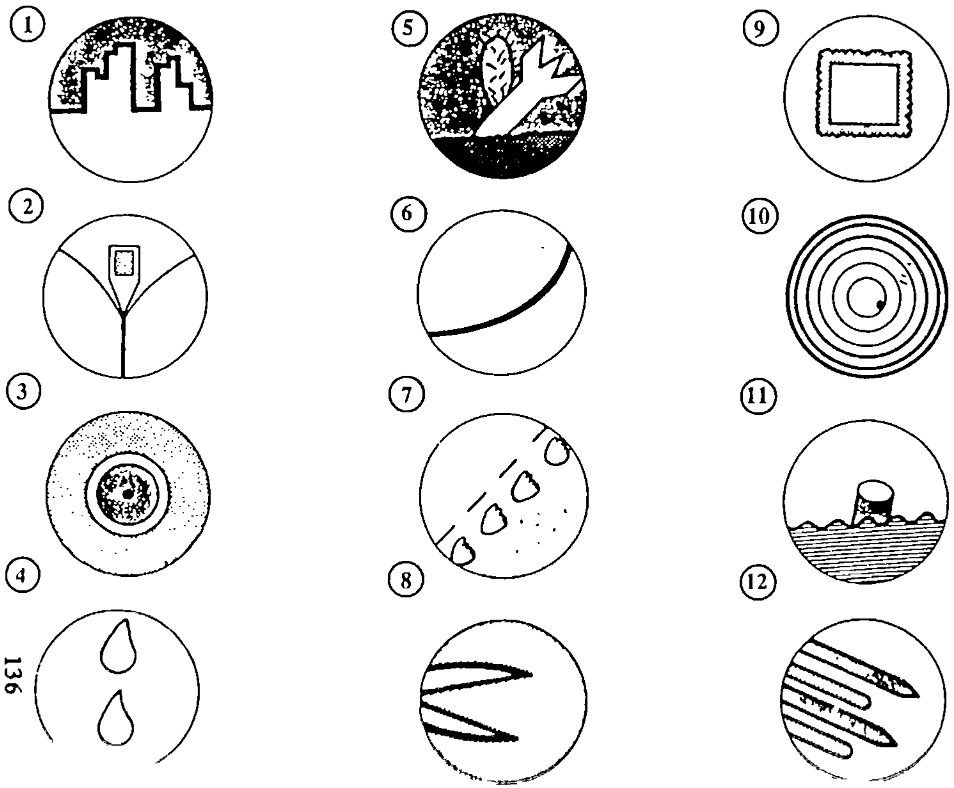
The twelve circles illustrated below all contain images for you to interpret

There are no 'right' answers. I am looking to see how many ~~funny~~ interesting or unexpected interpretations you are able to think of.

Write your suggestions on the sheet facing next to the appropriate number.

Example





1. A rickety staircase.
2. Butterfly in a bubble
3. Birdseye view of a coffee cup with a lump of sugar on the top.
4. Birdseye view of a [illegible] with two horns
5. A man drowning holding a flag/staff representing his clan (flag bearer).
6. Egg timer (baseball shaped)
7. Part of a persons' face with their eyes and [illegible]
8. Ball showing a [illegible] with only the legs visible
9. A rattle with the centre cut out
10. The earth cut open with the inner layers being shown
11. A sinking ship.
12. An octopus with [illegible]

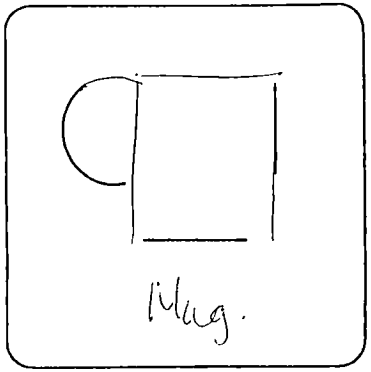
TEST TWO

Including these three lines in your work, produce 12 different images or pictures. Your drawings can be either either abstract or representational.

07/04

Remember that it is the variety that is important not the quality of drawing.
Give titles if appropriate.

(13)



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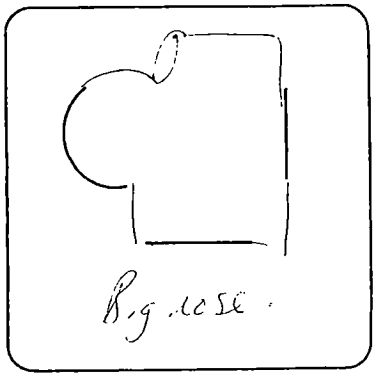

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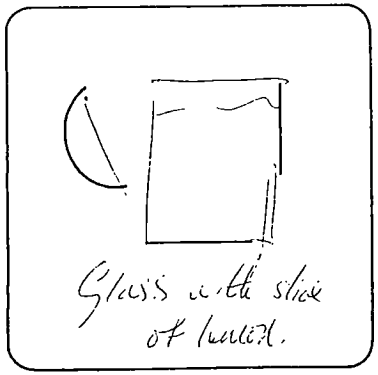

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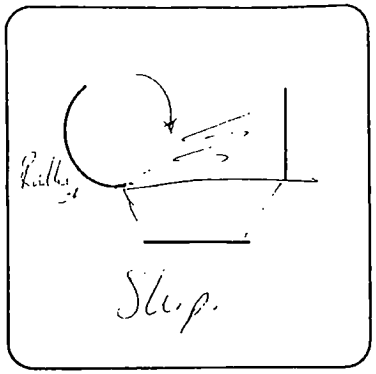

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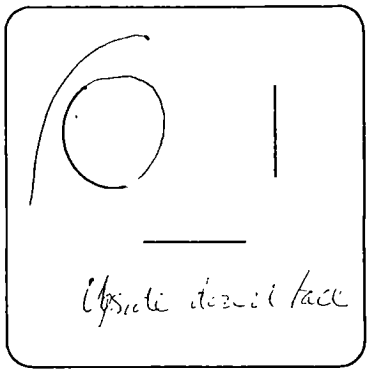

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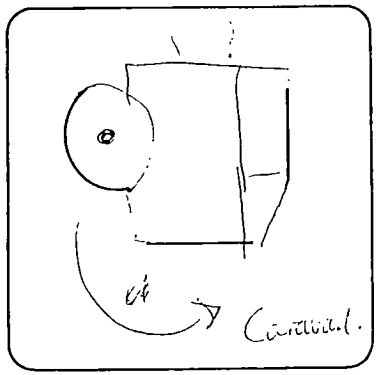

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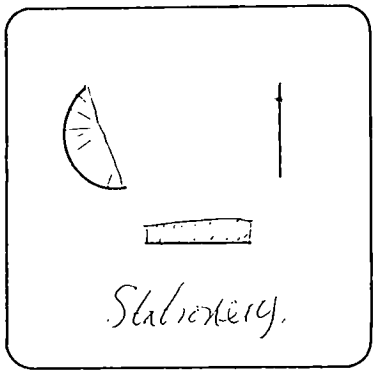

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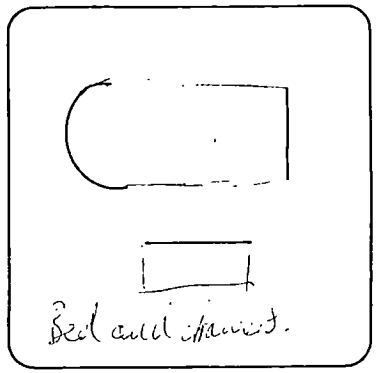

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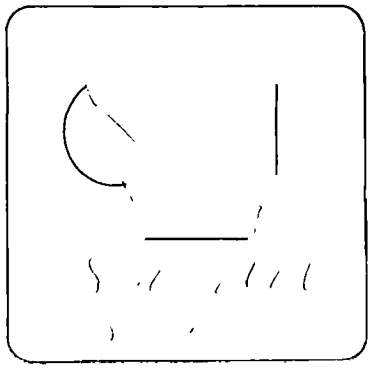

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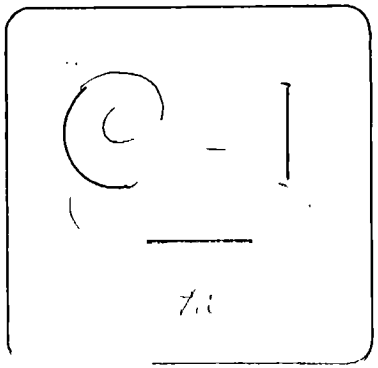

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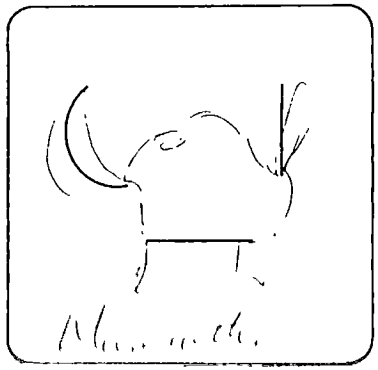

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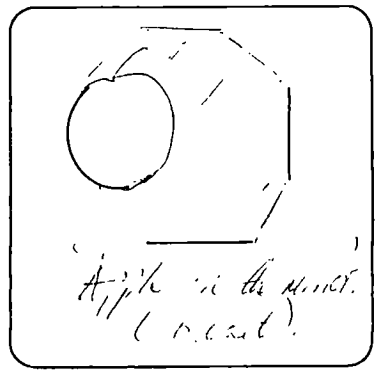


CREATIVITY TEST 049/02

Name: .....

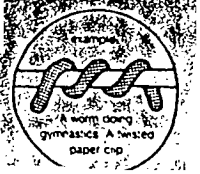
Please can you complete the following two tests to show me how creative you can be

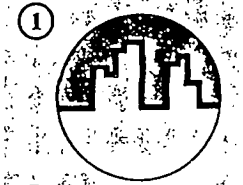
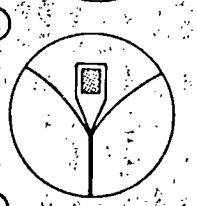
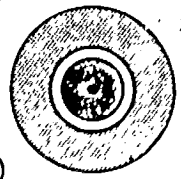
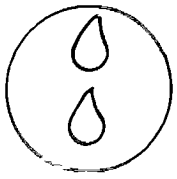
TEST ONE

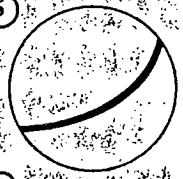
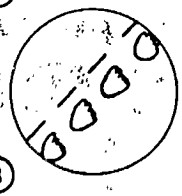
The twelve circles illustrated below all contain images for you to interpret.
There are no 'right' answers. I am looking to see how many ~~funny~~ interesting or unexpected interpretations you are able to think of.

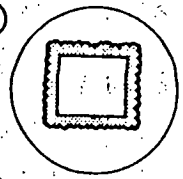
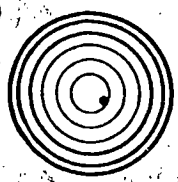
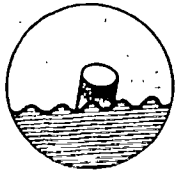
Write your suggestions on the sheet facing next to the appropriate number.

Example




1. A castles turrets in the night
2. Zip on someones jacket
   A peach
3. Top of a marker pen
4. Raindrops, snowdrops, someones foot print
5. A missile which has landed in the ground been there for a while and sprouted a cactus.
   Route of a plant.
6. Magnified magnifying glass.
   Outline of a picture
7. A dogs footprints who has only one leg and a walking stick.
8. A bunny rabbit just going to look in his burrow
   Pair of scissors.
9. A picture frame. A camera angle
   Outline of a kite
10. Top of a ball point pen.
    When you drop a stone into a pond.
11. A cigarette which has been dropped in a pond.
    Submarine top in the sea.
12. Ends of nails. Pencils.

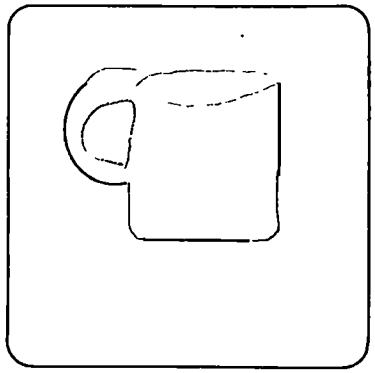
TE

Including these three lines in your work, produce 12 different images or pictures. Your drawings can be either either abstract or representational.

Remember that it is the variety that is important not the quality of drawing. Give titles if appropriate.

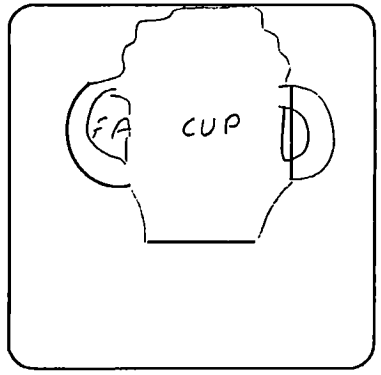
049/02

13



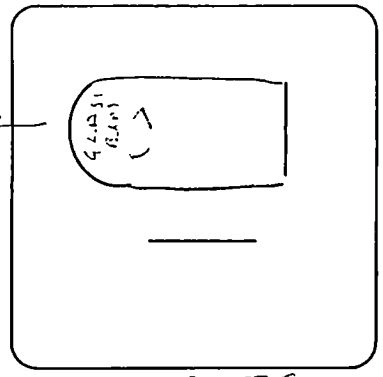
MUG

16



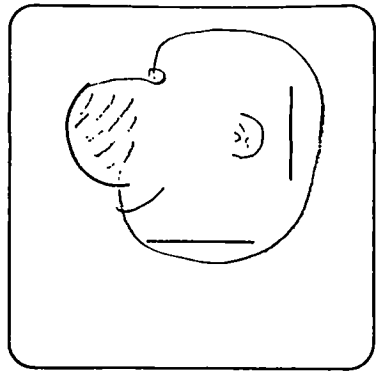
FA CUP TROPHY

19



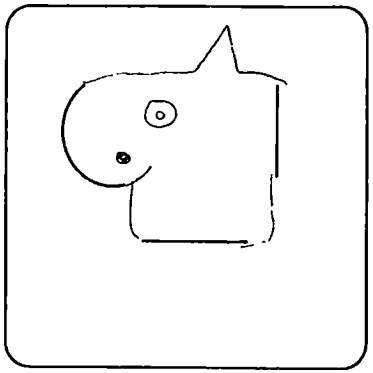
GLASS · BOTTLE BIN

22



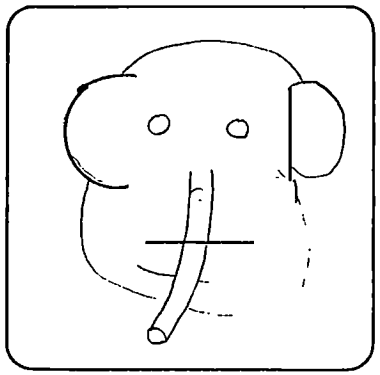
SOMEONE WITH A COMIC HEIGHT NOSE ON

14



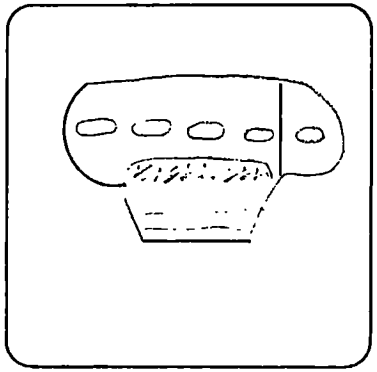
HOBBY HORSE

17



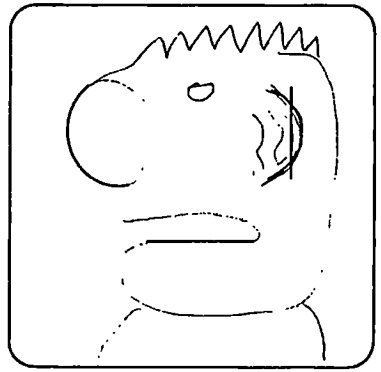
ELEPHANT

20



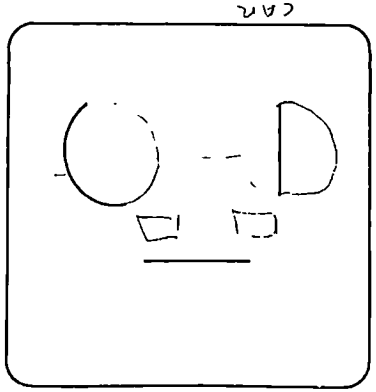
SPACESHIP.

23



CERTAIN THE MENACE.

15



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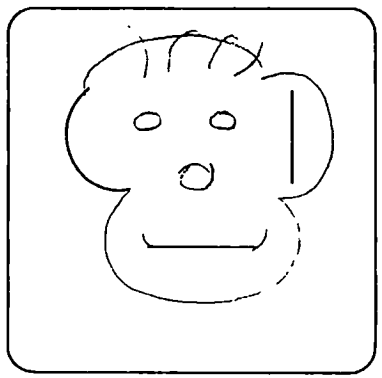
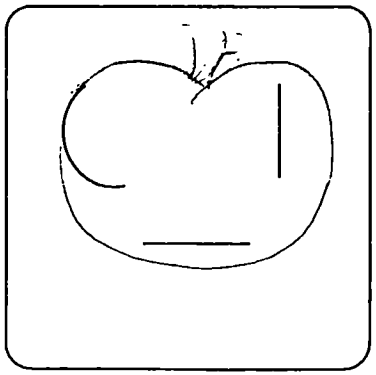


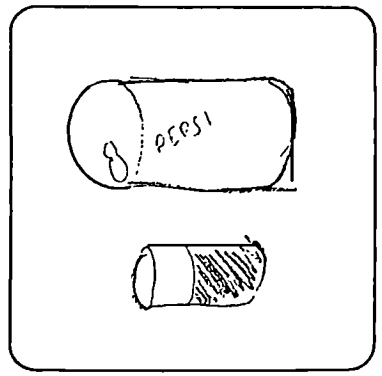
MONKEY

21



PEACH

24



GLASS + CAN OF PEPSI.

CREATIVITY TEST 032/08

Name: .....

Please can you complete the following two tests to show me how creative you can be

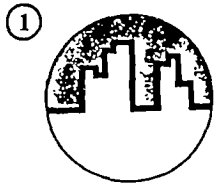
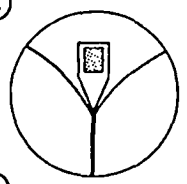
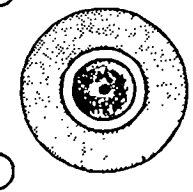
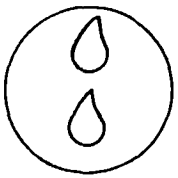
TEST ONE

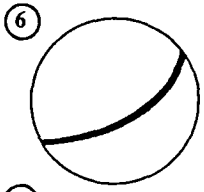
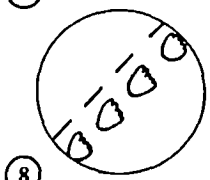
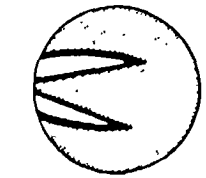
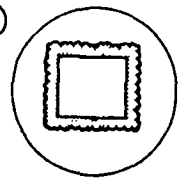
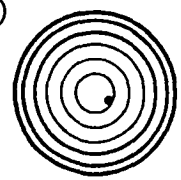
The twelve circles illustrated below all contain images for you to interpret

There are no 'right' answers. I am looking to see how many ~~funny~~ interesting or unexpected interpretations you are able to think of.

Write your suggestions on the sheet facing next to the appropriate number.

Example 

① Great skyscrapers in New York, at night fall.

②

③ A eye of an animal, looking at the other end of your binoculars.

④ Rain drops are falling

⑤ A plane just crashed in the middle of nowhere

⑥ An unknown planet in space.

⑦ Where are the foot prints leading? time to follow

⑧ Watch out, someone about! It could be your last.

⑨ Hey, where's my picture gone someone has stolen my lovely picture

⑩ A maze which you can never get out of.

⑪ Help! A letter inside a can to send for help.

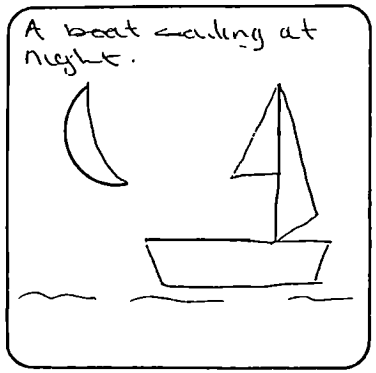
⑫ lovely colouring to circle with in pen.

TEST TWO

Including these three lines in your work, produce 12 different images or pictures. Your drawings can be either either abstract or representational.

Remember that it is the variety that is important not the quality of drawing. 032/08
Give titles if appropriate.

(13)



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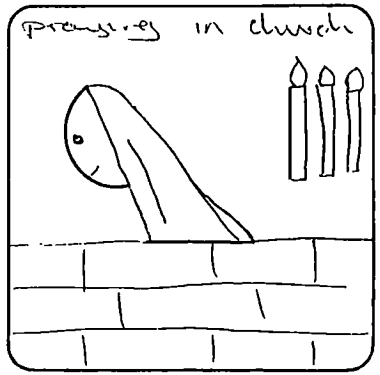

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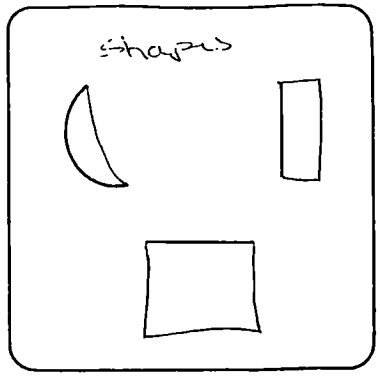

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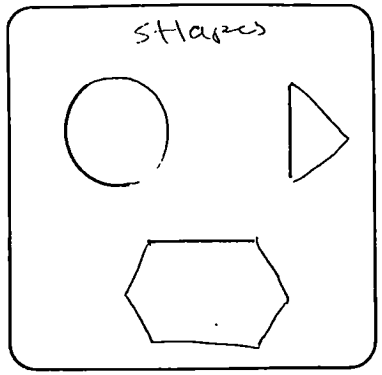

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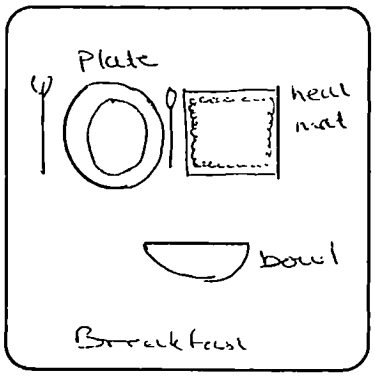

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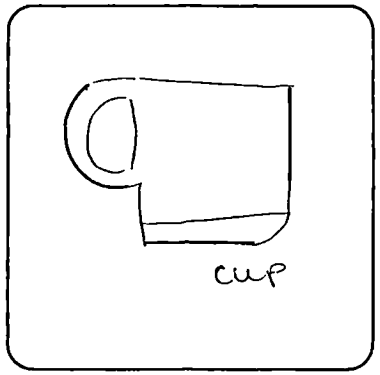

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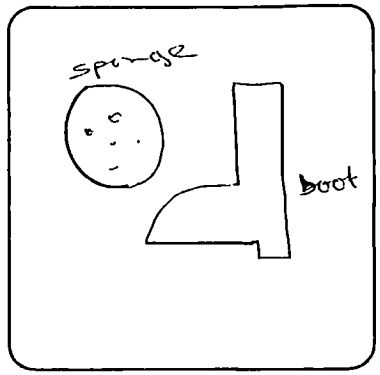

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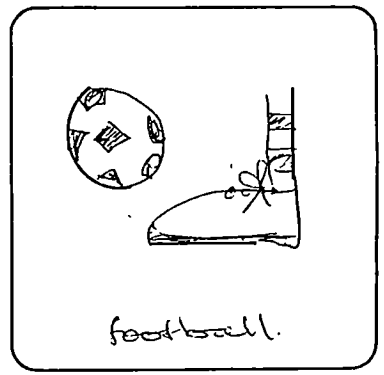

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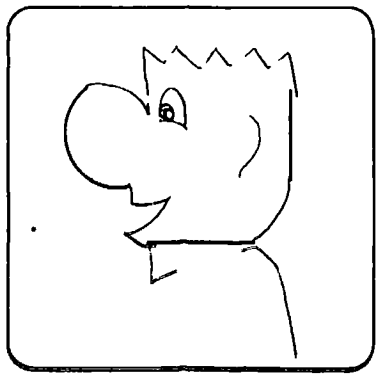

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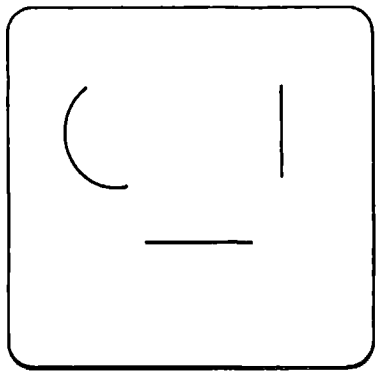

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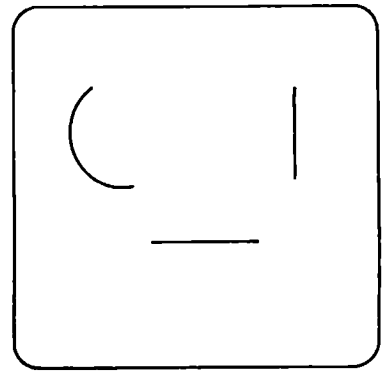


CREATIVITY TEST

Name: .....

021/02

Please can you complete the following two tests to show me how creative you can be

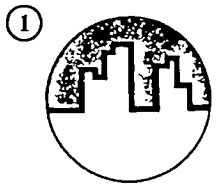
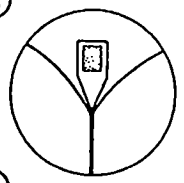
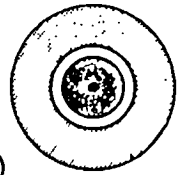
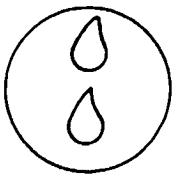
TEST ONE

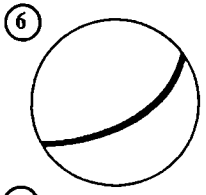
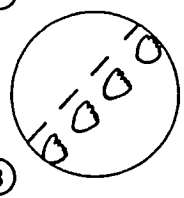
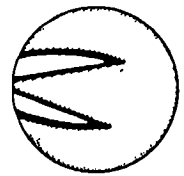
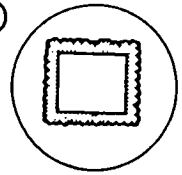
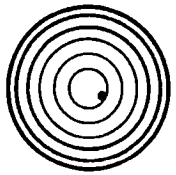
The twelve circles illustrated below all contain images for you to interpret

There are no 'right' answers. I am looking to see how many interesting or unexpected interpretations you are able to think up.

Write your suggestions on the sheet facing next to the appropriate number.

Example 

1 _____

2 I spy with my little eye something _____

3 The earth cut in half _____

4 _____

5 _____

6 _____

7 _____

8 A rabbit coming up to it's hole _____

9 A picture frame _____

10 A long tube with a man's head at the other end _____

11 _____

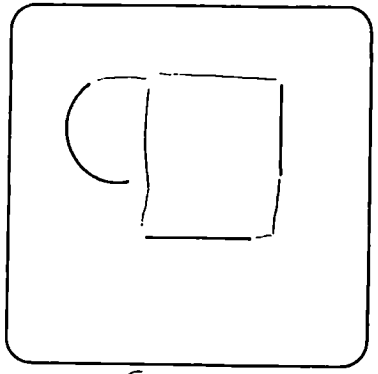
12 _____

Including these three lines in your work, produce 12 different images or pictures. Your drawings can be either either abstract or representational.

Remember that it is the variety that is important not the quality of drawing.
Give titles if appropriate.

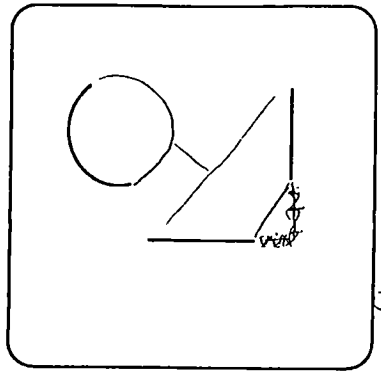
021/02

13



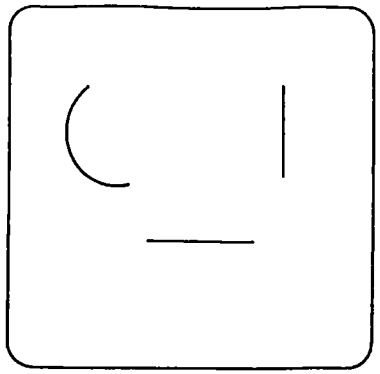
Cup

16



flower in a pot

19



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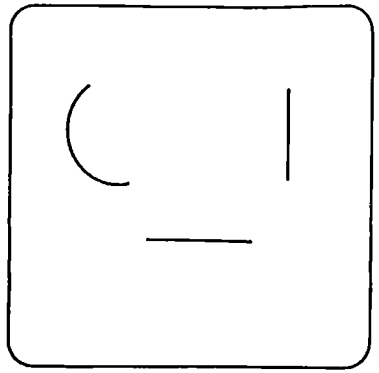

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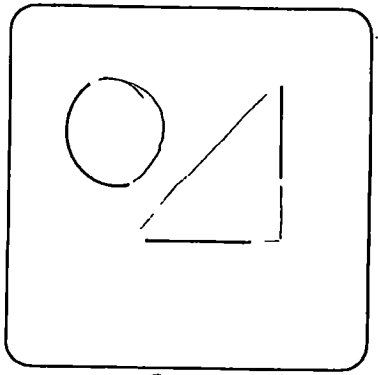
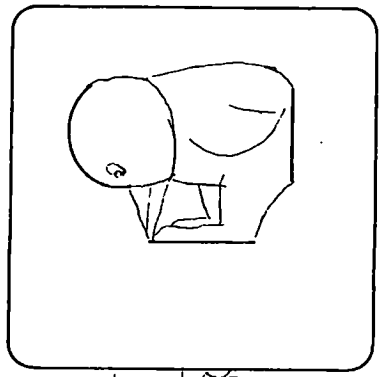


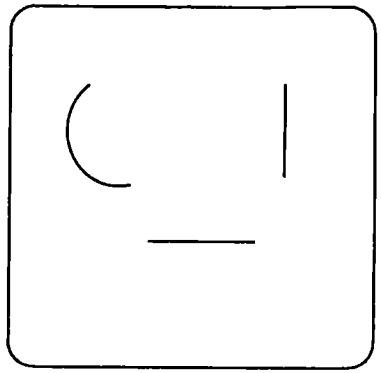
Shapes

17



a bird.

20



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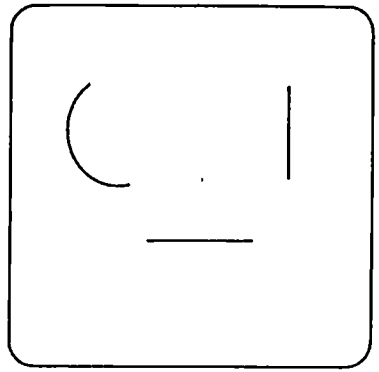

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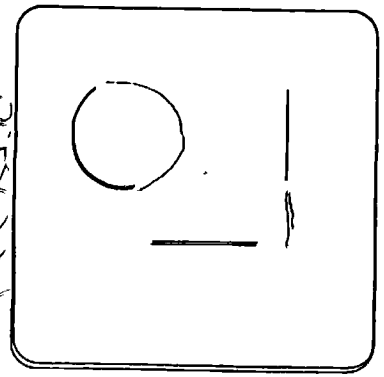

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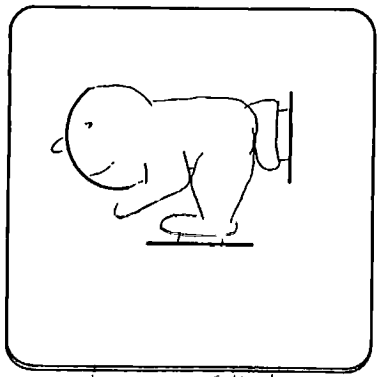
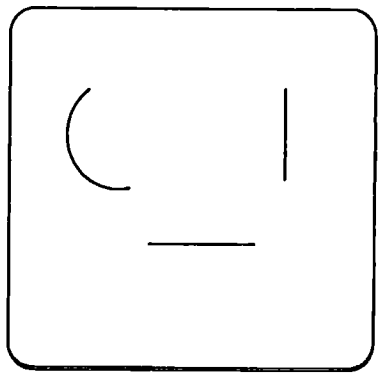


ME SKEIL E

21



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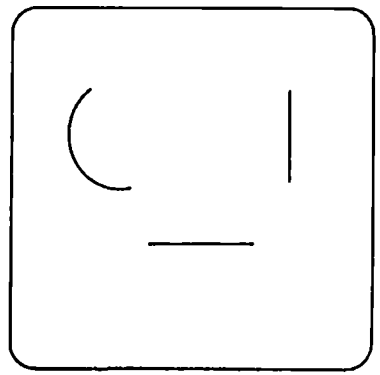


Appendix 5

The question tree

What do we mean by demotivation in the context of Technology project work *Answer : Discussion based upon Research/Interviews Teacher / pupils Classroom observation*

What are pupils reasons for choosing Technology *Quantitative data from QP1 Past Experience; Anticipated Qualities; Help in the future; Option Choices. Answer: % of pupils in each category*

What factors in the context of Technology Project Work affect demotivation?

- Could previous experience be a factor?
  - How many pupils enjoyed Technology more in yrs 7 - 9? *Quantitative data from QP1 Answer: Total number of pupils who enjoyed Technology in years 7-9*
  - How many pupils enjoyed Technology more in yrs 10/11? *Quantitative data from QP1 Answer: Total number of pupils who enjoyed Technology in years 10/11*
  - How many pupils enjoyed Technology equally at both key stages? *Quantitative data from QP1 Answer: Total number of pupils who enjoyed Technology equally at both key stages*
  - How many supportive comments were made regarding enjoyment of specific elements of Technology in yrs 7-9? *Quantitative data from QP1 Answer: Number of comments in each category (not the number of pupils as pupils could give more than one answer) (Project work; Teacher influence; Nature of the class)*
  - How many un-supportive comments were made regarding enjoyment of specific elements of Technology in yrs 7-9? *Quantitative data from QP1 Answer: Number of comments in each category (not the number of pupils as pupils could give more than one answer) (Project work; Organisation of the curriculum; Content)*
  - How many supportive comments were made regarding enjoyment of specific elements of Technology in yrs 10-11? *Quantitative data from QP1 Answer: Number of comments in each category (not the number of pupils as pupils could give more than one answer) (Choice; Skills; Project work; Treatment of pupils)*
- Is the process itself a factor?
  - How much is each aspect of the process enjoyed by the pupils?
    - Pupil perception *Quantitative and Quantitative data from QP1, QP2 & OP1 Answer: Comparison of average scores for enjoyment of each aspect of the design process*
    - Teacher perception *Quantitative data from QT1 Answer: Average score of the 8 Case study school teachers for pupil enjoyment of each aspect of the design process*
  - What is the balance of positive and negative comments regarding
    - Ease of choosing project?
    - Is research important?
    - Was the research enjoyed?
    - Enjoy designing more than making?
    - Enjoy making more than designing?
    - Is evaluation an important aspect?

    Quantitative data from IP1, QP2 & Qualitative data from OP1 Answers: Number of positive comments compared to number of negative comments
- Could there be any significance in the way pupils rank the four aspects of the design process in terms of enjoyment? *Quantitative data from QP1 and QP2 Answer: Comparison of Average scores for rank order of each aspect of the design process by the two samples including gender differences*
- Is there a relationship between rank order choice and result for each aspect of pupils folders? *Quantitative data from QP2, OP1 and Marks awarded by the school. Answer: Comparison of Average scores for rank order of each aspect of the design process with marks awarded*
- Is there a relationship between those who enjoy designing more than making or visa versa and the pupils perceived achievement levels? *Quantitative data from IP2 Answer: Comparison between the results regarding enjoyment of designing or making and perceived achievement levels from IP2*
- Is there any significance in the relationship between enjoyment of the process, achievement and independence? *Quantitative data from QP1 & QP2 Answer: Comparison between data for enjoyment, achievement and independence*
- Is level of enjoyment a significant factor in ability to finish projects *Quantitative data from QP1, IP1 and OP1 Answer: Comparison between the results regarding enjoyment of designing/making and finishing projects from data collected*
- Could unfinished/finished outcomes be a factor? *Quantitative data from QP1 & OP1 Answer: Number of pupils completed projects compared with levels of boredom*
- Is there a relationship between choice/given context & ability to complete projects? *Quantitative data from IP1 Answer: Comparison between those given context & those with free choice*
- Does the amount of extra work done affect the outcome of the projects? *Qualitative data from OP1*
  - When is the extra work done? *Quantitative data from QP1 & OP1 Answer: Number of pupils who do extra work at home and number who do it at school + gender differences*
  - How often is the extra work done? *Quantitative data from QP1 OP1 Answer: Number of pupils doing this extra work and how often, + gender differences*
  - What times of day is the extra work done? *Quantitative data from QP1 & OP1 Answer: Numbers of pupils who do extra work and when, + gender differences*
- Are parents interested in pupils project work? *Quantitative data from QP1 Answer: Number of pupils who say their parents were interested.*
- How much help do pupils receive from parents? *Quantitative data from QP1 Answer: Number of pupils who receive help from parents*
- Is there a gender difference? *Quantitative data from QP1 Answer: Comparison between amount of help girls and boys receive from parents*
- What percentage of pupils say they are a little bored/very bored and not bored by their work in Technology? *Quantitative data from QP1 Answer: Number of pupils very bored, a little bored and not bored*
  - Is there any difference between the genders regarding boredom? *Quantitative data from QP1 & OP1 Answer: Numbers of boys and girls very bored, a little bored and not bored at all*
  - Which aspects of the project work cause boredom? *Quantitative data from QP1 & OP1 Answer: Reasons given in numbers - Those bored, those very bored.*
  - What is the relationship between boredom with the subject of Technology separated by gender and completion of projects? *Quantitative data from QP1 & OP1 Answer: Numbers of pupils who completed Projects against boredom by gender. Completion rate to enjoyment of designing and making.*
- What effect does it have if the context of the task is given
  - a : on the enjoyment of the process *Quantitative data from IP1 & OP1 Answer: Comparison between those given a context and those given freedom as far as enjoyment of each aspect of the design process is concerned*
  - b : on the completion rate of projects *Quantitative data from IP1 & OP1 Answers: Comparison between those given context and those given freedom against finished / unfinished projects*
- Is the practical knowledge base required a factor? *Answer: Observation during Phase 2 giving qualitative data supported quantitative data IT1*
  - Does it affect designing? *Answer: Observation and reference to actual projects during Phase 2. Mainly qualitative data but number of pupils affected, quantitative data*
  - Does it affect making? *Answer: Observation and reference to actual projects during Phase 2. Mainly qualitative data but number of pupils affected, quantitative data*
- Are applied skills a factor? *Answer: Comparison between project work and observed demotivation Phase 2*
  - Which applied skills? 2D Modelling skills? Are drawing techniques used at different times within the design process a factor to be considered?
    - early sketches?
    - careful sketching?
    - orthographic drawing?
    - presentation perspective?

    Answers: Quantitative data from IP1 on each aspect compared to data from QP2 & OP1
  - Which applied skills? Writing skills? Are writing skills used at different times within the design process a factor to be considered?
    - Annotation?
    - Careful lettering ?
    - Evaluation?

    Answers: Quantitative data from IP1 on each aspect compared to data from QP2 & OP1
  - Which applied skills? 3D Modelling skills? Are manufacturing skills used a factor to be considered? *Answer: Qualitative and quantitative data from QP1, QP2, IP1 & OP1*
  - Is it the design concept being used at that time which causes the problem? *Answer: 5 sets of data. IP1, QP2, OP1, QP5 & QP6*
  - Or is it both? *Answers: quantitative data from IP1, OP1, QP5 & QP6 on each aspect. Supported by photographic evidence from projects, qualitative data from observation of pupils demotivated during Phase 2, and teachers feedback*

  In both instances this will be supported by photographic evidence from projects, qualitative data from observation of pupils demotivated during Phase 2, and teachers feedback.
- Is the relationship between the knowledge base, the process and the applied skills needed a factor?
  - Relationship between factual knowledge base, conceptual understanding of the process and 2D modelling skills?
  - Relationship between factual knowledge base, conceptual understanding of the process and 3D modelling skills?
  - Relationship between factual knowledge base, conceptual understanding of the process and writing skills?

  Answers: Comparison between 3 sets of quantitative data from QP2, data from QP6 backed by qualitative data from OP1
- Is the time involved in carrying out the process a factor? *Answer: quantitative data and qualitative data from QP1 & OP1*
- Are other external matters factors?
  - Examination *Answer quantitative and qualitative data from IT1, IT2 & OP1*
  - N.C. *Answer quantitative and qualitative data from IT1, IT2 & OP1*
  - Teacher *Answer quantitative and qualitative data from OP1, QP5 & QP6*
- Is a pupils ability a factor?
  - What type of ability are we referring to?
    - Is Goal orientation in general a factor? *Answer: Using quantitative data from QP3*
    - Is Creative ability a factor? *Answer: Using quantitative data from QP4*
    - Is verbaliser /imager orientation a factor? *Answer: Using quantitative data from QP7*

  Comparison between all of these pieces of data
- Does the organisation of the process, imposed by the staff (individually or by department) have an effect? *Answer : Qualitative data from OP1*

Does the teacher influence pupil demotivation in Technology Project Work?

- Do course hand-outs presented to the pupil have an effect? *Answers: quantitative and qualitative data from OP1 & QP6*
- Does teacher motivation have an effect?
  - Teachers understanding of the concepts? *Answer: qualitative data from OP1 & QP6*
  - Does the unenthusiastic teacher have in effect? *Answer: qualitative data from OP1, QP6 & IT2*
- Do external pressures on teachers have an effect?
  - NC pressures? *Answers : Qualitative and quantitative data from IT1 & IT2*
  - Examination pressures? *Answers : Qualitative and quantitative data from IT1 & IT2*

What percentage of pupils are demotivated in Technology Project Work? *Answer: quantitative data from QP1, QP2, QP6, OP1, IT1 qualitative data from OP1*

KEY:
QP1 - Questionnaire presented to 179 pupils - Phase One
QP2 - Questionnaire presented to 124 pupils - Phase Two
QP3 - Goal Orientation Test presented to 40 pupils - Phase One' and 50 pupils - Phase Two
QP4 - Creativity Test presented to 50 pupils - Phase Two
QP5 - Summative Questionnaire presented to 50 pupils - Phase Two
QP6 - Questionnaire presented to 166 pupils - Phase Two Extension
QP7 - Cognitive Style Analysis Test presented to 50 pupils - Phase Two

IP1 - Interview with 40 pupils - Phase One

OP1 - Observation Period 50 pupils and 8 teachers - Phase Two

IT1 - Interviews with 8 teachers - Phase One
IT2 - Interviews with 2 teachers - Phase Two Extension

Appendix 6

Pertinent publications 1993 - 1996

Identification of some causes of de-motivation amongst key stage 4 pupils in studying technology with special reference to design and technology

E Stephanie Atkinson
School of Education, University of Sunderland

Abstract

This paper reports the initial findings from the first year of an on going research project into the identification of some of the causes of de-motivation amongst pupils in years 10 and 11 studying Technology with special reference to Design and Technology.

Technology in schools requires pupils to apply skills and knowledge to develop solutions to practical problems. As the subject area of technology has developed so has the use of the design process as a method of delivering and examining subject content. It would appear from the initial research that long term pieces of course work, fundamental to the delivery of technology, may well prove to be tangible indicators in the identification of the causes of pupil de-motivation.

An initial survey was carried out in fifty schools in seven Local Education Authorities in the North East of England. Eight schools were then selected and a specific sample of Year 11 Technology pupils questioned. Three pupils from each of the eight schools were then selected to help with further research.

The findings presented in this paper are concerned with:
The number of pupils taking Technology subjects in Year 11;
The drop out rate from Technology examinations;
Pupils reasons for choosing their Technology option; and their perceptions regarding enjoyment, boredom, and difficulty within that chosen option.

The importance of technology education and the failure to involve a larger proportion of young people at a time of considerable technological change in society has been the concern of educationalists and others throughout the second half of this century. (DES 1988) A number of initiatives have done much to try to change attitudes in this area of the curriculum. Project Technology (1967-1972) and the Design and Craft Project (1968-1973) are two examples of such work, whilst more recently the Technical and Vocational Education Initiative and particularly the introduction of the Standing Orders for National Curriculum Technology have exerted significant influence on technological education.

Recent research regarding pupils' attitudes and concepts of technology in the United States of America has highlighted the important role of technology education. The report suggested that

> *'...students who had exposure to technology education classes had a more positive attitude toward, and displayed greater knowledge of, technology, as compared with students not having exposure to the classes,'*
>
> (Bame and Dugger 1990)

Given the importance of technology education, it is vital that the technology curriculum offered to pupils motivates them to participate fully. Technological capability gained from studying will

> *'...enable citizens to cope with a rapidly changing society and meet the challenges of the 21st century. '*
>
> (DES1990)

Over the past few years a lack of enthusiasm amongst a growing number of key stage 4 pupils for project based technology education has been observed. This has stimulated this research project which is focussed towards pupil de-motivation in Technology during key stage 4, pupils in years 10 and 11. It is hoped that an analysis of the collected data will suggest strategies which could help to improve the situation. This paper sets out to present the findings from an initial survey of fifty schools and a questionnaire used to elicit the opinions of a selected group of Year 11 pupils.

Technology is referred to in the National Curriculum (DES1990) as a new subject. It comprises two profile components, design and technology and information technology. Technology has developed

from work undertaken in the past in craft, design and technology, home economics, art and design, business education and information technology.

Technology as it is experienced in schools today requires pupils to apply skills and knowledge to develop solutions to practical problems. It is considered that pupils should be engaged in purposeful and comprehensive activities. (APU 1991)

> '...it is concerned with identifying needs, generating ideas, planning, making and testing to find the best solutions.'
>
> (DES 1990)

The relevance of the use of a design process which included designing, making and evaluating as a method of delivering and examining subject content had been identified by some schools and examination boards as early as the mid 1960's. The work tended to be carried out as long term pieces of course work in the form of design and realisation projects. As the subject area of technology has developed so has the use of project work throughout secondary education.

National Curriculum Technology is still in a state of flux, but there seems to be a consensus of opinion regarding the use of long term pieces of course work. Most recently these have been referred to as Design and Make Tasks (DMTs), and have been highlighted as a fundamental means of delivering technology. (DFE 1992)

Based upon personal professional experience and from initial fieldwork it was identified that in-depth analysis of these long term pieces of course work which are completed during years 10 and 11 may well be a tangible indicator in the identification of the causes of pupil dissatisfaction with this area of the school curriculum. (Down 1986)

The initial survey

Fifty schools were selected from Cleveland, Gateshead, Sunderland, North Tyneside, South Tyneside, Durham, and Northumberland for the initial survey . Forty-five schools replied giving information on the size of their school, number of pupils in year 11, age range of school, location of school and pupil gender. Each school also sent its GCSE entry lists from which the course work loading of individual pupils could be established.

A questionnaire to the Head of Technology at each of these schools revealed that many GCSE syllabuses were included under the umbrella of technology. After consideration, only Design and Realisation (D&R), Design and Communication (D&C) and Technology syllabuses were targeted for this study. Analysis of the information received from the Heads of Technology revealed the general pattern regarding the combination of these subjects. This is shown in Table 1

Combination of Subjects	Percentage of schools offering this combination
D&R, D&C and Technology	42%
D&R and D&C	21%
D&R and Technology	21%
D&R 16%	
n=45	*Table 1*

Of the total Year 11 sample from the forty-five schools 17% studied D&R as a GCSE course, 12% studied D&C and 10% studied Technology. Each of the schools had different policies regarding pupils who wished to take more than one technology subject. The number of pupils doing so was found to be small.

The examination entry pattern provided an interesting insight into the success which pupils were experiencing in these subjects. The numbers of pupils who were entered for the examinations shows a varying drop out rate. Technology entered 97% of all the pupils taking the subject, D&C entered 94% and D&R entered 86%

In Technology 73% of the schools entered all of their pupils for the examination with the lowest entry being twenty-nine pupils out of a cohort of thirty-six.

In D&C only 31% of the schools entered all of their pupils for the examination, although 75% of the schools entered over 90% of their pupils

The examination entry for D&R was low, only 25% of the schools having entered all their pupils for the examination, one school entered only seven of their twenty-five pupils, whilst another entered only sixteen of their thirty-two pupils.

The selection of the case study schools

From the original fifty schools all those who offered D&R, D&C, and Technology were selected. It was felt that this allowed pupil groupings in each of the subjects to be comparable across schools. From this selection eight case study schools were identified using the following criteria; the size of the Year 11 cohort, (under 225 and over 225) related to the location of the school (city/large town and suburban/ small town).

Pupil perceptions

All D&R pupils in each of the eight schools were targeted for the next stage of the study as a result of the initial survey highlighting the drop out rate for pupils taking D&R courses which was considerably higher than in the other two technology subject areas. It was also established from reading the different syllabuses that the nature of the design projects set in D&R tended to cover the complete design process. From the eight schools, a total of 179 pupils, 153 boys and 26 girls, completed a questionnaire which provided information relating to the pupils perceptions in connection with a number of aspects of D&R and the content of the courses which they had tackled. (Appendix 1)

Analysis of an open ended question regarding option choice within technology gave some reasons why pupils chose D&R as one of their GCSE options. This is shown in Table 2.

Reasons for Choice	Percentage
Past Experiences in yrs 7, 8 and 9	73%
Anticipated Qualities	10%
Of use in the future	10%
Option Choice	7%
n=179 *Table 2*	

Of those who had chosen D&R because of past experiences, a quarter of the pupils generalised, stating that they had enjoyed the lessons or that they had enjoyed designing and making. Just over half of pupils expressed pleasure at having made things. They specifically mentioned that they had enjoyed working with their hands, with tools and with materials. Wood was the material mentioned in the majority of cases. In comparison, only a small sample specifically referred to having enjoyed designing. A few pupils had chosen D&R because they believed that they were good at it, whilst another small group had chosen it because they liked having a tangible outcome, "something to show for my work".

In the group of pupils who had chosen D&R because of qualities they anticipated would be evident, the vast majority had believed that the subject would be interesting. One pupil felt it would be creative, another challenging and four pupils had chosen D&R because they thought that it would be easy. For these four pupils the evidence from the remainder of their questionnaires indicated that this had not been the case.

Those who had believed that studying D&R would help them in the future had decided that the practical skills gained would be of use in their future careers or to aid their lives in general. Gaining good GCSE results and even wishing to take the subject at A level, then at degree level had been the reasoning behind several pupils choice.

Of the remaining pupils, 6% had chosen D&R because they had had to choose a practical subject within the option scheme and D&R had seemed to be the best choice . Finally, 1% of the pupils had ended up taking D&R because they didn't get their first choice in their option scheme.

It was interesting to note that no pupils stated that they had been influenced by peer group or parental pressure in their choice of technology subject at GCSE which supports the findings of McCarthy & Moss in 1990.

The analysis of the results to a question which asked pupils whether they enjoyed design and technology more in years 7, 8 and 9 compared to during their GCSE Course are shown in Table 3

Enjoyment of Design and Technology	Percentage
Enjoyed Design and Technology in yrs 7, 8 and 9	25% (9% a lot more 16% a little more)
Enjoyed both equally	26%
Enjoyed Design and Realisation yrs 10 and 11	49% (21% a lot more 28% a little more)
n=179 *Table 3*	

Analysis of an open question which asked the pupils to give reasons for their enjoyment of design and technology in years 7,8 and 9 compared to during their GCSE Course gave some interesting answers.

Of those who had enjoyed their GCSE course the most 34% stated that it was because they were able to choose their projects,15% mentioned that they enjoyed feeling more independent, that they had learnt more and were therefore capable of doing more for themselves. 31% referred to the challenging nature of the projects tackled, 22% referred in a negative way to the work they had done in years 7, 8 and 9, citing that the work had been boring, too easy, that they had made too many small projects and that they had disliked moving around to new areas so often.

Of those who had enjoyed design and technology more in years 7, 8 and 9, 81% stated that it was because of the nature of the work in those years. Pupils mentioned such aspects as, less pressure, more time, easier work, less paperwork, and more practical activities. It was interesting to note that 19% referred to the fact that they had liked their teachers more then, that they had had more help from them and also that they had been able to be with more of their friends.

When asked specifically about their D&R course work and whether they ever became bored with their design project work less than a quarter of the total sample stated that they had not been bored. 59% stated that they were a little bored with certain aspects of their project work and 19% stated that they were very bored with certain aspects of their project work.

When looking at the reasons for the boredom, the replies were broken down into those who were very bored and those who were a little bored. Of the 19% who were very bored, 44% of them were "bored with all of it". 44% were very bored with certain parts of the design process (see Table 4 for details), 9% cited the slowness of the process as being the cause of their boredom, whilst 3% believed their boredom was caused by the attitude of their teachers.

Those who were very bored 19% of the Sample	
Aspect of the Design Process	Percentage
Research	15%
Writing	10%
Designing	10%
Making	7%
Evaluating	3%
Producing Working Drawings	3%
n=34	*Table 4*

Of the 59% who professed to being a little bored with their project work 16% suggested that they were a little bored with the subject in general, 42% stated that it was specific aspects of the design process that caused their boredom. (see Table 5 for details)

Those who were a little bored 59% of the Sample	
Aspect of the Design Process	Percentage
Research	12%
Evaluating	10%
Thinking of Initial Ideas	9%
Developing the Chosen idea	4%
Thinking of numerous ideas when one knows what one wants to make	4%
Analysis and Specification	2%
Thinking of problems to solve	1%
n=106	*Table 5*

34% referred to the mechanics of designing. (see Table 6 for details) Only 8% of the sample indicated that they were a little bored with aspects of making, the majority highlighted tedious jobs such as sanding and filing whilst others cited measuring and waiting for materials as the cause of their boredom, only one pupil stated that they were bored by all practical work.

Those who were a little bored 59% of the Sample	
Mechanics of Designing	Percentage
Writing	17%
Drawing	8%
All the Paperwork	4%
Production of Working Drawings	3%
Working out dimensions	2%
n=106	*Table 6*

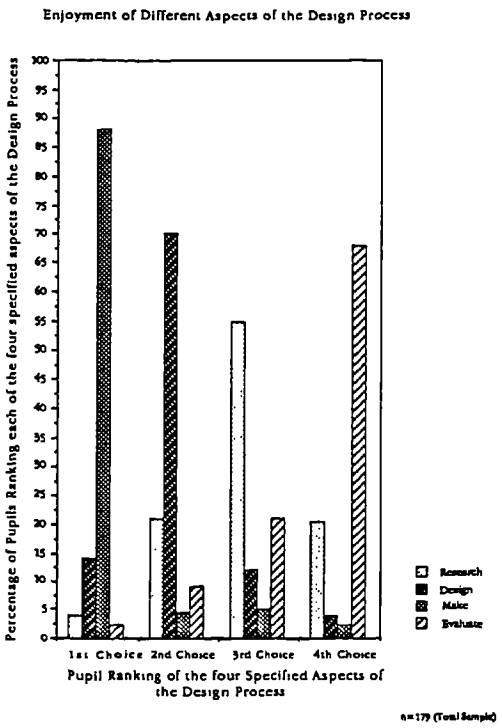
Analysis of the questionnaire showed similarities between the genders as far as boredom is concerned it is therefore interesting to note the gender difference when it comes to the numbers of pupils who finished all the projects during their GCSE course. 73% of girls finished all their projects whereas only 35% of boys finished theirs.

In each of the eight schools it was felt that the amount of time allocated on the time table for pupils to complete projects was not enough. Each school provided opportunities for pupils to do extra work. 51% of boys and 35% of girls stated that they did do extra work. When this extra work was done varied considerably, 61% of those who came in to do extra work only came in when it was needed, normally when project deadlines were looming, whilst 32% came in regularly and 7% came in as often as possible. Three quarters of those who came in to do extra work did so at lunch time or after school, while the other quarter came in when they were timetabled for other lessons.

Each school had its own policy on whether homework was regularly given each week or whether it was done when the project dictated that it was applicable, but all schools expected all their pupils to do homework. When pupils were questioned regarding extra work at home 96% of girls and 86% of boys stated that they did do work at home on their projects. All aspects of the process were tackled the most popular being research and the least often tackled the making of the artifact itself. 85% of girls and 80% of boys stated that their parents were interested in their project work. 55% stated that they had had help from their parents with some aspects of their project work although this was seldom more than 'once in a while'. The most help was given in the areas of selecting projects and research, whilst gender differences only became apparent in the area of help with 'making your chosen design' where girls received a little more parental help than boys.

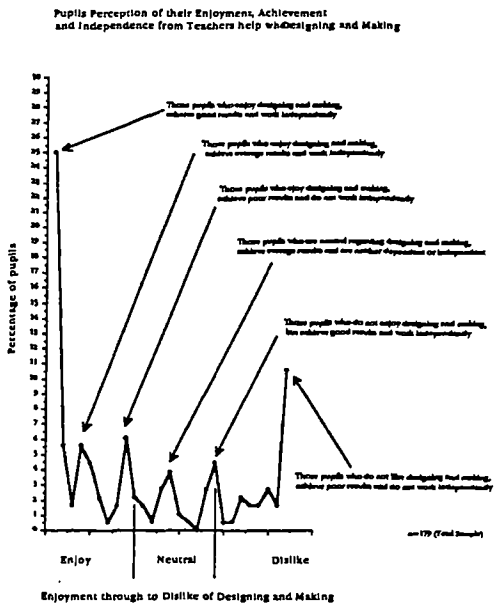
The other major area of research addressed by the questionnaire concerned the various aspects of the design process that pupils tackled in order to complete each of their projects.

Analysis of the data regarding the rank order in which pupils placed their enjoyment of Researching, Designing, Making and Evaluating gave the results shown in the graph below



As part of the questionnaire the design process was split into ten sections and pupils were asked to indicate how much they had enjoyed each aspect of the process, how much teacher help they had needed and how much difficulty they had had in achieving good results. Analysis of the data showed that 25% of the total sample had enjoyed designing and making, achieving good results and had worked independently. At the opposite end of the spectrum 11% had not enjoyed designing and making, failed to achieve good results and were unable to work independently. Two other interesting points were gleaned from this data, 6% of the total sample enjoyed designing and making, even though they achieved poor results and were unable to work

independently. Conversely, 5% of the total sample did not enjoy designing and making and yet achieved good results and worked independently.



The Next Stage of Research

From the material analysed to date a picture is beginning to emerge which suggests that certain aspects of the design process form stumbling blocks for a large number of pupils, even though some of these pupils go on to complete their work and therefore appear to have been successful. For a growing proportion of pupils these stumbling blocks are not surmounted leading to unfinished projects and subsequent de-motivation. The next stage of the research project is to seek to clarify these factors through the analysis of information collected through semi-structured interviews with yr 11 D&R pupils and the Head of Technology in each case study school.

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Key factors which affect pupils performance in technology project work

E Stephanie Atkinson
School of Education, University of Sunderland

Abstract

This paper reports the findings of a study into the perceptions of pupils and teachers regarding factors affecting performance in technology project work. The research was carried out in eight case study schools selected from an initial survey of fifty schools in seven Local Education Authorities in the North East of England. It involved interviews with forty Year 11 pupils and eight Design and Realisation teachers from the Case Study Schools.

The study forms part of an ongoing research project concerned with identifying the causes of de-motivation amongst pupils in Years 10 and 11 following courses in technology.

Using the analysis of the data collected from the interviews, the paper will discuss the key factors which pupils and teachers perceive to affect performance in technology project work.

This paper reports the findings of a study into the perceptions of Key Stage 4 pupils and their teachers regarding factors affecting performance in Technology [1] project work. The study is part of an on-going research project and has developed from work carried out in 1992/3, the results of which were presented at IDATER93 (Atkinson, 1993). The research was carried out in eight case study schools selected from an initial survey of fifty schools in seven Local Education Authorities in the North East of England. The data referred to in this paper was collected during interviews with forty Year 11 pupils and their eight teachers of Design and Realisation (D&R).

Before discussing the identified factors that affect Technology project work it would seem pertinent to refer to some of the relevant educational issues concerning Key Stage 4 pupils, particularly in the context of GCSE examinations and discuss the importance of project work as a means of delivering essential elements of Technology education.

Educational philosophy would have us believe that the assessment used to judge pupils' work should not dictate the curriculum content. Examination syllabuses should be designed to develop capability and test competence (SEC, 1986; NEAB, 1993). Because of the importance of the examination results to pupils and teachers alike, the nature of assessment and its criteria tend to influence what is learnt and how it is taught. The GCSE examination system can therefore be said to have a marked effect upon the nature of the work carried out by the pupils targeted in this piece of research.

At the heart of Technology education is the design process - the activity of designing and making. Capability in Technology involves a complex integration of processes, concepts, knowledge and skills (DFE, 1992). It is considered that all pupils should be engaged in these purposeful and comprehensive activities (Assessment of Performance Unit (APU), 1991; SCAA, 1994).

Projects, using a design process model, have been the main method of delivering the content of this area of the curriculum since the introduction of design activities into Technology education (Design Council, 1980; School Council, 1986). The fundamental purpose of designing is the development of outcomes of various types. Designing is an intellectually demanding process. There is a basic logical procedural strategy required when designing. The problem that pupils face is that for each new task this procedure should vary in emphasis and on the amount of time needed for each stage. In fact, even when a group is set a single task, each pupil's process should be determined by the individual nature of the developing solution. NC Technology and examination syllabuses have tended to interpret the process in a narrow, unhelpful and restrictive manner. The weakness of the models they have adopted is that they suggest that pupils are not engaged in designing unless they undergo and demonstrate each of the stipulated stages of the process. There is a tendency, therefore, for pupils to learn, and teachers to teach that designing is concerned with jumping through hoops in a pre-determined order.

Across education in general, project work and problem solving activities are seen as important aspects of teacher assessed coursework at Key Stage 4 (Scott, 1990). It is considered that this type of work has the potential to develop in pupils skills

which are difficult to assess by more traditional methods (SEC, 1987). Technology teachers accept that project work is the most suitable method of assessing the process. They have, however, found it increasingly difficult to balance the requirements to work creatively with a broad based range of materials in an ever expanding context, with the need to ensure that pupils produce outcomes of quality based on sound manufacturing skills.

For pupils, project work is recognised to have a motivational advantage over other forms of classroom activity (Down, 1986; Stables,1993). However, it is also recognised that project work can cause some pupils significant, motivational problems. Its very success can be its downfall. Project work can significantly increase the work load of the pupils. This increase can be caused by the conscientious pupil themselves or by a teacher's inappropriate level of expectation.

Motivation or the lack of it, when pupils are engaged in project work, is woven into each of the key factors which I have identified. It has been a pivotal feature of this research project for although motivation is not a pre-requisite to achieving success, success can bring about motivation, which in turn can lead to further achievement.

Attitudes towards success and failure have a significant bearing upon motivation and therefore upon project work. To identify which attitude has caused motivation or demotivation and then to determine whether it is internal or external, stable or fluctuating and whether it can be controlled or is uncontrollable is a difficult task (Weiner, 1992). The complex relationship between all these and external forces such as culture, context, parental and teacher expectations has a powerful bearing upon the situation. There are also gender differences to be taken into account. Helpless and mastery patterns of behaviour vary in boys and girls (Licht & Dweck, 1983). In Technology where many girls are lacking in confidence the potential to acquire learned helplessness is high (Seligman, 1975).

The complex relationship between the knowledge base and the procedural demands of the activity has been identified as one of the factors which affect performance. To pre-determine the knowledge and skills needed to tackle a task frequently denies the nature of the activity. Research supports the belief that knowledge acquired for a specific purpose is seen as more useful and more easily remembered. Using the "need to know" method motivates pupils to push themselves beyond their existing capabilities, but the resourcing, the teacher's own knowledge base and teacher management of such a method is crucial to its success. Professional designers understand intrinsical'y that they do not need to know all about everything in a particular task. They need to know what to find out , what form the knowledge should take and what depth of knowledge is required. From my professional experience in the classroom and observing others teach design using this approach, pupils will happily move into the unknown because they trust that the teacher has the answer and the capability to overcome any problems encountered, even if this may not be the case.

Creativity

The development rather than the strangulation of creativity in pupils should be the goal of all teachers. Before and during the first few years in school children are encouraged to think creatively. By the time pupils reach Key Stage 4 and GCSE examinations there is a marked drop in their creative ability (Torrence, 1964; and others). Reasons given have either been associated with developmental phenomena, or as Gowan (1981) suggests, due to 'the extinction of the right hemisphere imagery' which he believes is caused by the over-teaching of left-hemisphere brain functions such as reading, writing and arithmetic and a lack of stimulus of right hemisphere functions.

As a supposedly creative area of the curriculum, Technology should be able to stimulate and encourage creativity (APU, 1981). Stimulation, Torrence (1972;1981) and others (McAlpine, 1988; Ochse, 1990) suggest can be achieved by teachers building a responsive environment in which there is an atmosphere of receptive learning. One in which: over-teaching and over-guidance are avoided; disparaging or destructive criticism are not used; in-depth study is provided; pupils sensory awareness is addressed and the zest for learning and thinking are kept alive. Interestingly Torrence (1981) claims that teacher creativity is not a significant factor in influencing pupil creativity although he firmly believes that teaching can make a difference to a pupil's creativity. He suggests that correct methods, materials, attitudes and relationships with pupils, all contribute to a pupil's creative development. These suggestions for the development of creativity must not be lost because of the constraints imposed by NC Technology and GCSE Technology examinations.

Based upon my professional judgement and my research I would suggest that teachers of Technology believe that they can provide the creative environment that Torrence suggests. Problems that arises are due to constraints imposed by assessment. Both NC Technology and GCSE

examinations in particular are tending to inhibit the creative development of all but a few of the pupils.

Teachers Role

Interwoven with each of the factors concerning the pupils and their project work are the teachers themselves, their enthusiasm for their subject and their willingness to accept the challenge of being part of the developing philosophy which underpins the subject must be said to have a vital role to play.

The pace and extent of educational change in schools has been considerable, both for the school curriculum as a whole and for Technology as a subject area in particular. The lack of time in which to consolidate, reflect and evaluate has impinged directly upon teachers who plan and deliver the curriculum. In particular the implementation of NC Technology has led to a general undermining of confidence felt by many Technology teachers. Beliefs that have been held, skills that have in the past been shared with pride have all been brought into question.

The need to achieve success for pupils in GCSE examinations has always been of importance to teachers but with the publication of league tables an extra incentive has been introduced. This has lead, understandably, to many teachers sticking rigidly to GCSE requirements but it has also lead to many teachers interpreting the examination requirements in such a way as to lead to inappropriate use of the design process. For teachers of Technology, there are a plethora of support materials available regarding what pupils should do when they are engaged in designing. Without a clear, balanced understanding of the activity of design the process is often misunderstood, misused and hollow. In the context of this research, those charged with responsibility for the design of Technology examinations have an important role to play in helping to develop a valid design philosophy for both teacher and pupil alike.

Data collection and analysis

The interviews

Eight Case Study Schools					
The Process	Enjoyed		Neither enjoyed or disliked	Disliked	
Achievement	Good outcomes	Average outcomes	Average outcomes	Average outcomes	Poor outcomes
No. of Pupils	1	2	3	4	5

Table 1

The final forty pupils to be interviewed were selected using the criteria indicated in Table 1 after analysis of initial questionnaires completed by all D&R pupils in the case study schools.

Having already established, from the earlier data, the pupils' general understanding and enjoyment of the various stages of the design process the interviewer was able to target an area which had been highlighted as problematic in the questionnaires - that of communication skills. Pupils were encouraged to talk about the various forms of drawing and writing they had used in their Technology project work. Answers to these questions provided further insight into the intricate relationship between modelling skills and conceptual skills regarding the processes of designing.

Questions were also asked relating to the actual design process that had been used to complete major projects. This was discussed with pupils in some depth, starting with the choosing of the brief through to the completion of practical work and evaluation.

The relationship between drawing skills and conceptual design skills

Questions regarding drawing skills were divided into four types: sketching early ideas; careful sketch drawings during 'the development of ideas stage' of designing; orthographic drawings; presentation perspective drawings of the chosen idea. As earlier stated the relevant conceptual skills involved were also discussed. Analysis of the data for the total sample is shown in Table 2

n = 40 Communication Skills - drawing		Comments		
		Drawing skills	Thought processes	General points
Early sketches	pos 37	15	12	10
	neg 23	11	9	3
Careful sketches	pos 16	4	3	9
	neg 32	12	11	9
Orthographic drawings	pos 17	6	4	7
	neg 24	11	2	11
Presentation perspectives	pos 22	11	0	11
	neg 17	8	1	8

Table 2

It is interesting to note how the balance of positive to negative comments varied throughout the process. At the initial design stage when 'Early sketches' were being produced the balance was towards positive comments. Sixty-two percent of comments made were positive whilst only thirty-eight percent were negative. Pupils referred to having: enjoyed thinking of ideas; found it easy; believed it was necessary; enjoyed the drawing technique involved. Negative comments on the other hand pointed towards certain pupils: having difficulty in thinking of ideas; possessing poor freehand drawing skills; finding the task tedious; being unable to see the point of putting ideas down when they knew what they wanted to make.

The balance of positive and negative comments altered towards a greater number of negative comments in both the stage using 'Careful sketches' and the stage when 'Orthographic drawings' were produced. Only thirty-seven percent of the comments were positive whilst sixty-three percent were negative. Pupils referred in both these sections to difficulties associated with: working out the details; the accuracy needed in the drawing techniques; the time consuming nature of the task; and the fact that they wanted to get on with making. The few positive comments related to instances where pupils had: enjoyed working out the details; enjoyed the challenge of this type of drawing; been proud of the outcome.

The careful 'Presentation perspective' drawing produced a more even spread of positive and negative comments. Fifty-six percent were positive and forty-four percent were negative. There were those who enjoyed the drawing techniques involved, were proud of the outcome, and felt that it was a satisfactory way of completing the project. On the other hand there were those who spoke of finding the drawing technique difficult, time consuming, and even one who admitted that her older brother had done her drawing because she knew she could not achieve a satisfactory outcome.

The relationship between writing skills and conceptual design skills

Questions referring to writing were divided into three types, those relating to: annotation of early sketches in order to explain ideas and thoughts; careful lettering for headings,title sheets, orthographic drawings etc.; the written evaluation at the end of a project. Analysis of the data for the total sample is shown in Table 3.

n = 40 Communication Skills - writing		Comments		
		Writing skills	Thought processes	Time
Annotation	pos 30	0	28	2
	neg 27	12	13	2
Titles etc.	pos 25	8	13	4
	neg 20	6	6	8
Evaluation	pos 20	2	18	0
	neg 48	6	33	9

Table 3

The overall balance between positive and negative comments regarding the 'Annotation' of early sketches was fairly equal. Fifty-three percent of the comments were positive and forty-seven were negative. However, marked differences appeared within those figures. With regard to the writing skills needed in annotation, all the comments made were negative. The majority questioned referred to the untidiness that resulted from writing notes alongside their drawings. However, when it came to the thought processes involved during the production of annotations, twice as many of the comments were positive as negative. The positive comments suggested that pupils had: found it easy to think what to write; felt it was important to be able to communicate thoughts to others; believed it was a good way of explaining how things worked; explained that it could help them to clarify details. The negative comments concerned not enjoying having to think what to write and more explicitly, not understanding how things worked. Very few of the sample mentioned the time taken to annotate their drawings as being an important consideration. Only two pupils suggested that annotating was quick and easy, whilst another two did state that it was tedious if it was done for the sake of writing something.

Completing the careful lettering i.e. 'Titles' needed in their design work was once again reasonably balanced between those who gave positive feedback and those who saw the task in a negative light. Only eight pupils actually referred to having enjoyed the technique involved although thirteen others suggested that they were either proud of the outcome when they had finished or suggested that it was worth the effort as it enhanced the presentation of the project. Negative comments referred to difficulties concerned with the accuracy

needed and the time consuming nature of the task. Others admitted that they avoided doing it. The methods used to achieve this form of lettering varied. There were those who used computers because it was quick and easy to achieve a satisfactory result. There were those who used stencils in order to help them achieve a more accurate outcome, and there were those who preferred to do the lettering freehand, either because they got satisfaction from their endeavours, or because they wished to display an individual 'flavour' to their work. This they suggested could not be achieved by using either a computer or a stencil.

Evaluation, as expected (Atkinson, 1993) proved to be a stumbling block for many pupils. Twenty-nine percent of the comments regarding the process and the skills needed were positive whilst seventy-one percent were negative. Only one pupil out of the total sample suggested that they did not mind writing an evaluation whilst another said that it made up for their lack of drawing skills. The vast majority of the negative comments were concerned with the thought processes involved in producing an evaluation. Although nine pupils did refer specifically to the time consuming nature of the task. The major difficulties which pupils cited were to do with their lack of understanding regarding what should be written. Aspects which proved problematic were: explaining their thoughts; thinking of positive and negative things to say; being able to criticise their outcome when they thought their outcome was suitable. A number of pupils disliked having to reflect upon failure whilst others did not enjoy having to find out what others thought of their solutions. There were those who quite openly stated that the only reason they did an evaluation was to gain marks for their GCSE project.

This dislike of the evaluation process supports the earlier data collected from the questionnaires (Atkinson, 1993) when 'making' was ranked first by eighty-five percent of the sample, 'design' second by seventy percent of the sample, 'research' third by fifty-five percent of the sample and 'evaluating' was ranked fourth by seventy percent of the sample.

Manufacturing skills

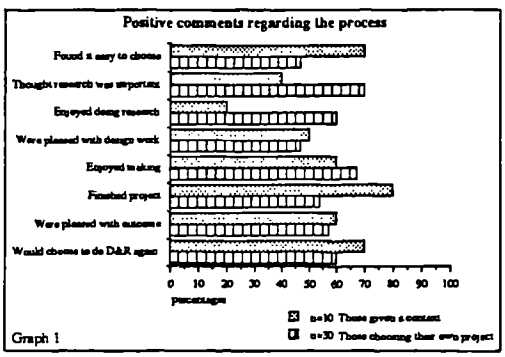
Manufacturing skills had been targeted in the earlier questionnaire although specific questions regarding whether pupils had enjoyed making their project, whether it was finished or not, and whether they were pleased with the outcome were all discussed during the interviews.

Of the total sample just over half of the sample had finished their practical work on time, whilst five others had almost finished. Six explained that they were "no where near finished" and five admitted that they had not even started. Twenty-six pupils spoke of having enjoyed the making aspect of their project with only seven others referring to the fact that they had disliked the manufacturing stage of the process. Reasons given for not enjoying this aspect of the project were mainly associated with the pressure of examinations and poor time management. On the positive side, the comments could be grouped into those who had enjoyed: the construction processes involved; those who had enjoyed using their hands and working with materials, and those who were proud of the outcome. This later group formed thirty percent of the total sample. What was quite interesting about this group was the fact that a number of them suggested that it was not necessarily the making of it that had caused them pleasure, rather the possession of the finished outcome. These pupils showed that they were able to motivate themselves to tackle something they did not find particularly enjoyable by looking forward to possessing something they would be proud of.

Those who had had difficulties or were disappointed with the making aspects of their projects cited inaccuracy as the most common cause of their dissatisfaction. Pupils suggested that the cause for the inaccuracy was: a lack of process skills; inaccurate marking out ; things not having been worked out carefully enough in the first place; and a lack of time management particularly at the design stage leaving them with too little time to finish the practical work to a satisfactory standard.

The effects of giving pupils a context to work in as opposed to freedom of choice

Two different approaches were adopted by the schools when it came to chosing a major project. Of the total sample of forty pupils, thirty were given the freedom to choose their own projects whilst ten were given a context within which to work. In one school this context was set by the Examination Board and in the other instance the school set its



Graph 1

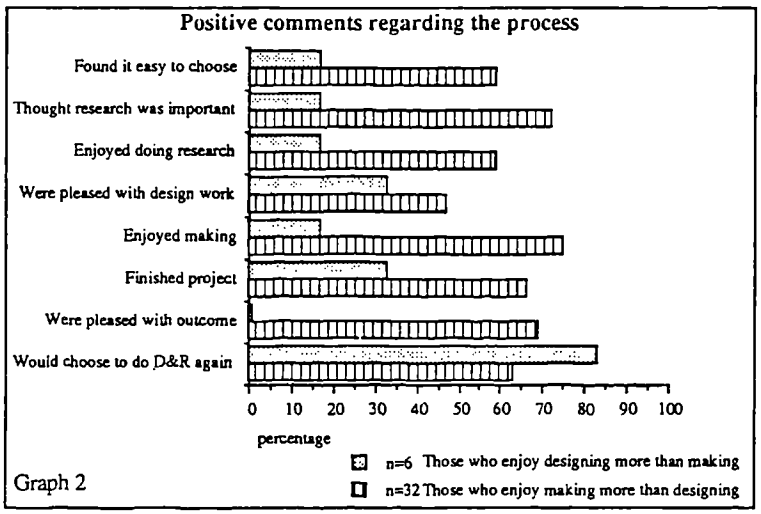
own. The obvious benefits to the school were in managing the resources that might be needed both at the research stage and the manufacturing stage. In the context of the design process, as far as the pupils were concerned the benefits or otherwise of these two approaches can be seen in Graph 1.

Those who were given a context within which to work found it easier to select a project than those who were given freedom. However, a negative effect was identified at the research stage for those who were given a context. Analysis of the data showed that this group did not believe that research was important nor did they enjoy carrying it out. When it came to the design work both groups were equally pleased with their work although this only represented fifty percent of each group. A slightly larger proportion of the pupils who were given the opportunity to choose their own projects enjoyed making them, whilst there was a significant difference between the two groups when it came to finishing the manufacturing stage on time. Eighty percent of the 'context' group finished their projects. I would suggest that this was in the main due to the fact that the projects tackled by this group were 'safe' projects. They were set well within the pupils' capabilities and the projects chosen were within areas which could be easily managed by the staff in the schools with the resources and equipment they had available. There was little difference in 'how pleased' the pupils were with their outcomes. One might have reasonably expected that those who had freedom to choose would be more pleased with their final products, but this was not the case. The results of the interviews suggested that in many instances problems arose during manufacture because of ill-conceived, unfinished design work that had led to radical changes being made during the manufacturing process. This caused a number of pupils to be disappointed with their outcome. Conversely, one could have expected some despondency regarding the outcome by those who were given their original context but this was not the case. Evidence suggested that in this case pleasure with the outcome was due to the fact that it was work done for an examination. In the pupils' eyes it was more important that the result was satisfactory than that the artifact was something they wanted.

One of the other questions asked during the interviews was concerned with whether the pupils had enjoyed designing more than making or making more than designing. Eighty percent stated that they had enjoyed making more than designing. It had been hoped to compare the differences between these two groups as far as conceptual and acquired skills relevant to designing were concerned, but analysis of the data revealed that the two groups were very unbalanced with regard to their levels of achievement in their project work. Those who enjoyed making more than designing displayed a normal distribution with regard to achievement but the group who enjoyed designing more than making all fell into the average or below average cohort for achievement. Therefore it was impossible to make a comparison using the resulting data. See Table 4.and Graph 2.

n = 40	Perceived achievement levels				
	Very well	Well	Average	Not so well	Not well at all
Enjoyed making more than designing	1	7	16	7	2
Enjoyed designing more than making	0	0	3	1	3

Table 4



Graph 2

Conclusion

From analysis of the teacher & pupil data with regard to the various processes that pupils adopt in order to tackle their major projects the evidence would suggest that pupils fall into two bound categories. (see diagram 1 - overleaf)

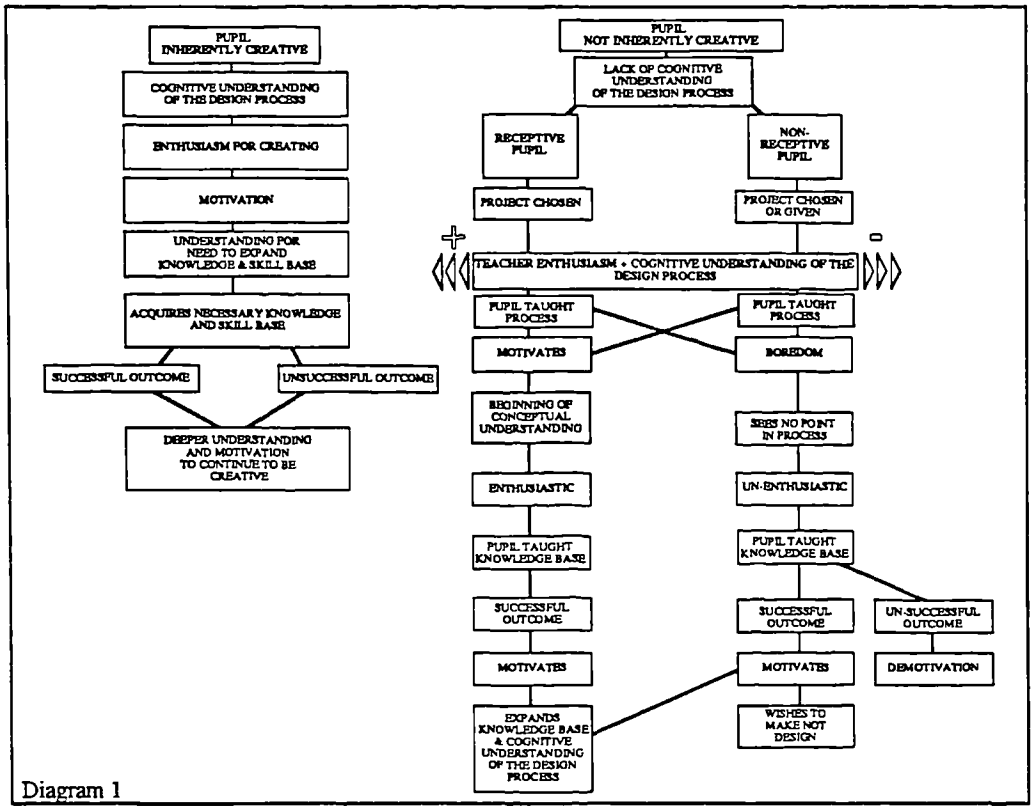


Diagram 1

There are those who are inherently creative and those who are not. Within each of these categories there are two types. The inherently creative can be divided into those who are able to create within the constraints of the GCSE examination process model, and there are those who are inhibited by such a structured approach. In the second category, that encompasses the vast majority of pupils, there are those who are not inherently creative but are receptive to learning the design process methodology that will allow them to produce creative outcomes and there are those who are not receptive and become easily de-motivated. Those who are inherently creative have the motivation to persevere however difficult the task may become. The other groups all need external encouragement to overcome their conceptual difficulties. The progress of all four groups is affected by a number of key factors specific to the task of designing and making. The complex relationship between these and other external forces such as culture, context, parental and teacher expectations cannot be underestimated. Since these factors can rarely be dealt with in isolation, I would suggest that in the context of technology project work, more often than not, one is concerned with a combination of a number or all of the following: pupils acquired modelling skills; conceptual skills regarding the process; inherent creative skills; the need for evidence for assessment causing the use of inappropriate forms of modelling by the pupils, and teacher cognition of the real process of designing.

Each of these factors is a key to achieving improvements in the designing and making tasks that are carried out by pupils at key Stage 4. But I would like to suggest that the teacher is the lynch pin that can cause the other factors to fall into place. A teacher who understands the 'real' process involved in designing can teach or guide pupils to acquire the appropriate modelling and conceptual skills, can enhance and encourage creativity, and can prevent pupils from using inappropriate forms of modelling.

It is hoped that in the next stage of this research project factors can be further defined and refined leading to the production of materials which could help to improve the performance of pupils in Technology project work.

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(1) *In order to avoid confusion and assist the reader the term 'technology' has been used to describe technology in the widest sense of the word. The terms 'Technology' and 'Technology education' have been adopted to describe the area of the curriculum associated with this research project, whilst 'NC Technology' has been used when reference is made specifically to National Curriculum Technology.*

2.1 Atkinson

Approaches to designing at key stage 4

E Stephanie Atkinson
University of Sunderland

Abstract
It is intended that this paper will report on the preliminary findings of an investigation concerned with the approaches to designing adopted by boys and girls in year 11 (age 16). The study involved fifty pupils and their teachers whilst they were engaged in major project work, undertaken as part of a GCSE Technology examination. The research is focused on eight case study schools and forms part of an on-going programme initially involving fifty schools selected from seven Local Education Authorities in the North East of England. (IDATER93 and IDATER94)

The sample was chosen utilising two data-gathering instruments. Firstly, a questionnaire that asked pupils to give their perception of: their enjoyment of designing and making; their personal ability to design and make. Secondly, a computer-presented, self-administered Cognitive Styles Analysis (CSA) test designed to assess two fundamental cognitive style dimensions: verbal-imagery and wholist-analytic. A case study approach based on observation was then used to chart the sample's (n = 50; 36 boys and 14 girls) progress in designing and making during the course of their major projects.

The paper will consider the similarities and differences between the genders in the initial sample (n=112) using the data collected from the questionnaire and the CSA test. Gender tolerance of the delivery programmes utilised by each school and the two main strategies that were adopted by teachers to enable pupils to meet deadlines and address the Examination Board's assessment criteria will be discussed. The different influences that these strategies may have had upon the boys' and girls' motivation, their approach to designing and the outcomes that were produced for assessment will also be examined.

Introduction

This paper reports the preliminary findings of an investigation concerned with the approaches to designing adopted by year 11 pupils. The study involved fifty pupils and their teachers who were engaged in major project work that was part of a General Certificate of Secondary Education (GCSE) Technology examination. This research is part of a wider on-going programme concerned with identifying some of the causes for a lack of motivation noted amongst pupils in years 10 and 11 whilst they follow courses in design and technology [1,2].

Design and technology in schools involves a complex integration of processes, concepts, knowledge and skills [3]. As the subject area has developed so has the use of the design process as a method of delivering and examining subject content (for example: [4,5,6]).

The latest revision of National Curriculum (NC) Design and Technology has retained support for the activity of designing and making even though there have been changes in emphasis regarding content throughout the revision procedure [7].

Design processes used in schools have developed out of the linear design models used in the early 1960's [6]. As teachers have become more experienced in working with them and as the subtlety of the process has become more apparent, so the models have become increasingly complex. By the end of the 1980's many models of the process had been developed [8]. It was acknowledged that some models became so complex that they were confusing to those who used them [6]. In 1986 the Department for Education and Science (DES) suggested that what was needed was a loose framework to guide designing rather than a well defined process

model which they saw as a "straitjacket". This approach supported by Lawson [9] stressed that designing required flexible procedures. He pointed out that when designing for different situations similarities did exist although it was most important to be aware of the essential differences too.

In addition to the approach taken to designing, research has shown that many other factors affect a pupil's performance and learning during design and technology project work [10,11,12]. APU [6] suggested that the factors could be divided into two types: those attributes that a pupil brought with them: their gender; general ability; curriculum experience - and the attributes of the task itself: its context; its structure. Whilst Curry, [13] referring to learning styles in general, organised the factors into three main types which he likened to layers of an onion. He suggested that learning behaviour was controlled by the central personality dimension, translated through the middle information processing dimensions and then, " ...given a final twist by interaction with environmental factors encountered in the other strata" [13].

In the context of design and technology the complex relationship between key factors such as a pupil's knowledge base, level of communication skills, conceptual skills, creative ability, cognitive style, goal orientation and such external forces as culture, context, parental and teacher expectations cannot be underestimated. Nor can the effect of attitude upon motivation be ignored. However, to identify which attitude has caused de-motivation and then determine whether it is internal or external, stable or fluctuating and whether it can be controlled or is uncontrollable is a difficult task [14]. To add further to this complex picture there are also the intricate gender differences which recent research has highlighted (for example: [6,15]). For this research study 'gender' has been taken to indicate biological gender. This is in contrast to behavioural or learning gender style where gender is seen as a continuum rather then as a binary divide [16].

In an achievement context such as school, pupils show either helpless or mastery patterns of behaviour when confronted by difficult tasks [15,17]. These patterns of behaviour are not necessarily related to levels of intelligence [14]. Learned helplessness [18] does not only effect the less intelligent. Research would have us believe [17] that in a school situation there is a tendency for girls to acquire helpless orientation when they are faced with the possibility of failure. Boys tend to attribute their failures to external causes whilst girls blame their own inadequacies. Dweck and Leggett [19] suggest that in a challenging achievement situation mastery orientated pupils pursue the "learning goal" of improving their ability whereas helpless pupils pursue the "performance goal" of proving their ability.

The assessment of pupil performance forms the backbone of GCSE project work. Educational philosophers would have us believe that the assessment used to judge pupils' work should not dictate the curriculum content [20], rather it should be designed to develop capability and test competence [21,22,23]. However, the importance of the examination results to pupils and teachers alike dictate that the nature of assessment and its criteria influence what is learnt and how it is taught [24,25]. Additionally, the need for accountability has led assessment to become overly objective [26]. As far as examination syllabuses have been concerned, this has lead to the use of a prescriptive design process with a very specific list of criteria to be met. Layton [8] aptly suggested that if teachers were not careful the process could impose "a procrustean regime" on the way pupils designed. Pupils have become 'outcome driven', with the process becoming a series of products. To obtain good examination grades pupils have had to provide evidence that each stage of the specified process has been addressed, irrespective of whether it was appropriate to the design of their particular product or not.

Against this background this phase of the research has sought to investigate further the factors affecting pupil motivation towards project engagement and completion that had been identified in earlier sections of this on-going research project.

Methodology - The Sample

For this study a new sample of pupils was selected from eight case study schools used in previous stages of the project [1,2]. The sample was chosen according to: pupil perception regarding their enjoyment of designing and making; pupil perception of their personal ability in designing and making; each pupil's predominant cognitive style.

Cognitive (or learning) style has been shown to be intimately related to people's ideas and attitudes [27,28,29]. It has been defined as "... an individual's characteristic and consistent manner of processing and organising what he sees and thinks about" [30]. The perception and evaluation of information are integral to the act of designing. It was considered appropriate, therefore, to utilise the relationship between enjoyment of designing, capability to design and predominant cognitive style in order to choose the sample.

The selection of the sample was made using two data-gathering instruments. These were administered at the end of year 10. Pupils in a mixed ability technology class at each school were asked to fill in a questionnaire (n = 124) during one session and complete a Cognitive Styles Analysis (CSA) Test (n = 115) on a second occasion. Pupil absenteeism gave a final sample size of 112, all of whom had participated in both tests.

The questionnaire assessed the pupil's enjoyment of designing and making and the pupil's perception of their overall ability when using design processes. Specific questions regarding the pupil's conceptual and modelling skill levels whilst designing were also included. The computer-presented, self-administered CSA test designed by Riding in 1991, was used to assess two fundamental cognitive style dimensions: wholist-analytic and verbal-imagery [28]. The wholist-analytic style he explained was concerned with whether an individual tended to process information in wholes or parts, and the verbal-imagery style with whether an individual was inclined to represent information during thinking verbally or in images.

The result from the CSA test showed that there was little difference in the proportion of verbalisers to imagers in the total sample. However, it was interesting to note a gender difference in that there was a ten percent swing towards imagers in the sample of girls and a five percent swing towards verbalisers in the sample of boys. (see Table 1)

PERCENTAGE OF VERBALISERS & IMAGERS IN TOTAL SAMPLE			
Cognitive Style	Boys Percentage	Girls Percentages	Totals
Imagers	47% (40)	56% (15)	49% (55)
Verbalisers	53% (45)	44% (12)	51% (57)
Totals	100% (85)	100% (27)	100% (112)
Table 1			*n = 112*

When the wholist-analytic dimension was added to the equation the results were not as clear cut. There continued to be no significant difference in gender between wholist and analytic verbalisers, although, a gender difference between wholist and analytic imagers was noted. Sixty-seven percent of girls and only forty-five percent of boys were found to be analytic. (see Table 2)

COGNITIVE STYLE DIMENSIONS SAMPLE SPLIT BY GENDER				
	Verbaliser		Imager	
	Boy	Girl	Boy	Girl
Analytic	56% (25)	58% (07)	45% (18)	67% (10)
Wholist	44% (20)	42% (05)	55% (22)	33% (05)
Totals	53% (45)	44% (12)	47% (40)	56% (15)
Table 2				*n = 112*

The results from the pupil questionnaire at the end of year 10 showed that at that time there was no statistically significant gender difference regarding pupils perceived ability or their enjoyment of designing. Although, a significant large number of the total sample believed that they were poor at designing and did not enjoy the activity. Fifty-one percent of the boys and thirty-seven percent of girls were found to be in this category. (see Table 3)

When the data from the CSA test and the data from the question concerning pupils enjoyment of the process were combined, little gender difference was identified between

PUPILS PERCEIVED ENJOYMENT AND CAPABILITY TO ACHIEVE GOOD RESULTS		
	Boys Percentages	Girls Percentages
Enjoyed and achieved	22% (19)	26% (7)
Enjoyed but couldn't achieve	14% (12)	15% (4)
Didn't enjoy but achieved	13% (11)	22% (6)
Didn't enjoy and couldn't achieve	51% (43)	37% (10)
Totals	100% (85)	100% (27)
Individual Column Chi Square	668.750	18.750
P - Value	< .0001	< .0006
Total Chi Square, *P* - value	2.078, *p* = .5564	
Table 3		*n = 112*

verbalisers and imagers. However, when the 'perceived capability' factor was added to the analysis some differences were detected. A significantly large number of boy imagers believed that they were incapable of achieving good results whilst designing ($x^2 = 50.00$, *df = 1*, $p < .0001$) . Girl imagers and both girl and boy verbalisers were evenly split with approximately half of each sample suggesting that they could design successfully and half believing that they could not. (see Table 4)
The combination of questionnaire results and cognitive style dimensions allowed a matrix of eight possible pupil types to be plotted. However, whilst not all pupil types were evident in each school the proportion of boys to girls in the selected sample remained similar to that of the overall sample.(see Table 5 for details.)

PERCEIVED DESIGN ABILITY						
	Verbalisers		Imagers		Totals	
	Boys	Girls	Boys	Girls		
Can	23	5	15	6	49	44%
Cannot	22	7	25	9	63	56%
Totals	45	12	40	15	112	100%
Chi Square	.500	2.000	50.000	4.500	98.000	
p - Value	.9590	.3146	<.0001	.0678	<.0001	
Table 4						*n = 112*

Methodology - The study

A case study approach was used to monitor the chosen sample (n = 50). Pupil progress throughout the designing and making of a GCSE examination project during year 11 was tracked on a fortnightly basis. Notes, sketches and diagrams were made on observation sheets during each visit. These sheets recorded the following aspects of the project work: the progress made by each pupil between the visits; the research, design and manufacturing methods utilised; the style of communication and modelling used throughout the project; all difficulties encountered, both those referred to by the pupil and those observed during the visit. Copies of all teacher handouts concerned with major projects were also collected. During the visits informal interviews were conducted with both the teachers and the pupils.

TABLE SHOWING COGNITIVE STYLE OF FINAL SAMPLE									
	Imagers				Verbalisers				Categories
School Code	A	B	C	D	E	F	G	H	
007- *I*	-	*Abo*	*Agx*	*Abo*	*Abx*	*Wgx*	*Abx*	*Wgo*	A = Imagers who enjoy designing and believe can design B = Imagers who enjoy designing but believe cannot design C = Imagers who prefer making but believe can design D = Imagers who prefer making and believe cannot design E = Verbalisers who enjoy designing and believe can design F = Verbalisers who enjoy designing but believe cannot design G = Verbalisers who prefer making but believe can design H = Verbalisers who prefer making and believe cannot design
021 - *I*	*Whx*	-	*Abo*	*Wbo*	*Agx*	*Wgo*	*Wgo*	-	
031 - *C*	-	-	*Wbx*	*Wbo*	*Abx*	*Wbo*	*Abx*	*Wbo*	
032 - *C*	*Wgx*	-	*Abx*	*Wbo*	-	*Abx*	*Abx*	*Abo*	
035 - *I*	-	*Wbo*	*Abo*	*Ago*	-	*Abo*	*Wgx*	*Ago*	
036 - *C*	*Wgx*	*Abx*	-	*Abo*	-	*Wbx*	*Abx*	*Ago*	W = Wholist A = Analyst *I* = Interventionist *C* = Collaborative *x* = Complete project *o* = Unfinished project *b* = Boy *g* = Girl
047 - *I*	*Wbo*	*Abx*	*Wbo*	*Wbo*	*Abx*	-	*Abx*	*Abo*	
049 - *I*	*Agx*	-	*Abx*	*Abo*	*Abo*	-	*Agx*	*Wbo*	
Table 5									*n = 50*

Delivery programmes

Delivery programmes were devised by each technology team to enable pupils to cover all the GCSE syllabus requirements. These took into account resources, staff specialisms, time tabling restrictions, and whether Information Technology was to be examined as part of a GCSE examination, or assessed only to meet NC requirements. The programmes were also designed to give parity of time to units of work carried out by different teaching groups.

The delivery programmes adopted fell into three categories. Type one (n = 2), devoted all of the technology lessons every week to completing one aspect of the syllabus before moving on to the next unit of work. Type two (n = 3), split the technology time each week equally between Core and Extension work. Type three (n = 3), integrated the Core and Extension work, devoting the majority of time in year 11 to a single project.

The total number of hours of timetabled time allocated to the major project varied only slightly from school to school, all schools having followed closely the examination boards recommendations. However, the actual amount of time used for major project work varied greatly from pupil to pupil. The differences could be accounted for by the amount of 'extra' time pupils were willing to spend on their projects both at home and in school.

Project deadlines were managed differently in each school. Some schools displayed all the necessary completion dates at the beginning of the academic year, whilst in others project deadlines were not referred to until hand-in dates were imminent. Evidence from the study would suggest that these differences, when combined with the teaching strategies adopted by the schools, did have an effect upon the pupil's ability to manage their project work.

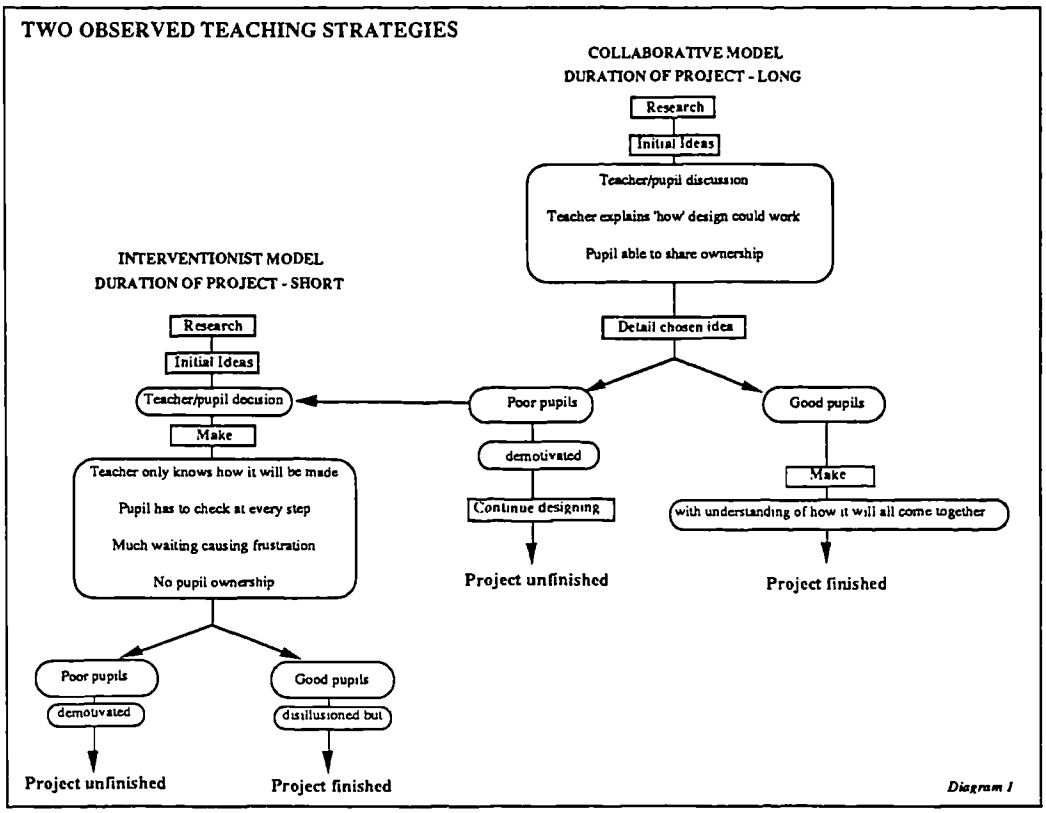
Approaches to designing adopted in relation to the observed teaching strategies

Through observation of approaches to designing adopted by the pupils it was apparent that teachers utilised one of two strategies to enable their pupils to meet deadlines and address the Examination Board's assessment criteria. Analysis of the two approaches suggested that in one the teacher tended to act as a collaborator, whilst in the other a more interventionist mode of teaching was adopted. (see Diagram 1.) The 'collaborative' model was found only in schools where the delivery programme supported an extended time allocation for the major project, whilst the 'interventionist' model was generally observed in schools where the major project was completed over a relatively short period of time.

No matter which teaching strategy was adopted the start of the projects followed a similar pattern. Examination Boards suggested contexts and pupils identified their own opportunity or need to address. This gave the pupils ownership of their projects at this stage of the process. This freedom to choose their own project was identified as an important factor in pupils enjoyment of key stage 4 in earlier phases of the research [1,2]. Teachers then discussed examination criteria, and work was begun on briefs, specifications, analysis of the chosen brief and research. Observation of the sample indicated that girls enjoyed this aspect of the project more than the boys which would support the APU findings of 1991 [6]. The girls tended to feel safe working within the reflective, evaluative research and analysis phase whilst the majority of the boys were looking forward, past the design activity, to the manufacturing period ahead.

At the initial ideas stage of the project all schools encouraged pupils to formulate several ideas to meet the requirements of the brief. The amount of time allocated to this aspect of the work varied considerably depending upon which delivery programme had been adopted by the school. In some schools early ideas were a series of hurried sketches whilst in others a number of sheets were presented with re-worked drawings and carefully prepared written notes. Very few boys and even fewer girls were concerned at this stage with the intricacies of how their ideas could be made to work, or constructional details of how they could be made.

Atkinson 2.1



Once initial ideas had been drawn, the next observed stage was for the pupil to choose which idea to develop. This was normally carried out with the teacher's assistance. Through a combination of observation and discussion five separate factors were identified that influenced the advice teacher's gave to the pupils: the teacher's personal technological capabilities; their understanding of how each different idea could or could not be manufactured given the school resources; the amount of time available; the teacher's knowledge of the pupil's manufacturing capability; the teacher's personal vision of what they believed was represented on the pupils design sheet.

Interventionist Model

It was at this point in the process that the important differences between the two teacher strategies became evident. In the 'interventionist' approach, where speed was crucial, pupils tended to move very quickly from initial ideas to the manufacturing stage. Very few pupils produced carefully detailed drawings: development of the chosen idea was carried out as manufacturing took place. Ill defined, but often in the context of the pupils existing technological or constructional understanding, adventurous ideas meant that pupils were working in areas which were beyond their technological capability. It was at this point that these pupils lost ownership of their idea. Decisions were made in a piecemeal, interventionist, manner by the teacher. This resulted in pupils having to rely heavily upon the teacher during the manufacturing stage of the process. Often, even capable pupils were unable to take the next step on their own due to the nature of the design process adopted. Teachers became overburdened and frustrated by pupils needing their help.

It was also during this stage that a difference was noted between the reaction of boys and girls to the 'interventionist' model. Girls tended to cope with the lack of ownership of their idea. They did not expect to understand how to tackle the constructional or technical facets of their project. They expected to be shown how to turn their ideas into reality. The more able girls saw the project as a learning experience or, were able to accept it as a necessary part of their GCSE examination in which they

wished to do well. In order to make the necessary progress they tended to make use of extra sessions through out the manufacturing stage of the project. This they saw as an opportunity to obtain more individual attention from their teacher.

The less motivated girls, on the other hand, became disillusioned by their lack of progress, rarely taking advantage of the extra sessions provided. During lesson times they tended to turn their attention to their design folder in order to try to meet the examination criteria as best they could.

pupils failed to finish their projects by the given deadline. This applied to sixty-seven percent of the boys and sixty-four percent of the girls.(see Table 6) In some schools no extra time was given to complete the deficient aspects of the project, whilst in others pupils were given the opportunity to continue working on them in their own time. Out of this group those who were motivated continued with their projects, although as a number of pupils said "...only because it is for the examination".

TABLE SHOWING PERCENTAGE OF COMPLETED PROJECTS BY GENDER

	Interventionist Model		Collaborative Model	
	Boys	Girls	Boys	Girls
Complete	33% (7)	36% (4)	60% (9)	67% (2)
Unfinished	67% (14)	64% (7)	40% (6)	33% (1)
Total	100% (21)	100% (11)	100% (15)	100% (3)

Table 6 *n = 50*

In contrast all boys tended to became frustrated with their inability to make progress. The less able boys seemed to become resigned to the situation, making less and less effort as time slipped by. The majority of the more able boys became very impatient. They found it difficult to cope with their lack of control when they were unable to solve manufacturing or technical problems for themselves. One boy expressed the feelings of many when he said "I am sick of waiting for my turn; I just don't know what to do next". Those who were highly motivated did make progress by attending extra sessions when, like the girls, the teacher could give them more individual attention. Others turned to their peers to see how they had completed tasks. Some simplified their ideas until they no longer became a challenge or a learning experience. Many made and re-made pieces of their project, altering their designs to fit their mistakes.

In schools adopting the 'interventionist' model a disappointingly large number of

Collaborative Model

In schools where teachers exhibited what has been defined as the 'collaborative' model, a pupil's lack of time management skills were not seen as a problem in the early stages of the project. Time could be given to individual pupil-teacher discussions. Both boys and girls benefited from this situation. Sketches were often used by the teacher when un-clear communication of pupil ideas needed exploring. Detailing of the chosen idea became a collaborative effort between pupil and teacher, with pupils still feeling that they had ownership of their idea. With the help of their teacher they produced carefully detailed drawings which they used in order to make their products.

The majority of those who succeeded in reaching the manufacturing stage of their project were able to complete their work in time for assessment. In the case of the boys, this they achieved with minimum intervention from the teacher. Those pupils who lacked

this they achieved with minimum intervention from the teacher. Those pupils who lacked the expertise to realise their products were able to make the necessary progress in collaboration with their teacher. However, when the initial deadline for completion of the projects arrived there were still thirty-nine percent of the sample who failed to finish. For these pupils the problems associated with this model came about through boredom. From a fairly early stage many pupils, particularly the boys and the less able girls, saw the design process stretching interminably ahead of them. The need for interim goals in long term projects [31] was not addressed. The manufacturing stage which they looked forward to seemed an impossible target to reach. This caused a noticeable slowing down of work rates that only exacerbated the situation. Deadlines came and went.

For some of these pupils, usually those who were disruptive, the teacher moved from the 'collaborative' to 'interventionist' model believing that once involved in making the pupil's interest would be rekindled. However, as has already been pointed out, the 'interventionist' model was rarely successful at the manufacturing stage of the process, with the teacher's availability at each step being essential for the maintenance of the pupil's progress. With large class sizes, and the teachers understandable wish to help the motivated pupils, this was usually impossible, causing these pupils to become even more frustrated.

Outcomes

In the context of this research 'outcomes' have been classified as either, the product or the GCSE result. With regard to the product, a disappointingly small number of well designed, well made products were completed by the total sample. ($x^2 = 800.00$, $df = 1$, $p < .0001$). No pupil working with a teacher who had adopted an 'interventionist' approach to designing was found to be in this category. Analysis of the data showed that only thirty-eight percent of those pupils in schools where a 'collaborative' approach had been adopted managed to complete their projects by the initial deadline, and only thirty-four percent of pupils in 'interventionist' schools (see Table 5).

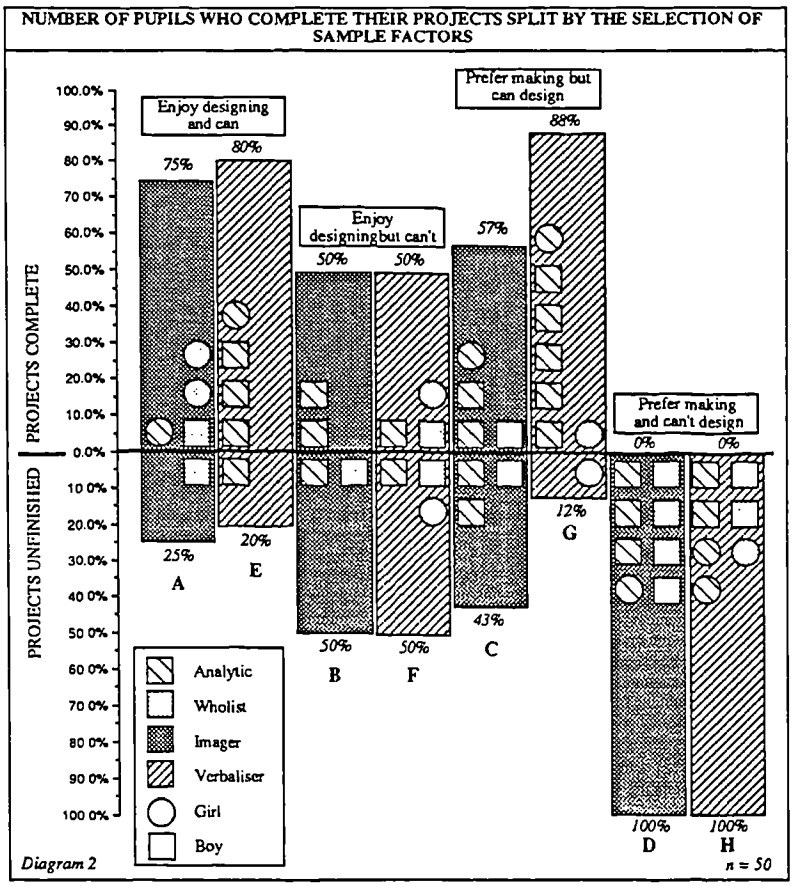
When the result of completion or non-completion of projects was correlated with the data referred to in Table 5, interesting clusters were observed (see Diagram 2). Those pupils who believed that they could design had more chance of completing the whole project than those who believed they could not design. Many of those who enjoyed designing more than making but believed that they had poor design ability were also unable to meet the project deadline.

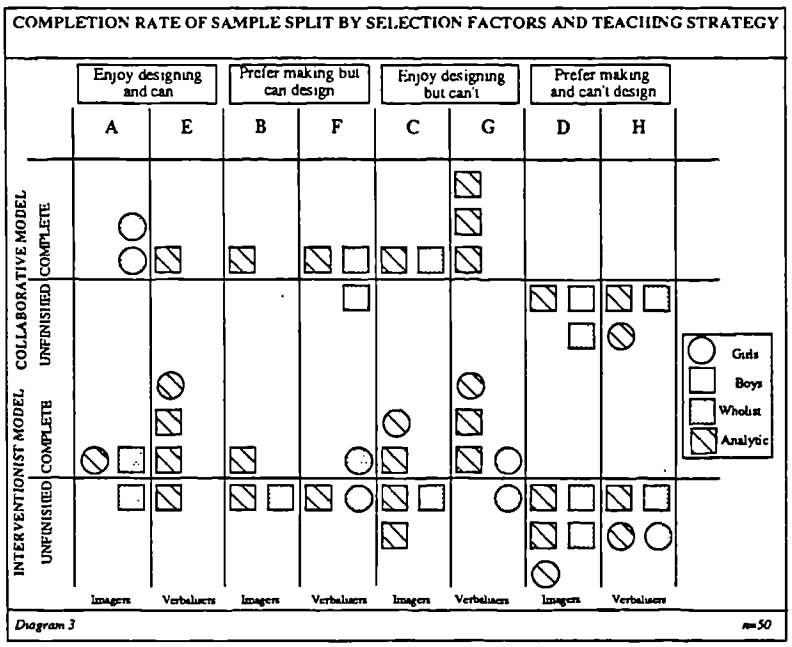
When the same data was analysed using cognitive style as a starting point, a high proportion of analytic-verbalisers were found within the group of pupils who believed that they could design, whether they enjoyed designing or preferred making. Verbalisers were found to have an equal, and in several instances, better completion rate than imagers. Whilst it was also noted that one hundred percent of those who preferred making and believed they could not design failed to complete their projects, whether they were, verbalisers or imagers. When the data in question was analysed using collaborative-interventionist groupings, some interesting clusters were observed (see Diagram 3). Once Groups D and H were removed from the equation (these scores skewed the results because of the 100% failure to complete rate of both these groups) analysis showed that ninety-two percent of the remaining pupils in schools that had adopted a 'collaborative' approach to designing and only fifty-six percent of pupils in schools that had adopted an 'interventionist' approach finished their projects by the initial deadline.

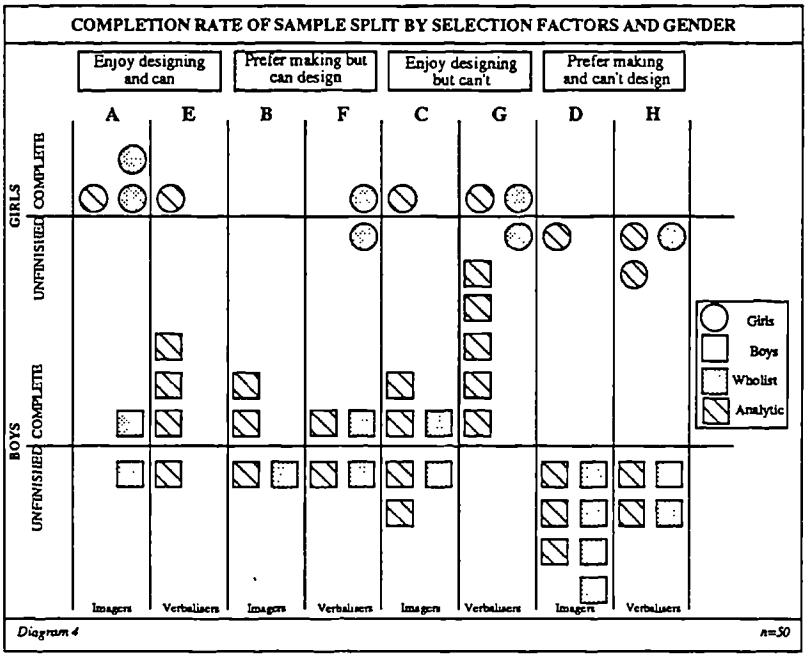
When the data was looked at from a gender perspective the numbers involved were too small for statistical analysis although some interesting differences can be seen in Diagram 4. Further statistical analysis of gender differences will need to wait until that data concerning completion of the projects has been collected from the original sample of 112 pupils.

As far as design folders from the total sample were concerned very few were completed without considerable pressure having been applied by the teachers. Motivated girls and boys in all schools were persuaded to re-work

2.1 Atkinson


NUMBER OF PUPILS WHO COMPLETE THEIR PROJECTS SPLIT BY THE SELECTION OF SAMPLE FACTORS
PROJECTS COMPLETE
PROJECTS UNFINISHED
Enjoy designing and can
Enjoy designing but can't
Prefer making but can design
Prefer making and can't design
75%
80%
50%
50%
57%
88%
0%
0%
25%
A
20%
E
50%
B
50%
F
43%
C
12%
G
100%
D
100%
H
Analytic
Wholist
Imager
Verbaliser
Girl
Boy
Diagram 2
n = 50


COMPLETION RATE OF SAMPLE SPLIT BY SELECTION FACTORS AND TEACHING STRATEGY
Enjoy designing and can
Prefer making but can design
Enjoy designing but can't
Prefer making and can't design
A
E
B
F
C
G
D
H
COLLABORATIVE MODEL
INTERVENTIONIST MODEL
COMPLETE
UNFINISHED
Girls
Boys
Wholist
Analytic
Imagers
Verbalisers
Diagram 3
n=50



or 'pretty-up' existing work and fill gaps in their design process. The limited time spent on the folder work in the 'interventionist' model meant that the folders, of even those who believed that they could design, presented little evidence of designerly thought at the various stages of the process. In an attempt to present the required evidence for assessment, pupils were encouraged to complete written sections describing their decision making procedures. This was often carried out retrospectively when pupils were pulling their design folders together.

The design work of those working in schools where a 'collaborative' approach had been adopted displayed two different levels of success within the folders. Those who enjoyed the act of designing produced visually excellent folders which contained creative thinking but also a considerable amount of re-worked and over-worked sheets. Those who did not enjoy designing produced numerous sheets of work attempting to satisfy the examination criteria but showing little evidence of designerly thought.

Sadly, when interviewed on completion of their projects, the great majority of the total sample were confused and dissatisfied with the design process they had used in their examination, seeing little point in the paper work they had had to produce.

The majority of girls and boys who reached the manufacturing stage, produced products which displayed a lack of craftsmanship or fitness for purpose. Summative evaluations, although tackled by most of the pupils, were hastily carried out. For those who had only tackled the design work they were often meaningless and only completed in order to gain marks. Even the evaluations of those pupils who had reached the manufacturing stage were often superficial. This was largely due to the un-finished or unsatisfactory nature of the products themselves and the lack of time or thought that was given to this aspect of the work.

As far as evidence to support conclusions regarding the GCSE outcome is concerned, answers to a summative questionnaire elicited a positive response from the pupils. Eighty-six percent of pupils were pleased with the results of their project for the examination ($x^2 = 312.500$, $df = 1$, $p < .0001$). However, it should be noted that, neither internal marking nor final examination marks are yet available to support or refute the pupils belief in their own ability to meet the GCSE assessment criteria.

Conclusion

The preliminary findings from the study concerned with the approaches to designing adopted by Year 11 pupils would suggest that the delivery programmes and strategies adopted by a school can have an overriding influence upon a pupil's capability to design and make. Analysis of the three delivery programmes and two strategies adopted by the schools, indicate that neither the 'collaborative' or the 'interventionist' teacher model allow pupils to develop entirely valid approaches to designing. The nature and speed of the process in schools utilising 'interventionist' approaches does not allow for the development and detailing of creative, innovative ideas. On the other hand the slowness of the process, particularly at the design stage, in schools adopting a 'collaborative' model has caused pupils to become overly concerned with the process at the expense of well designed outcomes.

Analysis of the data collected would suggest that gender and pupil type do affect how successfully pupils are able to tackle project work in Year 11. The study has also indicated that the nature of project work at Key Stage 4 has caused many pupils, both boys and girls, to work beyond their technological capability. In an attempt to support all pupils throughout their projects teachers have developed a strategy that has encouraged them to design solutions to pupils problems in their minds, as the need has arisen. The necessity for pupils to have an understanding of the way forward in their projects has been given a low priority. However well intentioned this course of action may be, the evidence from this study would suggest that it has had a de-motivating effect upon many of the boys and some of the girls. The common belief that ownership develops a sense of responsibility, pride, and the motivation to succeed would support the use of strategies that allow pupils, both boys and girls to retain ownership of their idea throughout the project. This, in turn, may help to produce well designed products and examination results of which pupils, parents and teachers can be proud.

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COVENTRY UNIVERSITY 10 - 11 July 1995

APPROACHES TO DESIGNING AT KEY STAGE 4

E Stephanie Atkinson

Abstract

This paper reports the preliminary findings of an investigation concerned with the approaches to designing adopted by year 11 pupils. The study involved fifty pupils and their teachers engaged in major project work, undertaken as part of a GCSE Technology examination. The research is focused on eight case study schools and forms part of an on-going programme involving fifty schools selected from seven Local Education Authorities in the North East of England.

Six pupils were selected from each of the eight schools according to three criteria: pupil perception regarding their enjoyment of designing and making; pupil perception of their personal ability in designing and making; each pupil's predominant cognitive style. Two data-gathering instruments were used. A questionnaire was completed at the end of Year 10 by all the pupils in a mixed ability technology class from each school *(n =112)*. This assessed the pupil's perceived capability and enjoyment of designing and making. At the same time, each pupil carried out a computer-presented, self-administered Cognitive Styles Analysis (CSA) designed to assess two fundamental cognitive style dimensions: verbal-imagery and wholist-analytic. A case study approach based on observation was then used to chart the sample's *(n = 50)* progress in designing and making during the course of their major projects. In addition, informal interviews were conducted at regular intervals with both the teachers and the pupils.

The paper considers the delivery programmes utilised by each school. Two main strategies that were adopted by teachers to enable pupils to meet deadlines and address the Examination Board's assessment criteria are identified. The effect that these strategies had upon the pupils motivation, their understanding of the design process and the outcomes that were produced for assessment are discussed and some preliminary conclusions are highlighted.

The author is in the Education Department of the University of Sunderland.

Methodology - The Sample

For this study a new sample of pupils was selected from eight case study schools used in previous stages of the project [1,2]. The sample was chosen according to: pupil perception regarding their enjoyment of designing and making; pupil perception of their personal ability in designing and making; each pupil's predominant cognitive style.

Cognitive (or learning) style has been shown to be intimately related to people's ideas and attitudes [20,21,22]. It has been defined as *"... an individual's characteristic and consistent manner of processing and organising what he sees and thinks about"* [23]. The perception and evaluation of information are integral to the act of designing. It was therefore considered appropriate to utilise the relationship between capability to design and predominant cognitive style in order to choose the sample.

The selection of the sample was made using two data-gathering instruments. These were administered at the end of Year 10. Pupils in a mixed ability technology class at each school were asked to fill in a questionnaire *(n = 124)* during one session and complete a Cognitive Styles Analysis (CSA) Test *(n = 115)* on a second occasion. Pupil absenteeism gave a final sample size of 112, all of whom had participated in both tests.

The questionnaire assessed the pupil's enjoyment of designing and making and the pupil's perception of their overall ability when using design processes. Specific questions regarding the pupil's conceptual and modelling skill levels whilst designing were also included. The computer-presented, self-administered CSA test designed by Riding in 1991, was used to assess two fundamental cognitive style dimensions: verbal-imagery and wholist-analytic.

The combination of questionnaire results and cognitive style dimensions allowed a matrix of eight possible pupil types to be plotted. However, not all pupil types were evident in each school (*Table 1*).

TABLE SHOWING COGNITIVE STYLE OF FINAL SAMPLE

	Imagers				Verbalisers				
School Code	A	B	C	D	E	F	G	H	Categories
007	-	A	A	A	A	W	A	W	
021	W	-	A	W	A	W	W	-	A = Imagers who enjoy designing and believe can design B = Imagers who enjoy designing but believe cannot design C = Imagers who prefer making but believe can design D = Imagers who prefer making and believe cannot design E = Verbalisers who enjoy designing and believe can design F = Verbalisers who enjoy designing but believe cannot design G = Verbalisers who prefer making but believe can design H = Verbalisers who prefer making and believe cannot design
031	-	-	W	W	A	W	A	W	
032	W	-	A	W	-	A	A	A	
035	-	W	A	A	-	A	W	A	
036	W	A	-	A	-	W	A	A	
047	W	A	W	W	A	-	A	A	W = Wholist A = Analyst
049	A	-	A	A	A	-	A	W	

Table 1 *n = 50*

Methodology - The study

A case study approach was used to monitor the chosen sample *(n = 50)*. Pupil progress throughout the designing and making of a GCSE examination project during Year 11 was tracked on a fortnightly basis. Notes, sketches and diagrams were made on observation sheets during each visit. These sheets recorded the following aspects of the project work: the progress made by each pupil between the visits; the research, design and manufacturing methods utilised; the style of communication and modelling used throughout the project; all difficulties encountered, both those referred to by the pupil and those observed during the visit. Copies of all teacher handouts concerned with major projects were also collected. During the visits informal interviews were conducted with both the teachers and the pupils. In addition photographs were taken of a selection of final artifacts and design sheets in order to illustrate specific points.

Delivery programmes

Delivery programmes were devised by each technology team to enable pupils to cover all the GCSE syllabus requirements. These took into account resources, staff specialisms, timetabling restrictions, and whether Information Technology was to be examined as part of a GCSE examination, or assessed only to meet NC requirements. The programmes were also designed to give parity of time to units of work carried out by different teaching groups.

The delivery programmes adopted fell into three categories. Type one *(n = 2)*, devoted all of the technology lessons every week to completing one aspect of the syllabus before moving on to the next unit of work. Type two *(n = 3)*, split the technology time each week equally between Core and Extension work. Type three *(n = 3)*, integrated the Core and Extension work, devoting the majority of time in year 11 to a single project.

The total hourage of timetabled time allocated to the major project varied only slightly from school to school, all schools having followed closely the examination boards recommendations. However, the actual amount of time used for major project work varied greatly from pupil to pupil. The differences could be accounted for by the amount of 'extra' time pupils were willing to spend on their projects both at home and at school.

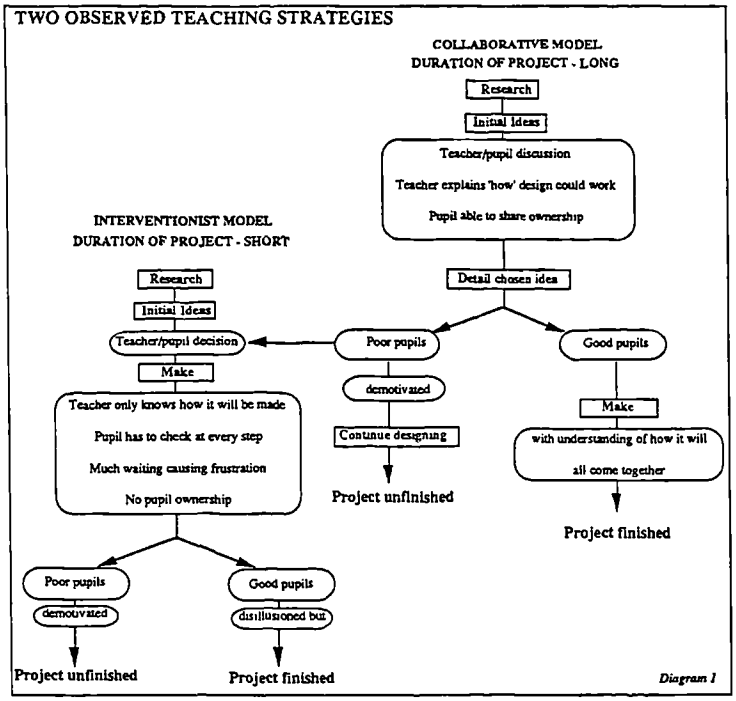
Project deadlines were managed differently in each school. Some schools displayed all the necessary completion dates at the beginning of the academic year, whilst in others project deadlines were not referred to until hand-in dates were imminent. Two schools published deadlines but planned for 'unpublished' extra time to allow pupils to complete the anticipated un-finished work. Two other schools who finished projects at the end of the autumn term expected pupils to use their own time to complete the un-finished stages of the project throughout the spring term. Evidence from the study would suggest that these differences, when combined with the teaching strategies adopted by the schools, did have an effect upon the pupil's ability to manage their project work.

Approaches to designing adopted in relation to the observed teaching strategies.

Through observation of approaches to designing adopted by the pupils it was apparent that teachers utilised one of two strategies to enable their pupils to meet deadlines and address the Examination Board's assessment criteria. Analysis of the two approaches suggested that in one the teacher tended to act as a collaborator, whilst in the other a more interventionist mode of teaching was adopted (see *Diagram 1*). The 'collaborative' model was only found in schools where the delivery programme supported an extended time allocation for the major project, whilst the 'interventionist' model was generally observed in schools where the major project was completed over a relatively short period of time.

No matter which teaching strategy was adopted the start of the projects followed a similar pattern Examination Boards suggested contexts and pupils identified their own opportunities or need to address. This gave the pupils ownership of their projects at this stage of the process Teachers discussed examination criteria, then work was begun on briefs, specifications, analysi of the chosen brief and research.

At the initial ideas stage of the project all schools encouraged pupils to formulate several ideas to meet the requirements of the brief. The amount of time allocated to this aspect of the work varied considerably depending upon which delivery programme had been adopted by the school In some schools early ideas were a series of hurried sketches whilst in others a number of sheets were presented with re-worked drawings and carefully prepared written notes



Once initial ideas had been drawn, the next observed stage was for the pupil to choose which idea to develop. This was normally carried out with the teacher's assistance. Through a combination of observation and discussion five separate factors were identified that influenced the advise teacher's gave to the pupils: the teachers personal technological capabilities; their understanding of how each different idea could or could not be manufactured given the school resources; the amount of time available; the teacher's knowledge of the pupil's manufacturing capability; the teacher's personal vision of what they believed was represented on the pupils design sheet.

It was at this point in the process that the important differences between the two teacher strategies became evident. In the 'interventionist' model, where speed was crucial, pupils tended to move very quickly from initial ideas to the manufacturing stage. Very few pupils produced carefully detailed drawings: development of the chosen idea was carried out as manufacturing took place. Decisions were made in a piecemeal, interventionist, manner by the teacher. It was at this point that these pupils lost ownership of their idea. This resulted in them having to rely heavily upon the teacher during the manufacturing stage of the process. Often, even capable pupils were unable to take the next step on their own due to the nature of the design process adopted. Teachers became overburdened with pupils needing their help. This in turn led to understandable impatience and frustration by many of the pupils and most of the teachers. One pupil expressed the feelings of many when he said *"I am sick of waiting for my turn; I just don't know what to do next"*.

Those who were highly motivated made progress by attending extra sessions at lunch time and after school when the teacher could give them more individual attention. Other pupils turned to their peers to see how they had completed tasks. Many pupils made and re-made pieces of their project, altering their designs to fit their mistakes. A disappointingly large number of pupils failed to finish their projects by the given deadline. This applied to fifty-six percent of the sample (see *Table 2*).

TABLE SHOWING NUMBER OF PROJECTS COMPLETED BY THE DEADLINE					
Interventionist Model			Collaborative Model		
School	Complete	Unfinished	School	Complete	Unfinished
007	5	2	031	3	3
021	2	4	032	4	2
035	1	5	036	4	2
047	3	4			
049	0	6			
Total	11	21		11	7
Table 2					*n = 50*

In schools where teachers exhibited what has been defined as the 'collaborative' model, a pupil's lack of time management skills were not seen as a problem in the early stages of the project. Time could be given to individual pupil-teacher discussions. Sketches were often used by the teacher when un-clear communication of pupil ideas were explored. Detailing of the chosen idea became a collaborative effort between pupil and teacher, with pupils still feeling that they had ownership of their idea. With the help of their teacher they produced carefully detailed drawings which they used in order to make their products.

The majority of those who succeeded in reaching the manufacturing stage of their project were able, to complete their work in time for assessment. This they achieved with minimum intervention from the teacher. However, there were still thirty-nine percent of the sample who failed to finish their projects by the initial deadline. For these pupils the problems associated with this model came about through boredom. From a fairly early stage many pupils saw the design process stretching interminably ahead of them. The manufacturing stage which they looked forward to seemed an impossible target to reach. This caused a noticeable slowing down of work rates that only exacerbated the situation. Deadlines came and went.

For some of these pupils, usually those who were disruptive, the teacher moved from the 'collaborative' to 'interventionist' model believing that once involved in making the pupil's interest would be rekindled. However, as has already been pointed out, the 'interventionist' model was rarely successful at the manufacturing stage of the process, with the teacher's availability at each step being essential for the maintenance of the pupil's progress. With large class sizes this was usually impossible, causing these pupils to become even more frustrated.

Outcomes

In the context of this research 'outcomes' have been classified as either, the product or the GCSE result. With regard to the product, a disappointingly small number of well designed, well made products were completed by the total sample ($x^2 = 800.00, df = 1, p < .0001$). No pupil working with a teacher who had adopted an 'interventionist' approach to designing was found to be in this category.

Analysis of the data showed that only thirty-eight percent of those pupils in schools where a 'collaborative' approach had been adopted managed to complete their projects by the initial deadline, and only thirty-four percent of pupils in 'interventionist' schools finished on time (see *Table 2).*

Very few design folders in the total sample were completed without considerable pressure having been applied by the teachers. Pupils in all schools were persuaded to re-work or 'pretty-up' existing sheets and fill gaps in their design process. The limited time spent on the folder work in the 'interventionist' model meant that the folders, of even those who believed that they could design, presented little evidence of designerly thought at the various stages of the process. In an attempt to present the required evidence for assessment, pupils were encouraged to complete written sections describing their decision making procedures. This was often carried out retrospectively when pupils were pulling their design folders together.

The design work of those working in schools where a 'collaborative' approach had been adopted displayed two different levels of success within the folders. Those who enjoyed the act of designing produced visually excellent folders which contained creative thinking but also a considerable amount of re-worked and over-worked sheets. Those who did not enjoy designing produced numerous sheets of work attempting to satisfy the examination criteria but showing little evidence of designerly thought. Sadly, when interviewed on completion of their projects, the great majority of the pupils were confused and dissatisfied with the design process they had used in their examination, seeing little point in the paper work they had had to produce.

The majority of those who reached the manufacturing stage, produced products which displayed a lack of craftsmanship or fitness for purpose. Evaluations, although tackled by most of the pupils, were hastily carried out. For those who had only tackled the design work they were often meaningless and only completed in order to gain further marks. Even the evaluations of those pupils who had reached the manufacturing stage were often superficial. This was largely due to the un-finished or unsatisfactory nature of the products themselves and the lack of time or thought that was given to this aspect of the work.

As far as evidence to support conclusions regarding the GCSE outcome is concerned answers to a summative questionnaire elicited a positive response from the pupils. Eighty-six percent of pupils were pleased with the results of their project for the examination ($x^2 = 312.500$, $df = 1$, $p < .0001$). However it should be noted that, neither internal marking nor final examination marks are yet available to support or refute the pupils belief in their own ability to meet the GCSE assessment criteria.

Conclusion

The preliminary findings from the study concerned with the approaches to designing adopted by Year 11 pupils would suggest that the delivery programmes and strategies adopted by a school can have an overriding influence upon a pupil's capability to design and make. Analysis of the three delivery programmes and two strategies adopted by the schools, indicate that neither the 'collaborative' or the 'interventionist' teacher model allow pupils to develop entirely valid approaches to designing. The nature and speed of the process in schools utilising 'interventionist' approaches does not allow for the development and detailing of creative, innovative ideas. On the other hand the slowness of teh process, particularly at the design stage, in schools adopting a 'collaborative' model has caused pupils to become overly concerned with the process at the expense of creative outcomes.

The study has also indicated that the nature of project work at Key Stage 4 has caused many pupils to work beyond their technological capability. In an attempt to support all pupils throughout their

projects teachers have developed a strategy that encouraged them to design solutions to pupils problems in their minds, as the need has arisen. The necessity for pupils to have an understanding of the way forward in their projects has been given a low priority. However well intentioned this course of action may be, the evidence from this study would suggest that it has had a de-motivating effect upon many of the pupils. The common belief that ownership develops a sense of responsibility, pride, and the motivation to succeed would support the use of strategies that allow pupils to retain ownership of their idea throughout the project. This, in turn may help to produce well designed products and examination results of which pupils, parents and teachers could be proud.

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KEY FACTORS INFLUENCING THE QUALITY OF PUPIL PERFORMANCE WHEN ENGAGED IN DESIGNING AND MAKING ACTIVITIES AT KEY STAGE 4

E Stephanie Atkinson
University of Sunderland

Introduction

This paper sets out to report the research findings concerned with the influence of selected key factors on the quality of performance in technology project work produced by secondary school pupils during key stage 4. The research programme has focused on eight case study schools selected from an initial study involving fifty schools taken from seven Local Education Authorities in the North East of England. Data gathering instruments have included: observation of project work; questionnaires; a creativity test; a cognitive style test; a goal orientation test; semi-structured and informal interviews with both pupils and teachers and the examination marks for the project work concerned. The data was collected over a period of two years.

Background

In schools in the United Kingdom technology involves a complex integration of processes, concepts, knowledge and skills [1]. As the subject area has developed so has the use of the design process as a method of delivering and examining subject content (for example: [2,3,4]). These processes have developed out of the linear design models used in the early 1960's [4]. As teachers have become more experienced in working with them and as the subtlety of the process has become more apparent, so the models have become increasingly complex. By the end of the 1980's many models of the process had been developed [5]. It was acknowledged that some models became so complex that they were confusing to those who used them [4]. In 1986 the Department for Education and Science suggested that what was needed was a loose framework to guide designing rather than a well defined process model which they saw as a *"straitjacket"*. This approach was supported by Lawson [6] who stressed that designing required flexible procedures.

However, the importance of the examination results to pupils and teachers alike dictate that the nature of assessment and its criteria influence what is learnt and how it is taught [7,8]. Additionally, the need for accountability has led assessment to become overly objective [9]. As far as examination syllabuses have been concerned, this has lead to the use of a prescriptive design process with a very specific list of criteria to be met. Layton [5] aptly suggested that if teachers were not careful the process could impose *"a procrustean regime"* on the way pupils designed. Pupils have become 'outcome driven', with the process becoming a series of products. To obtain good examination grades pupils have had to provide evidence that each stage of the specified process has been addressed, irrespective of whether it was appropriate to the design of their particular product or not.

In addition to the approach taken to designing, research has indicated that a complex pattern of factors affect a pupil's performance and learning during design and technology project work [4,10,11,12]. There are those attributes that a pupil brings with them: their gender; general ability; creative ability; cognitive style; knowledge base; curriculum experience - and the attributes of the task itself: its contextual location; its structure; its likely demands upon the pupil. In the context of design and technology the complex relationship between all these factors and such external forces as culture, context, parental and teacher expectations cannot be underestimated. Nor can the effect of attitude upon motivation be ignored [13].

The Study - Phase One

The first year's sample was composed of the entire cohort of pupils taking Design and Realisation (D&R) in each of the case study schools. A total of 179 pupils, 153 boys and 26 girls, completed a questionnaire which provided information relating to the pupils perceptions in connection with a number of aspects of D&R and the content of the courses which they had tackled.

ENJOYMENT OF TECHNOLOGY	
	No. of Pupils
Enjoyed Technology in yrs 7-9	45
Enjoyed both equally	46
Enjoyed Technology in yrs 10-11	88**
** *p = <0.001*	
Table 1	*n=179*

Enjoyment of project work was considered to be a possible motivating factor that could affect performance levels [14]. It therefore seemed appropriate that pupils should be asked to compare their enjoyment of design and technology in years 7 - 9 with their enjoyment of their GCSE D&R Course. As can be seen from *Table 1* a significant number of pupils enjoyed the subject more during years 10 and 11. The nature of the projects was cited by both those who preferred the work they had done during years 7 - 9 and those who preferred years 10 and 11. Many of the latter group suggested that the freedom to choose projects was an important factor in contributing to their enjoyment.

THE EFFECT OF BOREDOM ON COMPLETION RATE OF PROJECTS						
	Not Bored			Bored		
	T	b	g	T	b	g
Complete	23	18	5	49	35	14**
Incomplete	15	15	0	92**	85**	7
Totals	38	33	5	141	120	21
					** *p* = <0.001	
Table 2						*n=179*

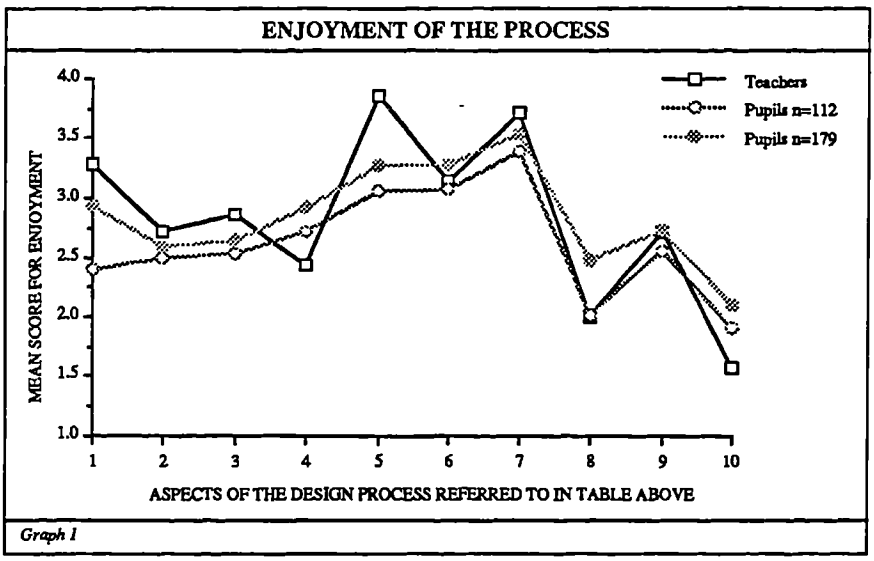
The researcher also wished to establish whether there was a relationship between boredom with project work and project completion rates. Analysis of the results did support this supposition *(Table 2)*. A large number of pupils of both sexes were found to be bored with their technology project work although there was a significant gender difference when it came to the numbers of pupils who finished their projects. Seventy-three percent of girls finished all their projects whilst only thirty-five percent of boys finished theirs.

The other major area of research addressed by the questionnaire concerned the various aspects of the design process that pupils tackled in order to complete each of their projects. Analysis of the data regarding the rank order in which pupils placed their enjoyment of researching, designing, making and evaluating supported the widely held belief that making was the most popular aspect of project work and evaluating was the area that pupils enjoyed the least *(Table 3)*.

POPULARITY OF ASPECTS OF THE DESIGN PROCESS 1993								
	Pupil selection of Rank Order				Ranked Data			
Aspects of the process	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Research	8	37	98	36	4	2	1**	3
Design	25	126	21	7	2	1**	3	4
Make	157	8	10	4	1**	3	2	4
Evaluate	4	16	37	122	4	3	2	1**
Table 3					** p <0.001.			*n = 179*

In questionnaires during both phase one and phase two pupils and their teachers were asked to indicate their enjoyment levels of each aspect of the design process separately. In support of the findings regarding rank order, both pupils and teachers gave high scores to the making aspects of the process and low scores to writing up reports for their project *(Table 4)* although it should be noted that teachers were on the whole more positive about pupils enjoyment of the process than the pupils were themselves *(Graph 1)*.

MEAN SCORES REGARDING ENJOYMENT OF THE PROCESS				
	The Process	Pupils 1993-4	Pupils 1994-5	Teachers
1	Selecting a project	2.93	2.39	3.29
2	Researching a project	2.59	2.49	2.71
3	Thinking of a number of ideas	2.63	2.53	2.86
4	Working out the chosen solution	2.92	2.71	2.43
5	Making the chosen solution	3.27	3.07	3.86
6	Making the chosen solution work	3.28	3.08	3.14
7	Using tools and equipment	3.54	3.39	3.71
8	Evaluating the project	2.47	2.02	2.00
9	Putting together a folio	2.73	2.56	2.71
10	Writing the report	*2.10*	*1.91*	*1.57*
	Max Score 4			
Table 4		*n = 179*	*n = 112*	*n = 8*



Graph 1

Interviews with a selected forty pupils from the phase one sample allowed further investigation of an aspect of designing which had been highlighted as problematic in the questionnaires - that of communication skills [15]. Pupils were encouraged to talk about the various forms of drawing and writing they had used in their project work. Answers to these questions provided further insight into the intricate relationship between modelling skills and conceptual skills during the process of designing.

PUPIL PERCEPTIONS REGARDING THE DRAWING PROCESS

Drawing technique	Positive comments	%	Negative comments	%
Drawing in general			find all drawing difficult	20
Early sketching	enjoy thinking of ideas	28	find it difficult to think of ideas	15
	find this type of drg easy	33	find it difficult to do	15
Detailing	enjoy doing careful drg	15	drawing technique difficult	30
			difficult to work out details	25
Orthographic drg	proud of outcome	15	complex drg technique	30
			avoid doing them	20
Final 3D perspective	proud of outcome	15	find it difficult to do	25
	enjoy doing them	28	avoid doing them	25

Table 5 *n = 40*

ONLY POINTS WHICH WERE MENTIONED BY 15% OR MORE OF THE PUPILS ARE REFERRED TO IN THESE TABLES

Questions regarding communication skills were divided into four types of drawing and three types of writing commonly used by pupils whilst engaged in designing. Analysis of the data regarding these skills indicated that pupils were generally more negative about their skills than

positive *(Table 5 & Table 6)*. Pupils highlighted a lack of accuracy as one of the main causes of their problems, whilst the tedious nature of writing was found to be high on the list of negative responses *(Table 6)*. Feedback from pupils indicated that the latter was often due to the fact that they did not appreciate the relevance of the activity.

PUPIL PERCEPTIONS REGARDING THE WRITING PROCESS				
Writing technique	Positive comments	%	Negative comments	%
Annotations	easy to think what to write	15	writing untidy -spoils work	15
	good way of communicating thoughts	17	didn't do it	15
Careful lettering	proud of outcome	18	find it difficult to be neat	20
			tedious	16
Evaluation	good way of finishing project	25	tedious	23
			only do it for assessment	23
Table 6				*n = 40*

ONLY POINTS WHICH WERE MENTIONED BY 15% OR MORE OF THE PUPILS ARE REFERRED TO IN THESE TABLES

Pupil's beliefs regarding manufacturing skills had already been targeted in the earlier questionnaire although clarification concerning, how much they had enjoyed making their project, whether it was finished or not, and whether they were pleased with the outcome were all discussed during the interviews. Sixty-five percent of the pupils had enjoyed making their project whilst fifty-eight percent were pleased with their outcome *(Table 7)*. Pupils believed that it was their lack of accuracy, and their poor manufacturing skill level which were the main causes of concern during the making of their products *(Table 8)*.

PUPIL PERCEPTIONS REGARDING THE MANUFACTURING STAGE OF THEIR PROJECT			
	Yes Percentage	No Percentages	Did not make project
Enjoyed making their project	65% (26)	22.5% (9)	12.5% (5)
Pleased with the outcome	58% (23)	32.5% (13)	12.5% (5)
Table 7			*n =40*

ASPECTS OF THE MANUFACTURING PROCESS WHICH CAUSED PUPILS PROBLEMS	
Poor manufacturing skills & inaccuracy	45% (18)
Idea not worked out before hand	7.5% (3)
Too big a project	5% (2)
Time management	12.5% (5)
None	30% (12)
Table 8	*n = 40*

The study - Phase Two

Phase one had been targeted at establishing pupils perceptions of the various factors that were thought to influence performance and motivation in project work at Key Stage 4. Phase two was designed to clarify these factors further, through observation of the on-going activity for the duration of the GCSE examination project itself [16].

The second year's sample of pupils came from the same eight case study schools. Pupils were chosen using two data gathering instruments towards the end of year 10. Firstly, a questionnaire investigating pupils perceptions of their enjoyment and abilities in design and technology project work was completed by all the pupils in a mixed ability, mixed gender technology class from each of the eight schools (n=112, 85 boys and 27 girls). In addition, the pupils were asked to complete a computer presented, self-administered Cognitive Styles Analysis (CSA) test. This was designed by Riding in 1991 to assess two fundamental cognitive style dimensions, verbal-imagery and wholist-analytic.

Cognitive style has been shown to be closely related to an individual's ideas and attitudes [17]. The perception and evaluation of information are integral to the act of designing, therefore each pupil's predominant cognitive style was seen as a possible indicator of performance during engagement in technology project work.

COGNITIVE STYLE DIMENSIONS SAMPLE SPLIT BY GENDER

	Verbaliser		Imager	
	Boy	Girl	Boy	Girl
Analytic	56% (25)	58% (07)	45% (18)	67% (10)
Wholist	44% (20)	42% (05)	55% (22)	33% (05)
Totals	53% (45)	44% (12)	47% (40)	56% (15)

PERCEIVED DESIGN ABILITY

	Verbalisers		Imagers		Totals	
	Boys	Girls	Boys	Girls		
Can	23	5	15	6	49	44%
Cannot	22	7	25 **	9	63**	56%
Totals	45	12	40	15	112	100%

PERCEIVED ENJOYMENT OF DESIGNING

	Verbalisers		Imagers		Totals	
	Boys	Girls	Boys	Girls		
Enjoy designing	9	2	9	4	24	21%
Prefer Making	36**	10 **	31 **	11 **	88**	79%
Totals	45	12	40	15	112	100%

** $p = <0.0001$

Table 9 *n = 112*

The three relevant sets of data were analysed *(Table 9)* and the results allowed a matrix of eight possible pupil types to be identified and selected for tracking *(Table 10)*. A case study approach based on observation and informal interviews was used during this phase of the research. The progress of fifty pupils was followed on a fortnightly basis throughout their technology examination project work.

FINAL SAMPLE SHOWN ON A MATRX OF EIGHT IDENTIFIED PUPIL TYPES

	Imagers				Verbalisers				Categories
School Code	A	B	C	D	E	F	G	H	
007	-	A	A	A	W	A	A	W	A = Imagers who enjoy designing and believe can design B = Imagers who enjoy designing but believe cannot design C = Imagers who prefer making but believe can design D = Imagers who prefer making and believe cannot design
021	W	-	A	W	A	W	W	-	
031	-	-	W	A	A	W	A	W	
032	W	-	A	W	-	A	A	A	E = Verbalisers who enjoy designing and believe can design F = Verbalisers who enjoy designing but believe cannot design G = Verbalisers who prefer making but believe can design H = Verbalisers who prefer making and believe cannot design
035	-	W	A	A	-	A	A	W	
036	W	A	-	A	-	W	A	A	W = Wholist A = Analyst
047	W	A	W	W	A	-	A	A	
049	A	-	A	A	A	-	A	W	

Table 10 *n = 50*

This investigation helped to support and clarify earlier findings [15] that had indicated a connection between pupil's creative level and the strategies pupils adopted whilst engaged in project work at key stage 4. Analysis of the data collected during the observation period suggested that pupils could be separated into two creativity categories *(Diagram 1)*, those who were creative and those who were not very creative. Evidence showed that within each of these categories there were two sub-groups. The inherently creative could be divided into those who were able to design within the constraints of the GCSE examination process model, and those who were inhibited by such a structured approach.

In the second category *(Diagram 2)*, that encompassed the majority of pupils, there were those who were not creative nor were they receptive towards working with the design process model offered to them. This group were seen to become increasingly de-motivated as the project work progressed. Pupils in the other sub-group were willing to accept the design methodology taught although they too were not naturally creative. At the start of the project these pupils were motivated because they wished to produce satisfactory outcomes of which they could be proud. However, as time progressed they too became increasingly dissatisfied with the process they had been asked to adopt. This group maintained their motivation by concentrating upon achieving a good examination result instead.

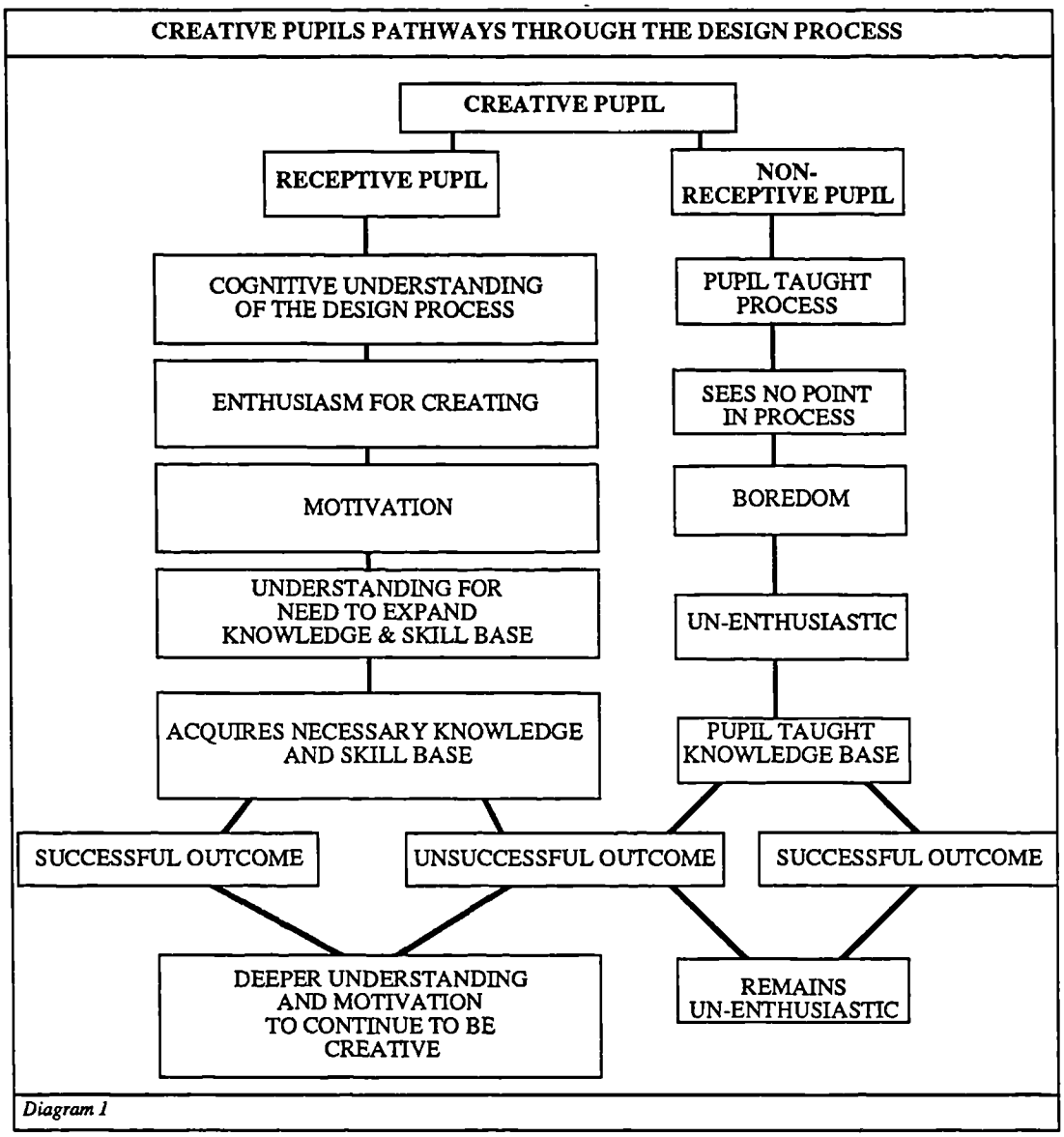


Diagram 1

Observation of those who were inherently creative but able to work within the constraints of the examination structure showed that they had the motivation to persevere however difficult the task became. Within the group who were creative but found the structure of the process inhibiting, there were those who failed to become involved in their work for the majority of the course and then produced a good project at the last minute. There was also an equal number of pupils with high levels of creative ability who never came to terms with the approaches adopted. They failed to produce anything of merit ending up with no finished project and a sceptical view of the design process they had been expected to adopt.

The groups who were not naturally creative needed external encouragement to help them through the process. The progress of these groups was seen to be affected by a number of key factors specific to the task of designing and making. Factors such as a pupil's level of conceptual skills and both two and three dimensional modelling skills. The evidence from the research would

THE PATHWAYS THROUGH THE DESIGN PROCESS FOR NON-CREATIVE PUPILS

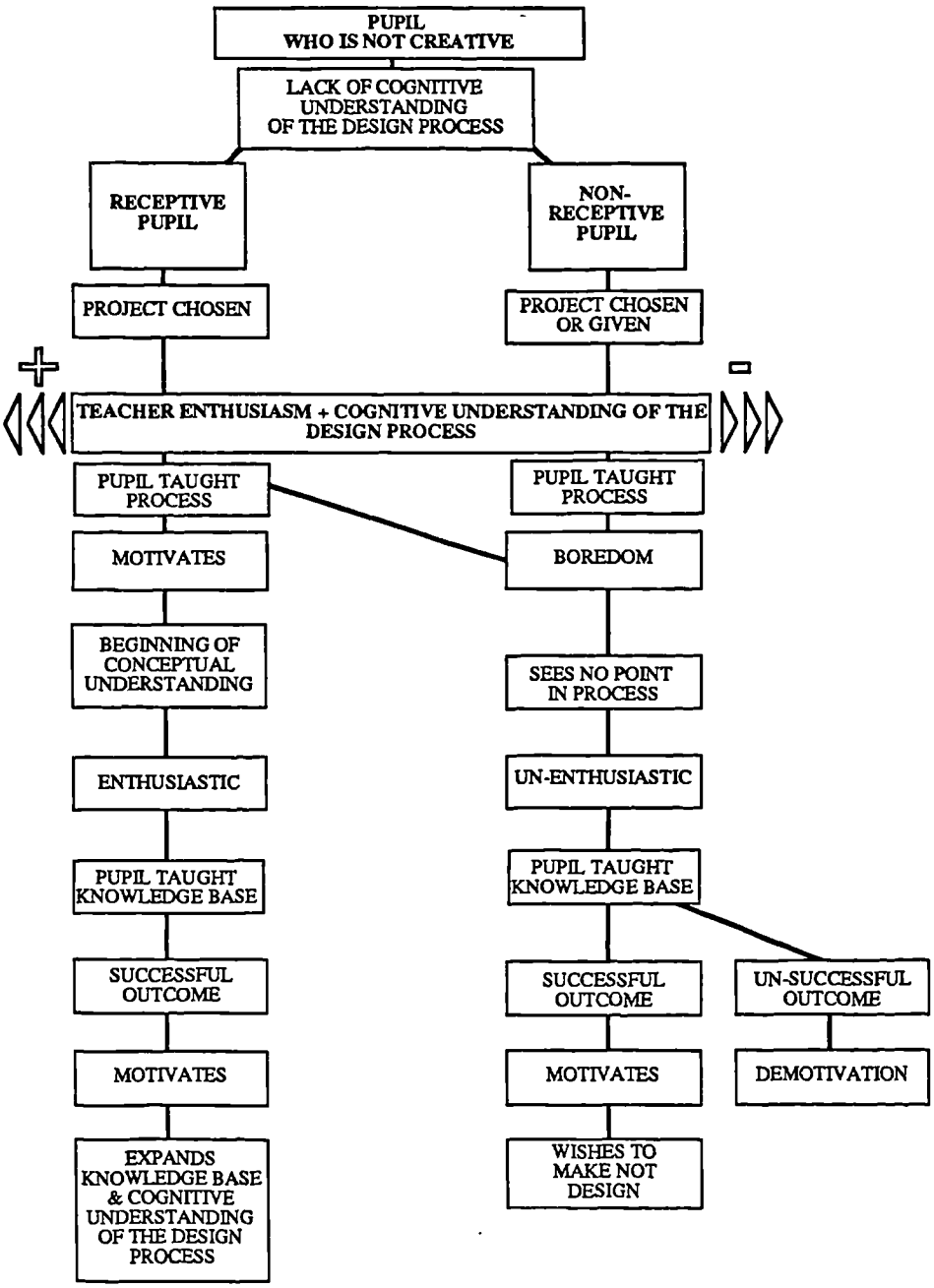


Diagram 2

suggest that the lynch pin that could cause these factors to fall into place for the pupil, was the teacher. An enthusiastic, skilful teacher was able to help pupils to approach project work positively and achieve successful outcomes. The teacher needed to: have a thorough understanding of designing beyond the requirements of the examination assessment criteria; enhance and encourage creativity; prevent pupils from using inappropriate forms of modelling whilst designing; enable pupils to plan their manufacture processes in order that outcomes were

produced that not only satisfied examination criteria but also produced products of which the pupils could be proud. It was also apparent that those pupils who had had adequate skills inputs during years 7 - 9 were able to tackle new processes and manufacturing techniques with more confidence than those for whom, during years 10 and 11, accuracy in even the most basic of manufacturing processes proved difficult.

Observation throughout the duration of the examination project work also gave the researcher the opportunity to investigate the delivery programmes devised by each school to enable pupils to cover all the examination syllabus requirements. These were seen to fall into three categories. Type one, devoted all of the technology lessons every week to completing one aspect of the syllabus before moving on to the next unit of work. Type two, split the technology time each week equally between Core and Extension work. Type three, integrated Core and Extension work, devoting the majority of time in year 11 to a single project.

Each school followed examination guidelines concerning the number of teaching hours to be allocated to the technology project. However, the actual amount of time used for the project varied greatly from pupil to pupil. The differences being accounted for by the amount of 'extra' time pupils were willing to spend on their projects both at home and in school.

Through observation of approaches to designing adopted by the pupils it became apparent that teachers utilised one of two strategies to enable their pupils to meet deadlines and address the Examination Board's assessment criteria. Analysis of the two approaches suggested that in one the teacher tended to act as a collaborator, whilst in the other a more 'interventionist' mode of teaching was adopted *(Diagram 3)*.

No matter which teaching strategy was employed the start of the projects were seen to follow a similar pattern. Examination Boards suggested contexts and pupils identified their own opportunity or need to address. This was an important aspect of the process as it gave the pupils ownership of their projects [14].

All pupils were encouraged to carry out research and analyse their findings in order to devise a specification for their outcome. At the initial ideas stage of the project in each school pupils formulated several ideas to meet the requirements of the brief. The amount of time allocated to this section of the work varied considerably depending upon which delivery programme had been adopted by the school.

In schools where teachers utilised an 'interventionist' approach, pupils tended to move very quickly from initial ideas to the manufacturing stage. Very few pupils produced carefully detailed drawings. Development of the chosen idea was carried out as manufacturing took place. It was at this point that these pupils lost ownership of their idea. Decisions were made in a piecemeal, 'interventionist', manner by the teacher. This was seen to have a de-motivating effect

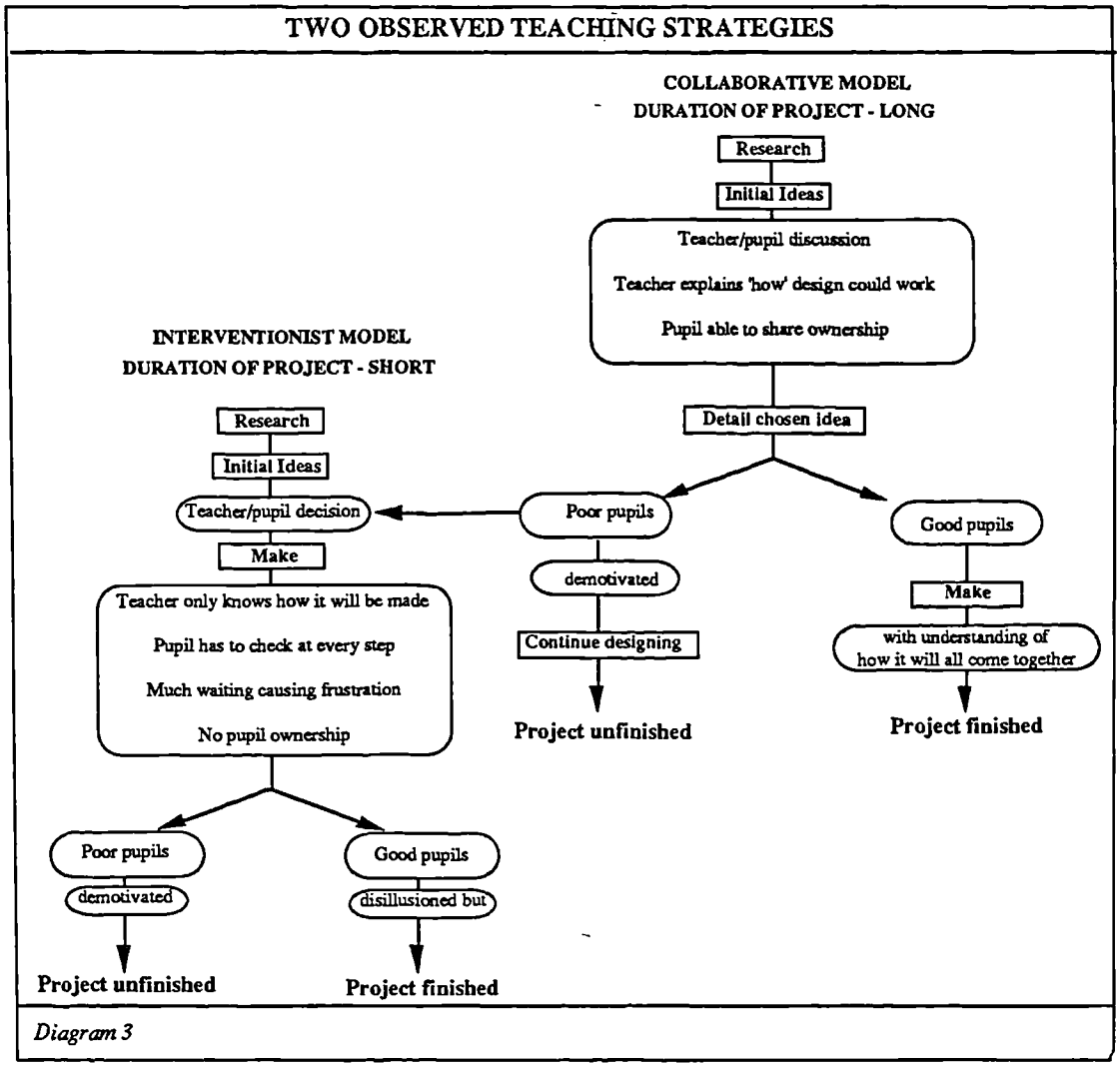


Diagram 3

upon many pupils which in turn led to a considerable number of incomplete projects when the hand-in date was reached *(Table 11)*.

TABLE SHOWING PERCENTAGE OF COMPLETED PROJECTS BY GENDER				
	Interventionist Model		Collaborative Model	
	Boys	Girls	Boys	Girls
Complete	33% (7)	36% (4)	60% (9)	67% (2)
Unfinished	67% (14)	64% (7)	40% (6)	33% (1)
Total	100% (21)	100% (11)	100% (15)	100% (3)
Table 11				*n = 50*

In schools where teachers exhibited what has been defined as the 'collaborative' model, a pupil's lack of time management skill was not seen as a problem in the early stages of the project. Time was given to individual pupil-teacher discussions. Detailing of the chosen idea became a 'collaborative' effort between pupil and teacher, with pupils still feeling that they had ownership of their idea. Many of those who succeeded in reaching the manufacturing stage of their project

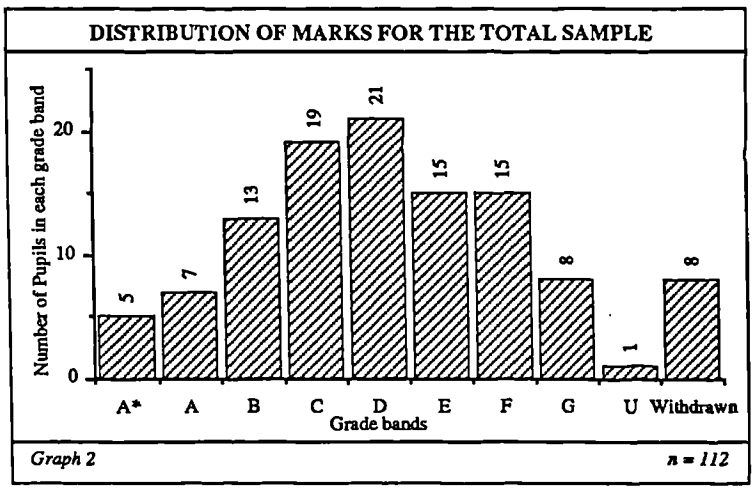
were able to complete their work in time for assessment. For those pupils who did not the problems associated with this model came about through boredom. From a fairly early stage these pupils saw the design process stretching interminably ahead of them. The manufacturing stage which they looked forward to seemed an impossible target to reach. This caused a noticeable slowing down of work rates that only exacerbated the situation.

In the total sample ninety-five percent of pupils reached the manufacturing stage although the majority of products produced displayed a lack of craftsmanship or fitness for purpose and many of them were never completed. When assessment time was reached the majority of finished projects had required pupils to use extra hours of non-timetabled time, after the hand-in-date, in order to complete the manufacturing process and evaluation.

Once pupils examination projects were marked, the fifty pupils were sampled using a creativity test, a goal orientation test and a questionnaire that investigated the pupils' perceptions of their success in their examination project work. This data was then correlated with the school's internal, moderated assessment mark for each project and the selection of sample factors for each pupil.

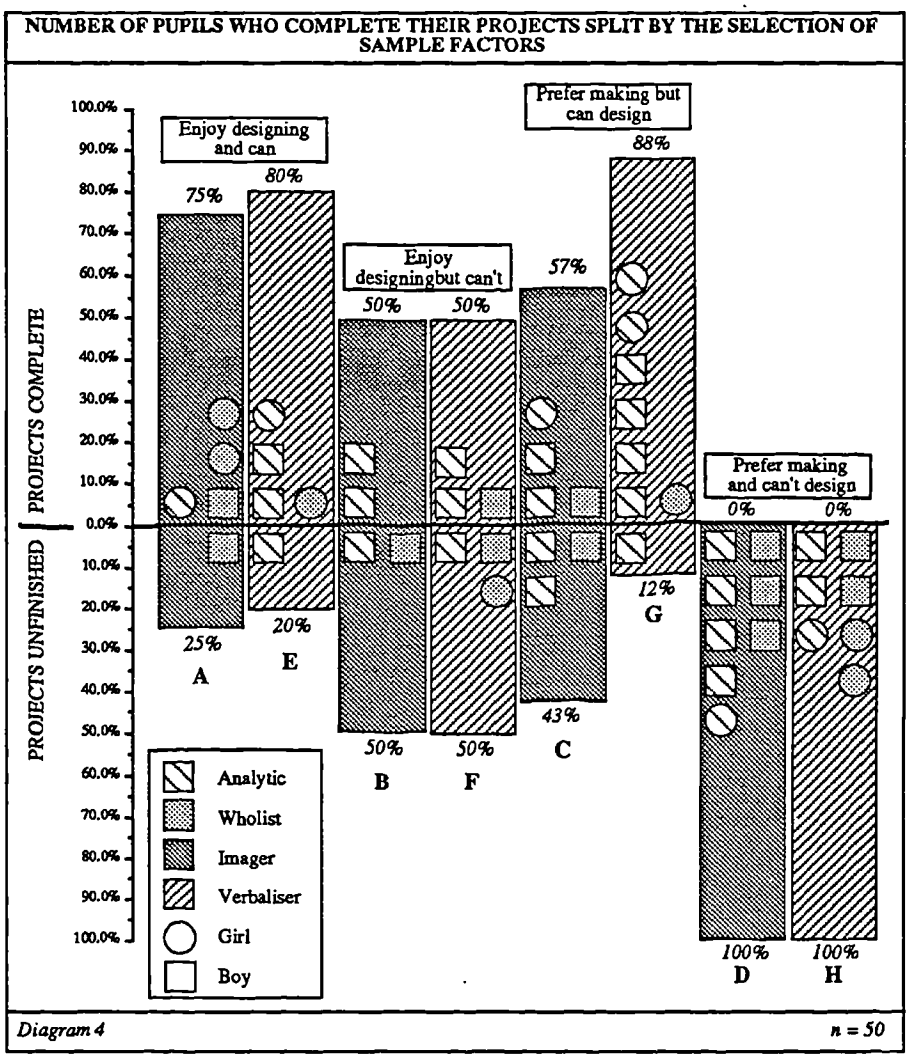
Results

In the first instance the moderated project work marks for the total sample were entered onto a graph *(Graph 2)*. The distribution of marks was then checked against the normal distribution curve achieved by the total candidature for the GCSE technology examination and found to be similar.



In order that correlations that had been observed during the case study could be verified the data collected was systematically analysed using two computer software packages, FileMaker Pro and StatView. In order to aid clarity between the various correlations, marks and scales for each factor that was to be analysed were converted to a single scoring matrix of nought to four, where four was the maximum score given.

In this paper four separate correlations have been targeted for discussion. Firstly, the correlation between sampling factors, completion rates and final marks for the project work were assessed. Secondly, clarification were sought regarding the relationship between strategies adopted by teachers, the design process used by pupils, and performance levels in technology project work. Thirdly, the correlation between pupil performance and communication skill levels were investigated. Finally, inherent creativity, pupil motivation and performance levels during technology examination project work were analysed. These have been discussed separately although it is recognised that in the 'real world' of the classroom all these factors are inextricably intertwined.



The Relationship between Sampling Factors, completion rates and performance

Analysis of the data collected suggested that gender, pupil type and perceived ability to achieve satisfactory outcomes affected how successfully pupils were able to tackle project work. When the result of completion or non-completion of projects was correlated with the sampling matrix referred to in *Table 10*, interesting clusters were observed *(Diagram 4)*. Those pupils who believed that they could design had more chance of completing their projects than those who believed they could not. When cognitive style was used as a starting point, a high proportion of analytic-

verbalisers were found within the group of pupils who believed that they could design, whether they enjoyed designing or preferred making.Verbalisers were found to have an equal, and in several instances, better completion rate than imagers. Whilst, it was also noted that one hundred percent of those who preferred making and believed they could not design failed to complete their projects, whether they were, verbalisers or imagers.

Design methodologists suggest that designing should be an holistic experience [4,18,21] and that imaging is central to the development of ideas [4, 19,20]. However the data collected indicated that those pupils who were imagers and wholists were the ones who achieved the poorest results *(Table 12)*. Whilst, those who were analytic whether they were imagers or verbalisers tended to achieve high marks. Through analysis of the data collected the researcher was able to identify and quantify the reasons for these features of the data.

AVERAGE MARK SPLIT BY ALL OF THE SELECTION OF SAMPLE FACTORS								
Average Mark	Enjoyed designing and can		Enjoyed designing but can't		Prefered making and can design		Prefered making and can't design	
	Analytic	Wholist	Analytic	Wholist	Analytic	Wholist	Analytic	Wholist
Verbalisers	75%	67%	40%	22%	64%	45%	43%	39%
Imagers	88%	48%	62%	20%	66%	36%	32%	28%
Table 12				*n =112 minus 8 pupils who were withdrawn from the examination*				

As drawing is such an important aspect of designing one might have expected verbalisers to achieve significantly lower marks for their projects than imagers. However, this was not the case. Analysis of the data suggested an explanation for this. Not all imagers were able to draw. In the sample only forty-six percent of imagers believed they had satisfactory drawing skills, whilst during observation only twenty-one percent were actually found to have adequate skills in this aspect of the process. Nor could the majority of imagers rely upon their writing skills as these were generally found to be weak.

For those imagers who avoided writing the on-going analysis and evaluation tended to be hidden in subtle forms within their drawn images. Access to a pupil's immediate thoughts at the time of the conception of ideas was impractical, nor was it then easy to credit these thoughts objectively during the assessment process. In comparison, those who were verbalisers communicated their thoughts in a form that was more easily interpreted by teachers during assessment, thereby gaining them valuable marks.

On the second point regarding the holistic nature of designing, analysis of the design processes adopted provided an explanation for the low mean score of wholists. In order to ensure that pupils met each of the assessment criteria teachers were seen to split the process into easily managed units of work. Observation showed that these were often tackled in isolation before the next aspect of the process was discussed. The holistic nature of the process was therefore fragmented, thus playing into the hands of those who were analytic.

AVERAGE MARK SPLIT BY ALL OF THE SELECTION OF SAMPLE FACTORS								
	Average Mark	Enjoyed designing and can		Enjoyed designing but can't -		Prefered making and can design		Prefered making and can't design	
		Analytic	Wholist	Analytic	Wholist	Analytic	Wholist	Analytic	Wholist
Boys *n = 85*	Verbalisers	71%	58%	40%	21%	68%	43%	39%	35%
	Imagers	-	34%	62%	20%	62%	34%	32%	24%
Girls *n = 27*	Verbalisers	94%	84%	-	23%	33%	57%	51%	53%
	Imagers	88%	70%	-	-	70%	50%	34%	44%
Table 13				*n =112 minus 8 pupils who were withdrawn from the examination*					

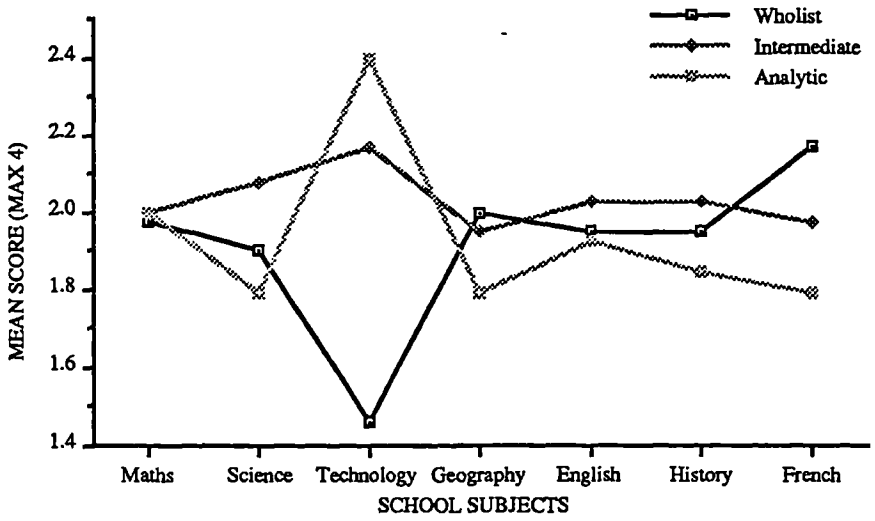
When the relationship between results, selection of sample factors and gender were analysed it could be seen that in all but one category the mean percentage achieved by the girls was considerably higher than the mean percentage achieved by the boys *(Table 13)*. This supported the general trend that Riding had identified in his paper concerned with the relationship between cognitive style and intelligence [22] *(Graph & Table 14)*. However, it is recognised that the proportion of girls to boys in the technology research sample is uneven and therefore no statistically sound conclusions should be drawn from the evidence collected.

When the relationship between the mean scores for technology and wholist-analytic style were compared with the mean scores achieved in the six school subjects identified in Riding's study, interesting comparisons could be made. Technology was found to be the only subject in which analytic pupils had such marked success compared to wholists *(Graph &Table 14)*.

Bimodal pupils, those equally able to use and interpret both imagery or verbal modes of presentation, displayed a positive relationship between the wholist-analytic dimension and mean performance scores. Those pupils who were wholist and bimodal achieved a significantly low mean score. Analytic-bimodal pupils managed to achieve the highest mean score of all the cognitive style categories. The mean scores for verbalisers showed little difference between those who were wholists and those who were analytic. Whilst imagers, who found themselves at the centre of the wholist-analytic dimension, achieved the highest mean score for imagers *(Graph & Table 15)*.

When considering the verbal/imagery dimension it was found that in support of Riding's findings the pattern for boys was a mirror image of that for girls when performance was measured against that dimension *(Graph & Table 16)*. In the case of the wholist-analytic dimension no such mirror image existed. Boys and girls followed a fairly similar pattern, although girls mean scores were higher than that achieved by the boys. This was particularly noticeable in the case of girl wholists *(Graph & Table 16)*. However, once again the sample size prevents these results from being statistically viable.

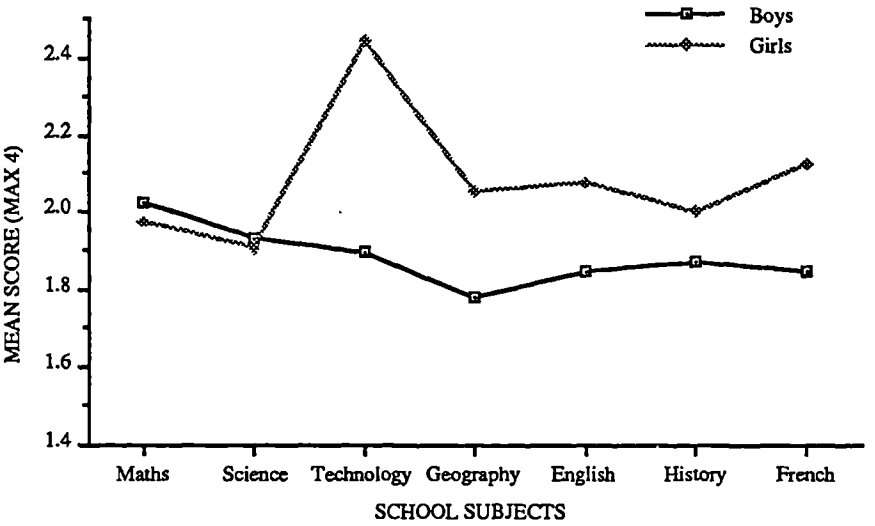
WHOLIST-ANALYTIC STYLE & SUBJECT PERFORMANCE



MEAN SCORES FOR PERFORMANCE IN SEVEN SUBJECTS & WHOLIST-ANALYTIC STYLE

Style	Maths	Science	Technology	Geography	English	History	French
Wholist	1.975	1.900	1.459	2.000	1.950	1.950	2.175
Intermediate	2.000	2.075	2.167	1.950	2.030	2.030	1.975
Analytic	2.000	1.790	2.400	1.790	1.850	1.850	1.790

GENDER & SUBJECT PERFORMANCE



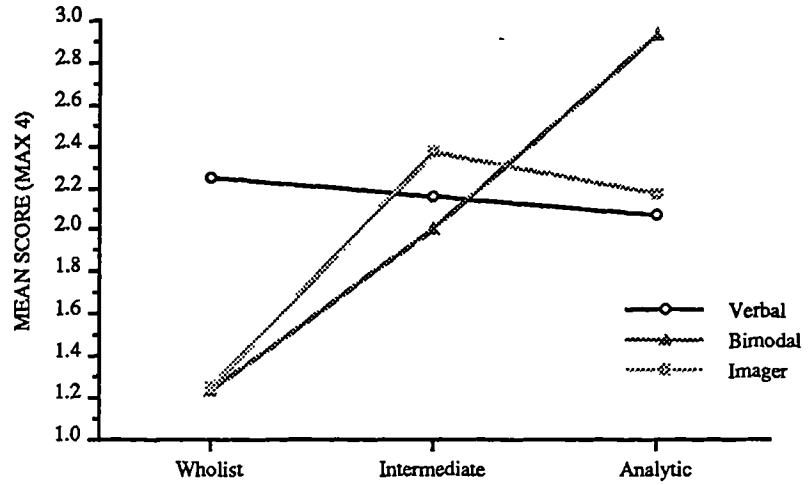
MEAN SCORES FOR PERFORMANCE IN SEVEN SUBJECTS BY GENDER

Gender	Maths	Science	Technology	Geography	English	History	French
Boys	2.025	1.930	1.894	1.780	1.850	1.870	1.850
Girls	1.975	1.910	2.444	2.050	2.075	2.000	2.125

Statistics for Maths, Science, Geography, English, History, French taken from:
RIDING, R.J. & PEARSON, F. (1994)*The Relationship between Cognitive Style & Intelligence*

Graph & Table 14 *n = 119 except technology n = 112*

COGNITIVE STYLE & PERFORMANCE

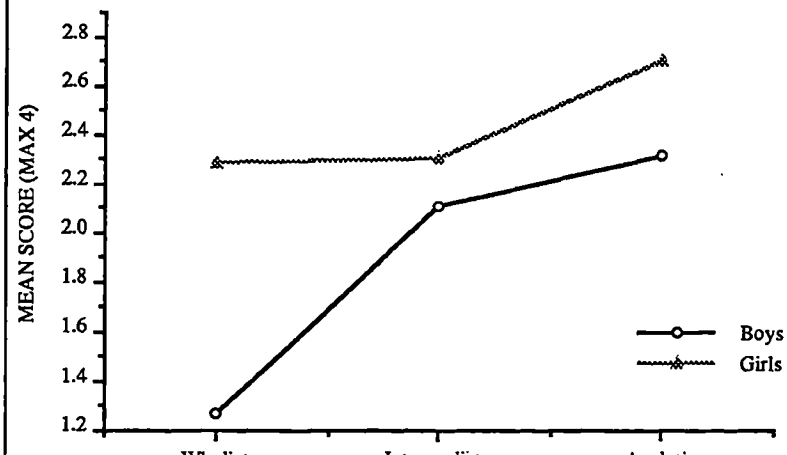


WHOLIST-ANALYTIC STYLE

MEAN SCORES FOR PERFORMANCE AND COGNITIVE STYLE

Cognitive Style	Wholist	Intermediate	Analytic
Verbal	2.250	2.167	2.077
Bimodal	1.235	2.000	2.933
Imager	1.250	2.375	2.176

WHOLIST-ANALYTIC STYLE, GENDER & PERFORMANCE IN TECHNOLOGY



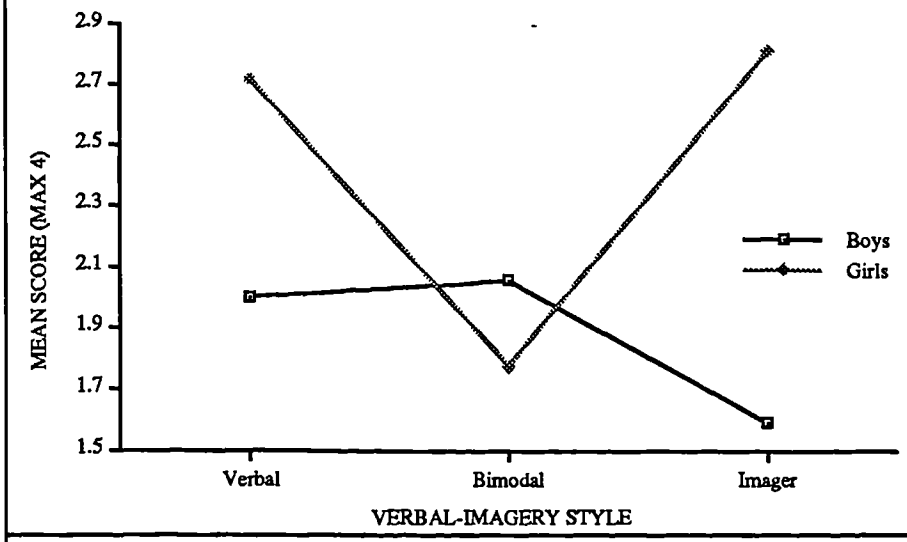
COGNITIVE STYLE

MEAN SCORES FOR PERFORMANCE, GENDER & WHOLIST/ANALYTIC STYLE

Cognitive Style	Wholist	Intermediate	Analytic
Boys	1.267	2.100	2.314
Girls	2.286	2.300	2.700

Graph & Table 15 *n = 112*

VERBAL-IMAGERY STYLE, GENDER & PERFORMANCE IN TECHNOLOGY

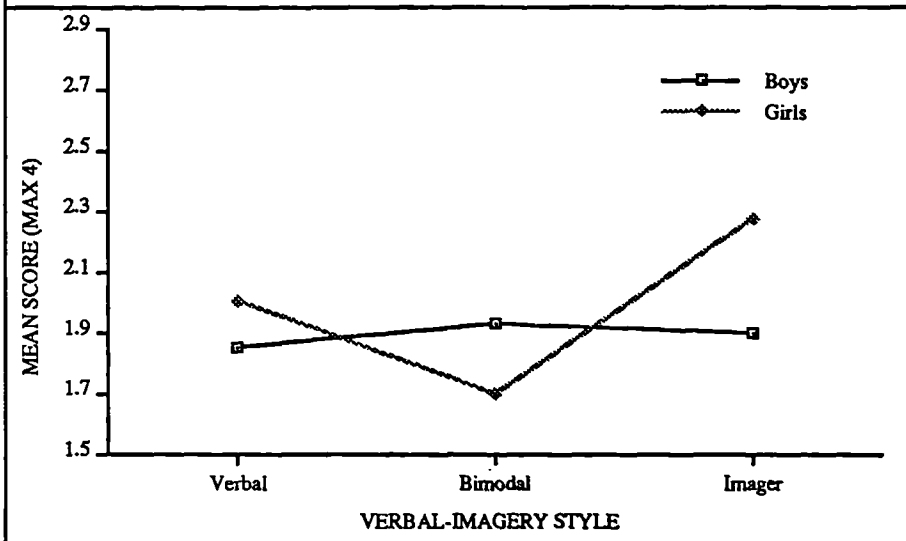


MEAN SCORES FOR TECHNOLOGY PERFORMANCE, GENDER & VERBAL-IMAGERY STYLE

Gender	Verbal	Bimodal	Imager
Boys	2.000	2.062	1.593
Girls	2.714	1.778	2.818

n = 112

VERBAL-IMAGERY STYLE, GENDER & SIX SUBJECT'S PERFORMANCE



MEAN SCORES FOR PERFORMANCE IN 6 SUBJECTS, GENDER & VERBAL-IMAGERY STYLE

Gender	Verbal	Bimodal	Imager
Boys	1.850	1.930	1.900
Girls	2.010	1.700	2.275

n = 119

Statistics for Maths, Science, Geography, English, History, French taken from:
RIDING, R.J. & PEARSON, F. (1994)*The Relationship between Cognitive Style & Intelligence*

Graph & Table 16

The relationship between teacher strategies, the process adopted and performance

The second correlation, between delivery programmes and strategies adopted by teachers and the design process utilised by pupils during their technology project work, provided some interesting data. The approach adopted in the two strategies and three delivery programmes have already been discussed, although relationship between the factors need further clarification.

Evidence would suggest that the speed of the process used by schools adopting an 'interventionist' approach failed to provide pupils with enough time for the maturation of thoughts and ideas at each stage of the process. Although pupils in schools where 'collaborative' strategies were used had the same amount of time for their projects, the evidence would suggest that the spread of this time over months rather than weeks allowed pupils access to this important maturation time. 'Collaborative' approaches also gave teachers time to familiarise themselves with pupil's projects. This enabled them to prevent some of their pupils from making un-wise design decisions. Whereas many teachers using 'interventionist' strategies were found to be frustrated by their inability to prevent design disasters occurring.

TABLE SHOWING MEAN SCORES FOR ASPECTS OF THE DESIGN PROCESS		
Aspect of the Process	Interventionist Mean	Collaborative Mean
Specification & Analysis	2.355	1.867
Research	2.387	2.000
Initial ideas	1.806	2.200
Detailing chosen idea	1.935	2.867
Planning	1.355	2.067
Manufacture	1.900	2.600
Product	1.645	1.933
Evaluation	1.710	1.800
	Maximum Score = 4	
FINAL MARK SHOWN AS MEAN PERCENTAGES & SCORES		
	Mean %	Mean Score
Collaborative	43.067	1.667
Interventionist	51.844	2.219
Total	49.043	2.027
Table 17		*n = 50*

When each of the individual aspects of the design process were viewed in isolation the structured nature of the 'interventionist's approach was seen to be more successful during early written sections of the project, although, this advantage was not sustained into design and manufacturing stages *(Table 17)*.

As was anticipated during observation of the pupils at work, the 'collaborative' approach produced better design strategies in such aspects of the process as initial ideas, detailing the chosen idea, planning for manufacture, and the manufacture of the product itself *(Table 17)*. All aspects in which thinking time was an important factor.

As far as design folders were concerned very few were completed without considerable pressure having been applied by the teachers. Motivated pupils in all schools were persuaded to re-work or 'pretty-up' existing work and fill gaps in their design process. The limited time spent on the folder work in the 'interventionist' model meant that the folders, of even those who believed that they could design, presented little evidence of designerly thought at the various stages of the process. In an attempt to present the required evidence for assessment, pupils were encouraged to complete written sections describing their decision making procedures. This was often carried out retrospectively in the pupils own time when they were pulling their design folder together.

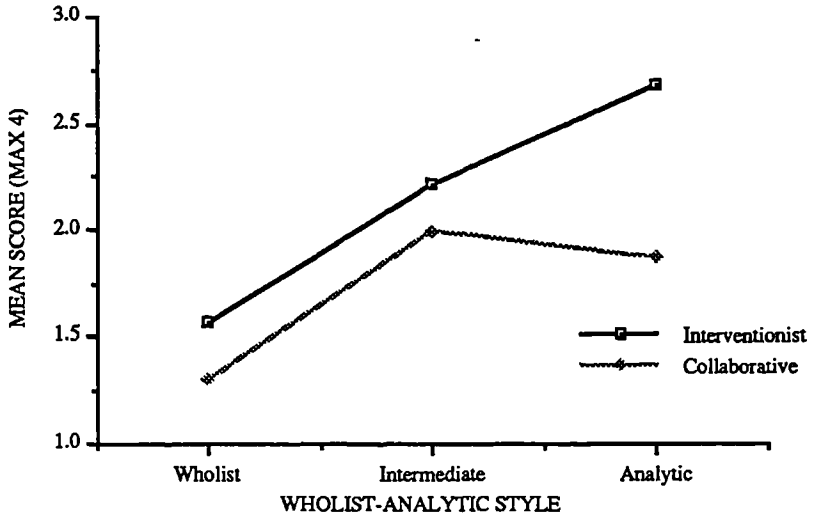
The design work of those working in schools where a 'collaborative' approach had been adopted displayed two different levels of success within their folders. Those who enjoyed the act of designing produced visually excellent folders which contained creative thinking but also a considerable amount of re-worked and over-worked sheets. Those who did not enjoy designing produced numerous sheets of work attempting to satisfy the examination criteria but showing little evidence of designerly thought.

With regard to completion rates, analysis of the data showed that ninety-two percent of those pupils who were entered for the examination in schools that had adopted a 'collaborative' approach to designing and only fifty-six percent of pupils in schools that had adopted an 'interventionist' approach finished their projects by the schools initial deadline. By assessment time this picture had been improved by the majority of schools adopting an 'interventionist' strategy. In these schools pupils were encouraged to finish projects in their own time. This was made possible because project deadlines were set earlier in the academic year than assessment deadlines. In all the schools adopting a 'collaborative' approach, where non-completion of projects was not as much of an issue, hand-in dates had been set to coincide with assessment deadlines thus leaving little flexibility for the few un-finished projects to be completed.

However, no matter which strategy had been adopted, a disappointing feature of the majority of the products produced was their poor quality both in terms of design and manufacture. No pupil, working with a teacher who had adopted an 'interventionist' approach to designing, could be said to have produced a product that was well designed and well manufactured.

Analysis of the three delivery programmes and two strategies adopted by the schools, indicated that neither the 'collaborative' or the 'interventionist' model were entirely successful. When the relationship between the two teaching strategies and examination results for the project work were analysed it was found that both mean scores were disappointingly low, although the data

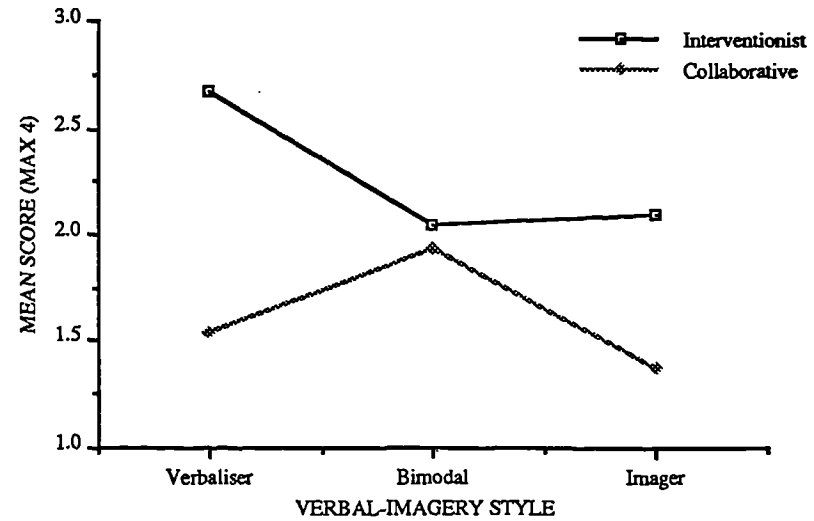
WHOLIST-ANALYTIC, TEACHER STRATEGY & SUBJECT PERFORMANCE



MEAN SCORES FOR PERFORMANCE & WHOLIST-ANALYTIC STYLE, TEACHER STRATEGY

Teacher Strategy	Wholist	Intermediate	Analytic
Interventionist	1.571	2.217	2.690
Collaborative	1.312	2.000	1.875

VERBAL-IMAGERY STYLE, TEACHER STRATEGY & SUBJECT PERFORMANCE



MEAN SCORES FOR PERFORMANCE, VERBAL-IMAGERY STYLE, TEACHER STRATEGY

Teacher Strategy	Verbaliser	Bimodal	Imager
Interventionist	2.667	2.040	2.100
Collaborative	1.533	1.938	1.375

Graph & Table 18 *n = 50*

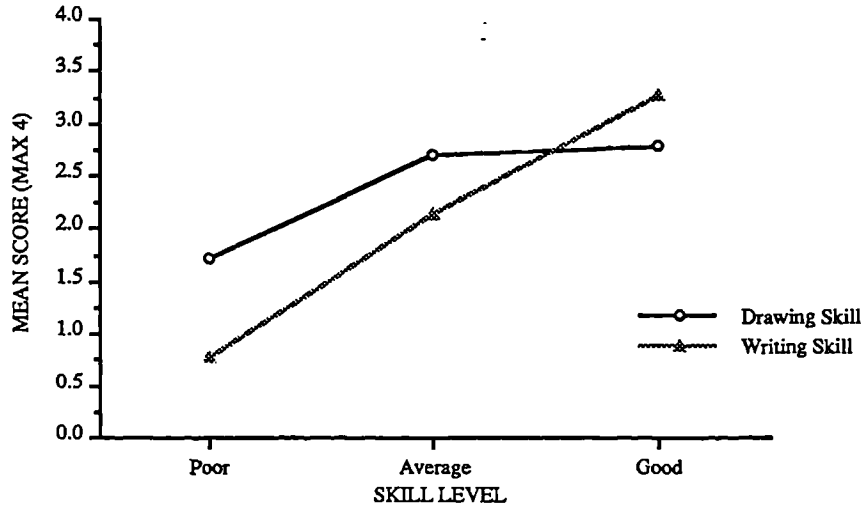
showed that a slightly higher mean score had been achieved by pupils in schools where an 'interventionist' approach had been adopted *(Table 17)*. These results supported the evidence that neither strategy allowed pupils to develop entirely valid approaches to designing. The nature and speed of the process in schools utilising 'interventionist' approaches did not allow for the development and detailing of creative, innovative ideas. On the other hand the slowness of the process, particularly at the design stage, in schools adopting a 'collaborative' model caused pupils to become overly concerned with the process at the expense of well designed outcomes. Analysis of feedback from pupils after they had finished their examination projects showed that although some pupils were able to obtain satisfaction from achieving success in the examination, the vast majority of pupils were sceptical about the validity of the process they had been asked to adopt.

Analysis of the relationship between cognitive style, performance and teaching strategy can be found in *Graph & Table 18.* This provided a clear picture in schools adopting a 'collaborative' approach to designing. In these schools flexible pupils who were not found at the extremes of either cognitive style dimension achieved the highest mean scores. Whereas in schools adopting an 'interventionist' approach to designing the data displayed a positive correlation between the wholist-analytic dimension and performance. Analytic pupils were found to benefit from the fragmented approach to the process that was adopted in these schools. They achieved the highest mean scores, whilst wholists who were unable to cope as easily with the fragmentation, achieved low mean scores. Verbalisers, who found it easy to use retrospective written evidence in order to make up for a lack of time devoted to the drawn aspects of the process were also found to be more successful in schools using the 'interventionist' model.

The relationship between pupil skills and performance

In all schools in the sample, the lack of skills and understanding regarding materials and processes lay at the root of many of the pupil's problems during both the design and the manufacturing stage of their project work. Pupil's ideas, when carried through to the manufacturing stage, caused many of them to work beyond their technological capability. In an attempt to support all pupils throughout this aspect of their work teachers were seen to develop a strategy in which they designed solutions to pupil's problems in their heads, as the need arose. The necessity for pupils to have an understanding of the way forward was given a low priority. This was particularly the case in those schools adopting an 'interventionist' approach where time was at a premium. However well intentioned this course of action may have been, the evidence from this study would suggest that it had a de-motivating effect upon many of the pupils, particularly the boys. Observation would suggest that girls tended to cope with the lack of ownership of their idea. They did not expect to understand how to tackle the constructional or technical facets of their project. They expected to be shown how to turn their ideas into reality. The more able girls saw the project as a learning experience or, were able to accept it as a necessary part of their GCSE examination in which they wished to do well. In order to make the

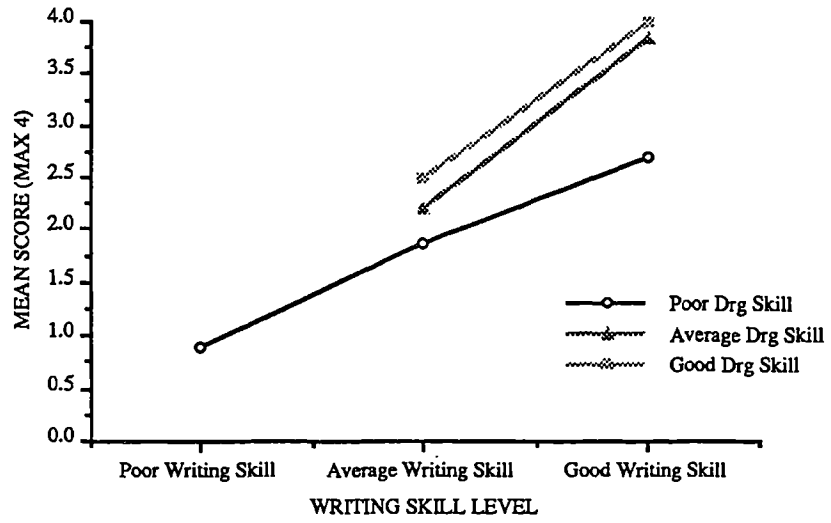
PERFORMANCE AND INDIVIDUAL SKILL LEVELS



MEAN SCORES FOR PERFORMANCE & SKILL LEVEL IN DRAWING AND WRITING

	Drawing skills	Writing skills
Poor skill	1.720	0.778
Average skill	2.700	2.148
Good skill	2.800	3.286

PERFORMANCE AND COMBINED SKILL LEVELS



MEAN SCORES FOR PERFORMANCE AND COMBINED SKILL LEVELS

	Poor drg skills	Average drg skills	Good drg skills
Poor writing skills	0.900	-	-
Average writing skills	1.875	2.214	2.500
Good writing skills	2.714	3.833	4.000

Graph & Table 19 *n = 50*

necessary progress they tended to make use of extra sessions through out the manufacturing stage of the project. This they saw as an opportunity to obtain more individual attention from their teacher. However, the common belief that ownership develops a sense of responsibility, pride, and the motivation to succeed would support the use of strategies that would allow all pupils to retain ownership of their idea throughout the duration of their project.

The correlation between specific communication skill levels and performance can be found in *Graph & Table 19.* When looked at in isolation it can be seen that writing skills have a positive correlation with performance, pupils who have poor writing skills achieve poor results and pupils with good writing skills achieve good results. It can also be seen that pupils with poor writing skills achieve poorer results than pupils who have poor drawing skills, whereas pupils with good writing skills achieve better results than pupils who have good drawing skills. This would suggest that there is a tendency for performance in the GCSE examination project to be governed by a pupil's ability to write rather than a pupil's ability to draw.

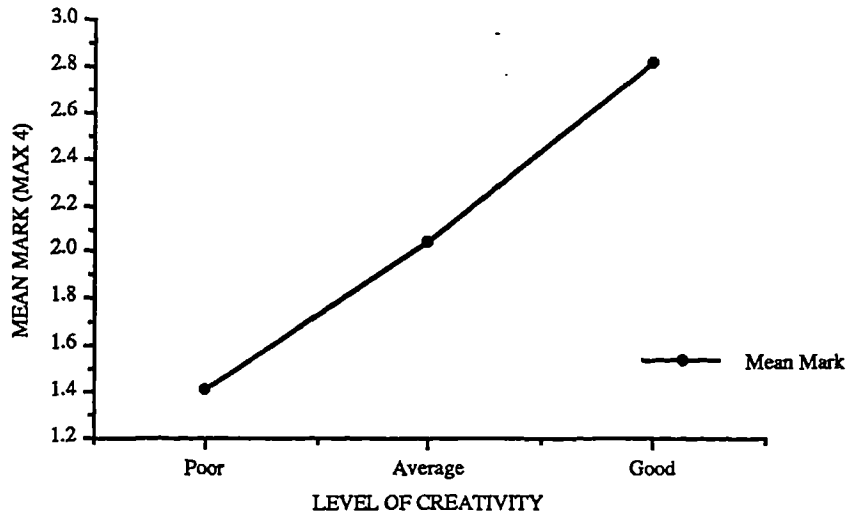
When the scores for communication skills were combined it was found that pupils with poor writing skills were only found in the group of pupils who also had poor drawing skills. Whereas pupils with poor drawing skills could be found at each writing skill level. The mean scores for pupils with average writing skills increased a small amount as their drawing skills improved. Once again there was support for the research finding which suggested that writing skills were of great importance in achieving good examination marks. The mean scores for those who had good writing skills showed that with only average drawing skills pupils were still able to achieve high marks in the examination project work.

Very few pupils were seen by the researcher to have good manufacturing skills whilst they were making their examination projects. When the relationship between manufacturing skill levels and examination results were assessed it became obvious that poor manufacturing skills had little effect upon overall results. An explanation for this was found when examination assessment criteria were analysed [21,23]. On average the two examination boards, involved in this research, only allocated six percent of the marks to this aspect of a project. The major thrust of the marks awarded in the making section were given for planning rather than carrying out the manufacturing process itself. In the majority of cases this planning was done retrospectively once all the practical mistakes had been made and folios were being pulled together.

The relationship between creativity, performance and motivation

For the fourth targeted correlation of this study, the relationship between creative ability and pupil performance in the examination project work was analysed. A direct correlation was found between creativity and performance *(Graph & Table 20).* Those who were creative achieved high mean scores whilst those who were not creative achieved low mean scores. When considering the relationships between creativity, motivation and performance, analysis showed that a

CREATIVITY & PERFORMANCE



MEAN SCORES FOR PERFORMANCE & CREATIVITY

	Poor Level	Average Level	Good Level
Creativity Mean Score	1.412	2.048	2.818

Graph & Table 20 *n = 50*

significantly high proportion of the total sample where de-motivated *(Graph &Table 21 & 22).* The relationship between performance and motivation was found to be positively correlated in that pupils who were motivated achieved a high mean score whilst those who were de-motivated achieved a significantly lower mean score.

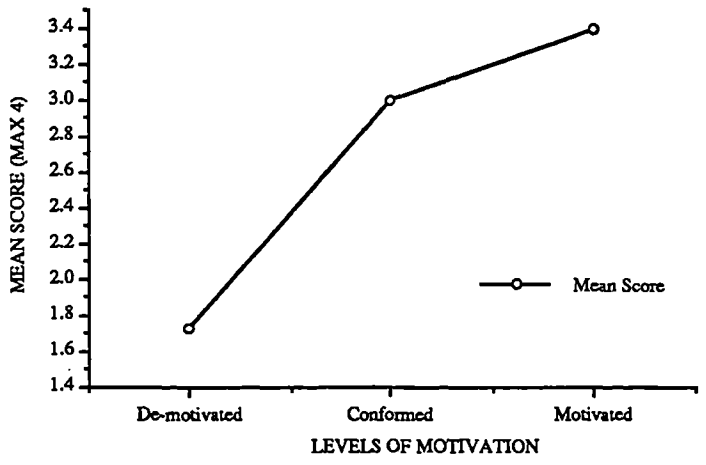
TABLE SHOWING MEAN MARKS GROUPED BY CREATIVITY CATEGORIES

Category	Mean Mark (expected result)	No. of pupils	Mean Mark (unexpected result)	No. of pupils	Categories	
A	89%	3	-	-	Creative Pupils A = Inherently creative and motivated	11
B	76%	4	20%	4	B = Inherently creative but de-motivated	
C	69%	7	-	-	Not very creative pupils C = Receptive and motivated	
D	37%	8	-	-	D = Receptive but de-motivated E = Unreceptive but conforming	39
E	57%	5	90%	1	F = Unreceptive and de-motivated	
F	14%	11	51%	7	Total	50
					chi - square	392.00
					p - value	< 0.0001

Table 21 *n = 50*

LEVELS OF MOTIVATION		
Level of Motivation	Creativity Categories	No of Pupils
Motivated	A + C	10
Conformed	E	6
De-motivated	B + D + F	34 **
** $p = <0.0001$		

MOTIVATION & PERFORMANCE



Graph & Table 22 *n = 50*

Conclusion

Results of this study support the theory that a complex matrix of key factors influence the quality of pupil performance when engaged in technology project work. The study has indicated that strategies adopted by both pupils and teachers affect the quality of the project work produced. Creativity and cognitive style have been shown to be a possible indicator of a pupil's ability to achieve successful outcomes when measured by examination results.

Quite rightfully, syllabus designers would have us believe that their assessment criteria allow for the development of well designed products that can also achieve excellent examination results. However, there appears to be a mis-match between theory and practice. In a school situation where for pupils, parents and teachers alike the examination result is of great importance, the process adopted has certainly imposed a *"procrustean regime"* [5] upon the majority of pupil's design activities. Pupils may end up with satisfactory marks for their GCSE examination but a disappointingly large proportion of them remain sceptical about the activity in which they have been involved and are dissatisfied with the practical outcomes they have produced.

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Please contact the Author if you are wishing to publish any part of this paper.

E.S Atkinson
University of Sunderland
School of Education
Hammerton Hall
Sunderland SR2 8JB e-mail: stephanie.atkinson@sunderland.ac.uk

KEY FACTORS INFLUENCING THE QUALITY OF PUPIL PERFORMANCE WHEN ENGAGED IN TECHNOLOGY PROJECT WORK

E Stephanie Atkinson
University of Sunderland

Abstract

This paper sets out to report the research findings concerned with the influence of selected key factors on the performance outcomes of technology project work produced by secondary school pupils at the age of sixteen. It is based on data collected during a study that involved fifty pupils and their technology teachers. The research is focused on eight case study schools and forms part of an on-going programme that initially involved fifty schools selected from seven Local Education Authorities in the North East of England. A case study approach based on observation and informal interviews was used to monitor the selected sample. Their progress was followed on a fortnightly basis throughout the designing and making of their General Certificate of Secondary Education (GCSE) technology examination project.

Data collected pre- the project, during the project and once the project was completed will be correlated and conclusions will be drawn.

Introduction

This paper sets out to report the research findings concerned with the influence of selected key factors on the performance outcomes of technology project work produced by secondary school pupils. The project work was carried out by pupils engaged in practical design-and-make tasks for a GCSE technology examination at the age of sixteen.

In schools in the United Kingdom technology involves a complex integration of processes, concepts, knowledge and skills [1]. As the subject area has developed so has the use of the design process as a method of delivering and examining subject content (for example: [2,3,4]). These processes have developed out of the linear design models used in the early 1960's [4]. As teachers have become more experienced in working with them and as the subtlety of the process has become more apparent, so the models have become increasingly complex. By the end of the 1980's many models of the process had been developed [5]. It was acknowledged that some models became so complex that they were confusing to those who used them [4]. In 1986 the Department for Education and Science suggested that what was needed was a loose framework to guide designing rather than a well defined process model which they saw as a *"straitjacket"*. This approach was supported by Lawson [6] who stressed that designing required flexible procedures.

However, the importance of the examination results to pupils and teachers alike dictate that the nature of assessment and its criteria influence what is learnt and how it is taught [7,8]. Additionally, the need for accountability has led assessment to become overly objective [9]. As far as examination syllabuses have been concerned, this has lead to the use of a prescriptive design process with a very specific list of criteria to be met. Layton [5] aptly suggested that if teachers were not careful the process could impose *"a procrustean regime"* on the way pupils designed. Pupils have become 'outcome driven', with the process becoming a series of products. To obtain good examination grades pupils have had to provide evidence that each stage of the specified process has been addressed, irrespective of whether it was appropriate to the design of their particular product or not.

In addition to the approach taken to designing, research has indicated that a complex pattern of factors affect a pupil's performance and learning during design and technology project work [4,10,11,12]. There are those attributes that a pupil brings with them: their gender; general ability; creative ability; cognitive style; knowledge base; curriculum experience - and the attributes of the task itself: its contextual location; its structure; its likely demands upon the pupil. In the context of design and technology the complex relationship between all these factors and such external forces as culture, context, parental and teacher expectations cannot be underestimated. Nor can the effect of attitude upon motivation be ignored [13].

The Study

Building upon previous phases of an on-going research project [14,15,16] this paper has sought to investigate the relationship between three selected factors and pupils ability to produce well designed, well made products, whilst at the same time satisfying examination assessment criteria. The factors used to select the pupil sample were pupils' perceived enjoyment of technology project work; pupils' perceived capability to achieve a successful result during different phases of a project; pupils' predominant cognitive style.

Cognitive style has been shown to be closely related to an individual's ideas and attitudes [17]. The perception and evaluation of information are integral to the act of designing, therefore each pupil's predominant cognitive style was seen as a possible indicator of performance during engagement in technology project work.

The research targeted eight case study schools selected from the on-going research programme involving fifty schools in seven Local Education Authorities in the North East of England. The paper focuses on data collected from fifty pupils and their technology teachers.

The sample of pupils was chosen using two data gathering instruments when the pupils were aged fifteen. Firstly, a questionnaire investigating pupils perceptions of their abilities in technology project work was completed by all the pupils in a mixed ability, mixed gender technology class from each of the eight schools (n=112). In addition, the pupils were asked to complete a computer presented, self-administered Cognitive Styles Analysis (CSA) test. This was designed by Riding in 1991 to assess two fundamental cognitive style dimensions, verbal-imagery and wholist-analytic.

The data from these two tests allowed a matrix of eight possible pupil types to be identified and selected for tracking (see Table 1). A case study approach based on observation and informal interviews was used during this phase of the research. The progress of the fifty pupils was followed on a fortnightly basis throughout their technology examination project work.

Notes, sketches and diagrams were made on observation sheets during each visit. These sheets recorded the progress made by each pupil between the visits; the research, design and manufacturing methods utilised; the style of communication and modelling used throughout the project; all difficulties encountered, both those referred to by the pupil and those observed during the visit.

FINAL SAMPLE SHOWN ON A MATRIX OF EIGHT IDENTIFIED PUPIL TYPES								
	Imagers				Verbalisers			
School Code	A	B	C	D	E	F	G	H
007	-	A	A	A	W	A	A	W
021	W	-	A	W	A	W	W	-
031	-	-	W	A	A	W	A	W
032	W	-	A	W	-	A	A	A
035	-	W	A	A	-	A	A	W
036	W	A	-	A	-	W	A	A
047	W	A	W	W	A	-	A	A
049	A	-	A	A	A	-	A	W

A = Imagers who enjoy designing and believe can design
B = Imagers who enjoy designing but believe cannot design
C = Imagers who prefer making but believe can design
D = Imagers who prefer making and believe cannot design

E = Verbalisers who enjoy designing and believe can design
F = Verbalisers who enjoy designing but believe cannot design
G = Verbalisers who prefer making but believe can design
H = Verbalisers who prefer making and believe cannot design

W = Wholist A = Analyst

Table 1 *n = 50*

Delivery programmes, devised by each school enabling pupils to cover all the examination syllabus requirements, were observed. These fell into three categories. Type one, devoted all of the technology lessons every week to completing one aspect of the syllabus before moving on to the next unit of work. Type two, split the technology time each week equally between Core and Extension work. Type three, integrated Core and Extension work, devoting the majority of time in year 11 to a single project.

Each school followed examination guidelines concerning the number of teaching hours to be allocated to the technology project. However, the actual amount of time used for the project varied greatly from pupil to pupil. The differences being accounted for by the amount of 'extra' time pupils were willing to spend on *their projects* both at home and in school.

Through observation of approaches to designing adopted by the pupils it became apparent that teachers utilised one of two strategies to enable their pupils to meet deadlines and address the Examination Board's assessment criteria. Analysis of the two approaches suggested that in one the teacher tended to act as a collaborator, whilst in the other a more interventionist mode of teaching was adopted (see Diagram 1).

No matter which teaching strategy was employed the start of the projects were seen to follow a similar pattern. Examination Boards suggested contexts and pupils identified their own opportunity or need to address. This was an important aspect of the process as it gave the pupils ownership of their projects [14].

All pupils were encouraged to carry out research and analyse their findings in order to devise a specification for their outcome. At the initial ideas stage of the project in each school pupils formulated several ideas to meet the requirements of the brief. The amount of time allocated to this section of the work varied considerably depending upon which delivery programme had been adopted by the school.

In schools where teachers utilised an 'interventionist' approach, pupils tended to move very quickly from initial ideas to the manufacturing stage. Very few pupils produced carefully detailed drawings. Development of the chosen idea was carried out as manufacturing took place. It was at this point that these pupils lost ownership of their idea. Decisions were made

TWO OBSERVED TEACHING STRATEGIES

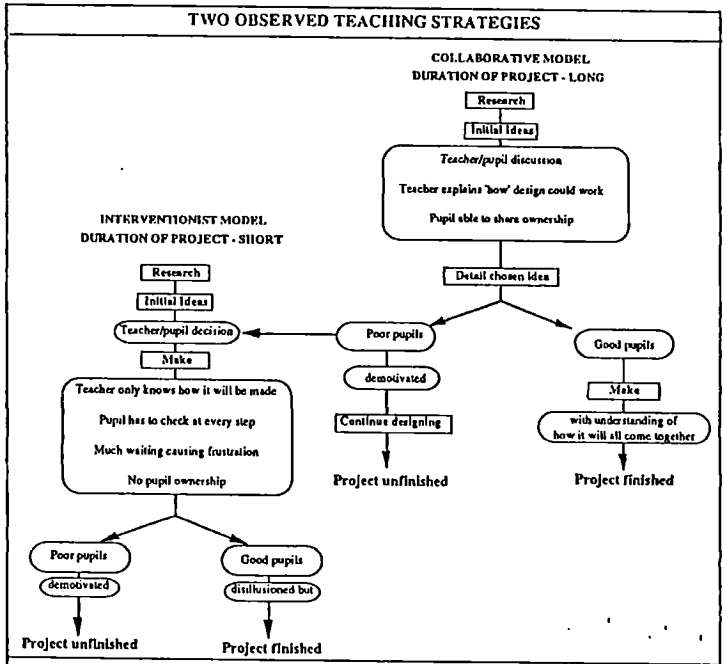


Diagram 1

in a piecemeal, interventionist, manner by the teacher. This was seen to have a de-motivating effect upon many pupils which in turn led to a considerable number of incomplete projects when the hand-in date was reached (see Table 2).

TABLE SHOWING NUMBER OF PROJECTS COMPLETED BY THE DEADLINE					
Interventionist Model			Collaborative Model		
School	Complete	Unfinished	School	Complete	Unfinished
007	5	2	031	3	3
021	2	4	032	4	2
035	1	5	036	4	2
047	3	4			
049	0	6			
Total	11	21		11	7

Table 2 *n = 50*

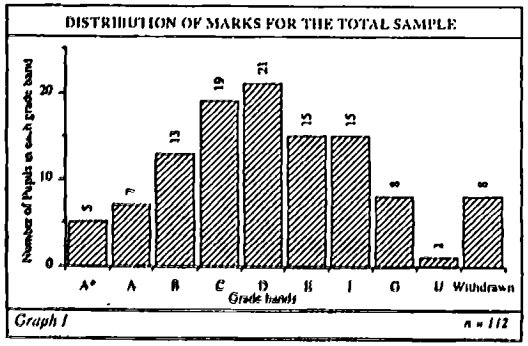
In schools where teachers exhibited what has been defined as the 'collaborative' model, a pupil's lack of time management skill was not seen as a problem in the early stages of the project. Time was given to individual pupil-teacher discussions. Detailing of the chosen idea became a collaborative effort between pupil and teacher, with pupils still feeling that they had ownership of their idea. Many of those who succeeded in reaching the manufacturing stage of their project were able to complete their work in time for assessment. For those pupils who did not the problems associated with this model came about through boredom. From a fairly early stage these pupils saw the design process stretching interminably ahead of them. The manufacturing stage which they looked forward to seemed an impossible target to reach. This caused a noticeable slowing down of work rates that only exacerbated the situation.

In the total sample ninety-five percent of pupils reached the manufacturing stage although the majority of products produced displayed a lack of craftsmanship or fitness for purpose and many of them were un-finished. When assessment time was reached the majority of finished projects had required pupils to use extra hours of non-timetabled time in order to complete the manufacturing process and evaluation.

Once pupils examination projects were marked, the fifty pupils were sampled using a creativity test and a questionnaire that investigated the pupils' perceptions of their success in their examination project work. This data was then correlated with the school's internal, moderated assessment mark for each project and the selection of sample factors for each pupil.

Results

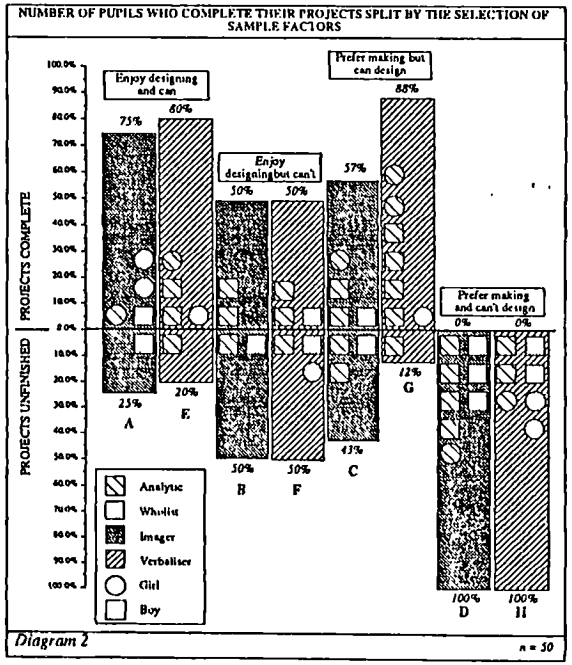
In the first instance the moderated project work marks for the total sample were entered onto a graph (see Graph 1). The distribution of marks was then checked against the normal distribution curve achieved by the total candidature for the GCSE technology examination and found to be similar.



In order that correlations that had been observed during the case study could be verified the data collected was systematically analysed using two computer software packages, FileMaker Pro and StatView. Three particular correlations were targeted for discussion in this paper. Firstly, the correlation between gender, cognitive style, pupil perception of their ability to achieve satisfactory outcomes; pupil perception of their enjoyment of the process and final marks for the project work; were assessed Secondly, the correlation between inherent creativity and pupil motivation during technology examination project work were analysed. Thirdly, clarification was sought regarding the relationship between delivery programmes and strategies adopted by teachers and the design process used by pupils during their technology project work. These have been discussed separately although it is recognised that in the 'real world' of the classroom all these factors are inextricably intertwined.

Analysis of the data collected suggested that gender, pupil type and perceived ability to achieve satisfactory outcomes affected how successfully pupils were able to tackle project work. Evidence would support the notion that a pupils cognitive style could be a useful indicator of a pupils potential to be successful in practical technology project work for examinations.

When the result of completion or non-completion of projects was correlated with the sampling matrix referred to in Table 1, interesting clusters were observed (see Diagram 2). Those pupils who believed that they could design had more chance of completing the whole project than those who believed they could not design. Many of those who enjoyed designing more than making but believed that they had poor design ability were also unable to meet the project deadline.



When the same data was analysed using cognitive style as a starting point, a high proportion of analytic-verbalisers were found within the group of pupils who believed that they could design, whether they enjoyed designing or preferred making. Verbalisers were found to have an equal, and in several instances, better completion rate than imagers. Whilst, it was also

noted that one hundred percent of those who preferred making and believed they could not design failed to complete their projects, whether they were, verbalisers or imagers.

Design methodologists suggest that designing should be an *holistic experience* [4,18]. Imaging is considered to be central to the development of ideas [4, 19,20]. However, those pupils who were imagers and wholists were found to be the ones who achieved the poorest results (see Table 3). Correspondingly, those who were analytic and either an imager or a verbaliser tended to achieve high marks. Through a combination of observation and discussion with pupils during engagement in their projects the researcher sought to identify and quantify the reasons for these features of the data.

AVERAGE MARK SPLIT BY ALL OF THE SELECTION OF SAMPLE FACTORS

Average Mark	Enjoyed designing and can		Enjoyed designing but can't		Prefered making and can design		Prefered making and can't design	
	Analytic	Wholist	Analytic	Wholist	Analytic	Wholist	Analytic	Wholist
Verbalisers	75%	67%	40%	22%	64%	45%	43%	39%
Imagers	88%	48%	62%	20%	66%	36%	32%	28%

Table 3 — *n = 112 minus 8 pupils who were withdrawn from the examination*

As drawing is such an important aspect of designing one might have expected verbalisers to achieve significantly lower marks for their projects than imagers. However, this was not the case. A number of explanations for this were found. Firstly, not all imagers were able to draw. In the sample only forty-six percent of imagers believed they had satisfactory drawing skills, whilst during observation only twenty-one percent were actually found to have adequate skills in this area (see Table 4). Nor were the majority of imagers able to rely upon their writing skills.

TABLE SHOWING PUPILS PERCEIVED AND OBSERVED SKILLS

	Drawing Skills		Writing Skills	
	Imagers	Verbalisers	Imagers	Verbalisers
Perceived ability	11	14	9	16
Observed ability	5	6	4	13

Table 4 — *n = 50* — *24 Imagers, 26 Verbalisers*

For those who avoided writing the on-going analysis and evaluation was in subtle forms within drawn images. Access to pupil's immediate thoughts at the time of the conception of ideas was impractical, nor was it easy to credit these thoughts objectively during the assessment process. In comparison, those who were verbalisers communicated their thoughts in a form that was more easily interpreted by teachers during assessment, thereby gaining them valuable marks.

Secondly, in order to ensure that pupils met each of the assessment criteria teachers have split the process into easily managed units of work. Observation showed that these were tackled often in isolation before the next aspect of the process was discussed. The holistic nature of the process was therefore fragmented, thus playing into the hands of those who were analytic.

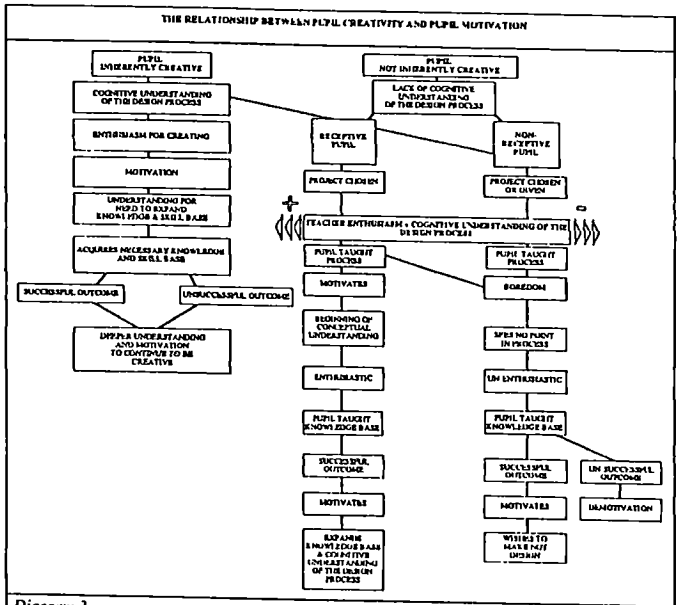


Diagram 3

For the second targeted correlation of this study, the relationship between creative ability and pupil motivation during the examination project work was analysed (see Diagram 3). The collected data supported observations made in an earlier phase of the on-going research project [15].

In the sample there was found to be two categories. A small group who were inherently creative and a significantly large group who were not (see Table 5). Evidence showed that within each of these categories there were two sub-groups. The inherently creative could be divided into those who were able to design within the constraints of the GCSE examination process model, and those who were inhibited by such a structured approach.

TABLE SHOWING MEAN MARKS GROUPED BY CREATIVITY CATEGORIES

Category	Mean Mark (expected result)	No. of pupils	Mean Mark (unexpected result)	No. of pupils	Categories	
A	91%	4	-	-	Creative Pupils A = Inherently creative and motivated B = Inherently creative but de motivated	12
B	76%	4	20%	4		
C	66%	7	-	-	Not very creative pupils C = Receptive and motivated D = Receptive but de motivated E = Unreceptive but conforming F = Unreceptive and de motivated	38
D	49%	8	-	-		
E	25%	5	90%	1		
F	17%	10	46%	7	Total	50
					chi - square	338 00
					p - value	< 0 0001

Table 5 — *n = 50*

In the second category there were those who were not creative nor were they receptive towards working with the design process offered to them. This group were seen to become increasingly de-motivated as the project work progressed. The other sub-group were willing to accept the design methodology taught although they too were not naturally creative. At the start of the project these pupils were motivated because they wished to produce satifactory outcomes of which they could be proud. However, as time progressed they too became increasingly dissatisfied with the process they had been asked to adopt. This group maintained their motivation by concentrating upon achieving a good examination result instead.

Observation of those who were inherently creative but able to work within the constraints of the examination structure showed that they had the motivation to persevere however difficult the task became. Within the group who were creative but found the structure of the process inhibiting, there were those who failed to become involved in their work for the majority of the course and then produced an excellent project at the last minute. There was also an equal number of pupils with high levels of creative ability who never came to terms with the approaches adopted. They failed to produce anything of merit ending up with very poor examination results (see Table 5) and a sceptical view of the design process they had been expected to adopt.

The other two groups who were not naturally creative needed external encouragement to help them through the process. The progress of these groups was affected by a number of key factors specific to the task of designing and making. Factors such as a pupil's level of conceptual skills and both two and three dimensional modelling skills. The evidence from the research would suggest that the lynch pin that could cause these factors to fall into place for the pupil, was the teacher. An enthusiastic, skilful teacher was able to help pupils to approach project work positively and achieve successful outcomes. The teacher needed to: have a thorough understanding of designing beyond the requirements of the examination assessment criteria; enhance and encourage creativity; prevent pupils from using inappropriate forms of modelling whilst designing; enable pupils to plan their manufacture processes in order that outcomes were produced that not only satisfied examination criteria but also produced products of which the pupils could be proud.

The third correlation between delivery programmes and strategies adopted by teachers and the design process utilised by pupils during their technology project work provided some interesting data. The approach adopted in the two strategies and three delivery programmes have already been discussed, although correlation of the factors need further clarification.

Evidence would suggest that the speed of the process used by schools adopting an interventionist approach failed to provide pupils with enough time for the maturation of thoughts and ideas at each stage of the process. Although pupils in schools where collaborative strategies were used had the same amount of time for their projects, the evidence would suggest that the spread of this time over months rather than weeks allowed pupils access to this important maturation time. Collaborative approaches also gave teachers time to familiarise themselves with pupil's projects. This enabled them to prevent some of their pupils from making un-wise design decisions. Whereas many teachers using interventionist strategies were found to be frustrated by their inability to prevent design disasters occurring.

When each of the individual aspects of the design process were viewed in isolation the structured nature of the interventionists approach was seen to have more success than the collaborative approach during early written stages of projects. Although, this advantage was not sustained through out the entire project.

As was anticipated during observation of the pupils at work, the collaborative approach produced better results in such aspects of the process as initial ideas, detailing the chosen idea, planning for manufacture, and the manufacture of the product itself. All aspects in which thinking time was an important factor (see Table 6).

TABLE SHOWING MEAN SCORES FOR ASPECTS OF THE DESIGN PROCESS

Aspect of the Process	*Interventionist Mean*	*Collaborative Mean*
Specification & Analysis	2.355	1.867
Research	2.387	2.000
Initial ideas	1.806	2.200
Detailing chosen idea	1.935	2.867
Planning	1.355	2.067
Manufacture	1.900	2.600
Product	1.645	1.933
Evaluation	1.710	1.800
	Maximum Score = 4	

Table 6 *n = 50*

As far as design folders were concerned very few were completed without considerable pressure having been applied by the teachers. Motivated pupils in all schools were persuaded to re-work or 'pretty-up' existing work and fill gaps in their design process. The limited time spent on the folder work in the *'interventionist' model meant that the folders, of even those* who believed that they could design, presented little evidence of designerly thought at the various stages of the process. In an attempt to present the required evidence for assessment, pupils were encouraged to complete written sections describing their decision making procedures. This was often carried out retrospectively in the pupils own time when they were pulling their design folder together.

The design work of those working in schools where a 'collaborative' approach had been adopted displayed two different levels of success within their folders. Those who enjoyed the act of designing produced visually excellent folders which contained creative thinking but also a considerable amount of re-worked and over-worked sheets. Those who did not enjoy designing produced numerous sheets of work attempting to satisfy the examination criteria but showing little evidence of designerly thought.

In all schools in the sample, the lack of skills and understanding regarding materials and processes lay at the root of many of the pupil's problems during both the design and the manufacturing stage of their project work. Pupil's ideas, when carried through to the

manufacturing stage, caused many of them to work beyond their technological capability. In an attempt to support all pupils throughout this aspect of their work teachers were seen to develop a strategy in which they designed solutions to pupil's problems in their heads, as the need arose. The necessity for pupils to have an understanding of the way forward was given a low priority. This was particularly the case in those schools adopting an interventionist approach where time was at a premium. However well intentioned this course of action may have been, the evidence from this study would suggest that it had a de-motivating effect upon many of the pupils. The common belief that ownership develops a sense of responsibility, pride, and the motivation to succeed would support the use of strategies that allow pupils to retain ownership of their idea throughout the duration of their project.

With regard to completion rates, analysis of the data showed that ninety-two percent of those pupils who were entered for the examination in schools that had adopted a 'collaborative' approach to designing and only fifty-six percent of pupils in schools that had adopted an 'interventionist' approach finished their projects by the schools initial deadline (see Table 2). By assessment time this picture had been improved in some of the schools adopting an interventionist strategy. In these schools pupils were encouraged to finish projects in their own time. This was made possible because project deadlines were set earlier in the academic year than assessment deadlines. In all the schools adopting a collaborative approach, where non-completion of projects was not as much of an issue, hand-in dates had been set to coincide with assessment deadlines thus leaving little flexibility for the few un-finished projects to be completed.

A disappointing feature of the majority of the products produced, no matter which strategy had been adopted, was their poor quality both in terms of design and manufacture. No pupil, working with a teacher who had adopted an 'interventionist' approach to designing, could be said to have produced a product that was well designed and well manufactured.

Analysis of the three delivery programmes and two strategies adopted by the schools, indicated that neither the 'collaborative' or the 'interventionist' model were entirely successful. Neither of them allowed pupils to develop entirely valid approaches to designing. The nature and speed of the process in schools utilising 'interventionist' approaches did not allow for the development and detailing of creative, innovative ideas. On the other hand the slowness of the process, particularly at the design stage, in schools adopting a 'collaborative' model caused pupils to become overly concerned with the process at the expense of well designed outcomes.

Conclusion

Results of this study support the theory that a complex matrix of key factors influence the quality of pupil performance when engaged in technology project work. The study has indicated that strategies adopted by both pupils and teachers affect the quality of the project work produced. The cognitive style of pupil's has been shown to be a possible indicator of a pupils ability to achieve successful outcomes when measured by examination results.

Quite rightfully, syllabus designers would have us believe that their assessment criteria allow for the development of well designed products that can achieve excellent examination results. However, there appears to be a mis-match between theory and practise. In a school situation where for pupils, parents and teachers alike the examination result is of great importance, the process adopted has certainly imposed a *"procrustean regime"* [5] upon the majority of pupil's design activities. Pupils may end up with satisfactory marks for their GCSE examination but most of them remain sceptical about the activity in which they have been involved and are disappointed in the practical outcomes that have resulted.

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Appendix 7

Teacher hand outs from Phase Two

Comprehensive TECHNOLOGY DEPARTMENT

TECHNOLOGY REPORTS from all areas and all projects must have all these sections and in this order. Always use your very best graphical techniques, that is i) use personalised plain paper [no lines] ii) use a backing sheet with straight lines to keep your work neat iii) try to keep the same "style" right through the whole project but at the same time use different methods :- some hand written some computer work, some stencilled, use some colour.

This is an honest and detailed account of the making ,quality and performance of your item look to the specification for what it must do A presentation drawing in 3D and colour should be included

This has in it a working drawing [Orthographic or Isometric] which shows details such as materials ,sizes joints and colours of all parts. This should have enough information that you could give it to another person and they could make without needing to talk to you. Such as a flow diagram showing the order that jobs should be done in.

EVALUATION

PLAN +MAKE

ATTAINMENT TARGET FOUR

Write in this section why you chose one particular idea and why others were rejected. Before this your idea will only be as a sketch with some suggestions about materials and methods of manufacture ,take this and work on and improve it until you can prepare your plans.

DEVELOPMENT

ATTAINMENT TARGET THREE

Produce a range of ideas using different materials, production methods and levels of difficulty. Use coloured drawings (some in 3D) and add notes to explain . This section of your file should be one of the biggest

DESIGN IDEAS

ATTAINMENT TARGET TWO

SPECIFICATION

NATIONAL CURRICULUM ATTAINMENT TARGET ONE

Based on your research detail exact limits and factors which your final solution MUST meet, such as size,weight, materials performance and safety . ALL OF THE FOLDER BEFORE THIS SECTION HELP YOU TO WRITE IT. AND ALL OF THE FOLDER AFTER THIS. LOOK BACK TO IT. AND SO IT IS ONE OF THE MOST IMPORTANT. LOOK BACK TO YOUR SPECIFICATION WHEN CHOOSING YOUR FINAL SOLUTION AND DURING EVALUATION.

RESEARCH AND ANALYSIS

ATTAINMENT TARGET FIVE IS CAPABILITY WITH I.T.

DESIGN BRIEF

Study and get as much information as you can from as many different sources as possible. Books, magazines, TV. Experts and other people who may be making a similar product. Look at materials,methods, ERGONOMICS costs aesthetics. always comment on your research don't just put information in without saying something about it and where you got the information from.

IDENTIFY PROBLEM OR NEEDS

CONTENTS

This is a statement which says what you intend to do to solve the problem or need that you have talked about in the first section.

TIME PLAN

It is the heart of Technology that you do things to try to do something to help people and make things easier them (That person may be your self and your need may be to be amused or entertained). Describe an area which you think needs improving and then look at the particular thing that this project will seek to improve.

TITLE PAGE

List of all of the sections in the project by title and page number

Name & year (& form)

date

Set out how long you are going to allow yourself to spend on each of the sections and remember to look back at this plan to see if you are keeping to it.

The front cover of your file will set the 'tone' of your project. It will have basic information about the project but it will also need to be attractive and clear . First impressions about a project can count for a great deal.

PROJECT TITLE

WHAT IS IN A DESIGN FOLDER?

1993

TECHNOLOGY (CHECK SHEET)

YEAR = 11 (EXAM GROUP)

NAME.....FORM.....LESSON..MON.../ FRI.

STAGES OF DESIGNING.

	FINISHED	DATE
1 RECOGNITION OF PROBLEM.		
2 PROBLEM ANALYSIS .		
3 RESEARCH		
4 ANALYSIS OF RESEARCH		
5 SPECIFICATION		
6 GENERATION OF IDEAS.		
7 DEVELOPMENT /CHOSEN DESIGN.		
8 PLANNING AND MAKING.		
9 MAKING		
10 EVALUATION		

COMMENTS

DATES

SCHOOL DESIGN AND TECHNOLOGY

DESIGN GUIDE

1) State the "problem".

2) ANALYSIS
Break down the problem to find out what is required.
Answer such questions as:
a) What should the solution do?
b) Where will it be situated?
c) Who will be affected by this problem or solution?
d) How much money will be available to make it?
e) Are any of the following important: size, weight, shape, colour, strength, safety?
f) How much time is available to produce a solution?

3) Produce a "Design Brief"
This should be a clear statement of what it is that is to be designed.
A "Specification" may be included to give details of what is to be expected from the solution.

4) RESEARCH AND INVESTIGATION
Collect appropriate information from books, magazines, photographs, or drawings from observation. Write to anyone you think may have useful information requesting help, detalils, or guidance. Talk to those who may know something about your problem, and record the information you are given.

5) INITIAL IDEAS
Sketch and make notes on a selection (about six) of possible solutions to the problem. Each solution should be based on a different principle. Indicate your choice of "best" solution clearly, and give reasons for your selection and rejection.

6) DEVELOPMENT
Make detailed sketches and notes on the "best idea" to explain:
a) What it does and how it does it.
b) Which materials are used, and why?
Give alternatives, and reasons for selection and rejection.
c) How it will look (including surface finishes).
d) How it is constructed (and why the methods were chosen .

7) WORKING DRAWING
Draw three views in orthographic projection, fully dimensioned. A parts list or cutting list should be included. Indicate the scale used in the drawing.

8) MODEL
Produce a simple model of the project, as quickly as possible to show the principles involved. (Use paper, card, etc.)

9) PROTOTYPE
Make the designed object, and modify the working drawing if required as you go.

10) EVALUATION
Evaluate the prototype. i.e. Write answers to the following questions:
Does it work? Could it work better? Could it be made more simply or more economically? Will it continue to perform as it does now? What would you change if you were to build a Mk.2. version?

Appendix 8

Information regarding software packages used for analysis of the collected data

StatView highlights

StatView is the first software package that offers in a single application all the tools that scientists and researchers need to analyze and present their data. In the past, you first entered data into a spreadsheet program where you performed transformations or mathematical manipulations; the transformed data was then imported into a second application for statistical analysis; a third program was used to create graphs; and finally a drawing program was required to prepare tables and graphs for presentation. Each of these transfers added time to your project, introduced the possibility of error, and forced you to learn separate applications. By allowing you to perform all these tasks inside one application, StatView can significantly decrease the time you spend on data analysis and presentation.

Spreadsheet-like data management

StatView's data management give you full control over your data. Data is stored in a column/row format, like a spreadsheet. You have many options for customizing the appearance of the dataset: font, size, number of decimal places, etc. The dataset offers a wide variety of data types including real, integer, date/time, string, currencies, and more. And the variable attribute pane allows you to view descriptive statistics for all your variables at any time and change the type and format of any column with a single click of the mouse.

StatView's formula generator contains over 150 functions which can be used to create new variables using simple or complex mathematical, statistical, Boolean, and other expressions. If your original data columns change, formula-generated columns change accordingly. The formula generator also generates numerous series, distributions, and random numbers. You can also easily explore your data by restricting an analyses to any user-defined subset of a dataset using the Criteria feature.

Fully customizable graphs and tables

Graphs offered by the program include interaction bar, line, and point charts, pie charts, univariate and bivariate scattergrams and line charts, frequency distribution histograms, percentile plots, regression plots, box plots and more. You can add error bars to your graphs, using any error type you wish. Simple and polynomial regression lines and equations can be added to scattergrams.

Every component of a graph is individually customizable, including the font and size of axis labels, point type, size, and color, bar or pie slice fills and color the location and size of tick marks, graph frame style, and axis bounds. The exact dimensions of each graph can be specified to meet the requirements of any journal or report format. StatView also offers ten table formats and allows you to create your own table format as well.

A complete drawing environment

All output appears in our view window which has all the features of a drawing document and can cover as many pages as you wish. You can move drawn objects, text, graphs and tables to anywhere in this document. You can align objects to a grid or use rulers to precisely position your output. You can group objects together and position them in different layers.

The Draw menu offers sophisticated tools for adding embellishments to your output, such as arrows, rectangles, lines, splines, and more. You have complete control over color. Text of any font, size, or style can be added anywhere in the view

Broad-based statistics

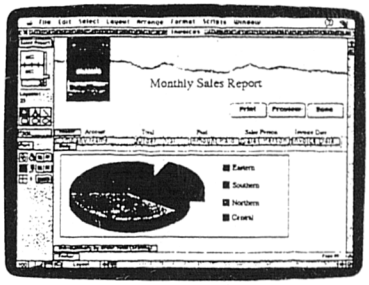
Of course, StatView offers a comprehensive range of statistical analyses. From basic descriptive statistics to ANOVA and factor analysis, to a wide range of nonparametric tests. Each statistic offers you many options for specifying to exact detail the parameters of your analysis. And best of all there are no intimidating commands you have to learn to use a statistic. StatView's expertly designed dialog boxes allow you to quickly and easily choose your statistical tests. This statistical breadth and ease of use has made StatView the most popular statistics package on the Macintosh.

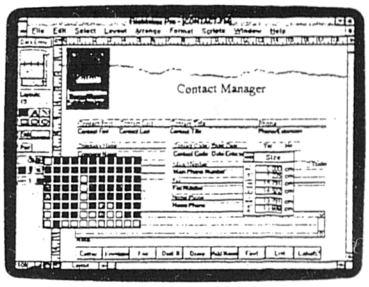
FileMaker Pro 2.0

Put everything where you can get it.

When it comes to managing your data, you won't find a more versatile program than FileMaker Pro. Whether you're in a Macintosh or Windows environment, FileMaker Pro looks and works exactly the same, taking advantage of the graphical interface to let you view your information dozens of different ways.

With FileMaker Pro, a host of graphical tools gives you access to powerful layout and organisation features without the need for programming. These tools enable you to create visually appealing, professional-looking reports and forms. And as your needs grow, FileMaker Pro can grow right along with you, creating a comprehensive, file-sharing, workgroup environment.





Whether you're in a Macintosh or Windows environment, the FileMaker Pro graphics tools turn your data into useful, informative reports.

FEATURES

- Create data-entry and report layouts with the power of graphics
- Multiple-file lookups for automatically retrieving data from other files, even across a network
- Powerful ScriptMaker™ automates task sequences and menu operations
- Ready-to-use business templates for common data management tasks
- Platform-transparent file compatibility between Windows and Macintosh environments
- Attach commands or scripts to buttons without programming
- Complete workgroup support and security down to the field level

For Windows version:

- Multi-user data sharing utilises Windows Dynamic Link Libraries to support Novell NetWare and PhoneNet Talk networks
- Data import capability from popular DOS, Windows, and Macintosh formats such as dBASE, Lotus 1-2-3, and more

HOT TIP

- Access Macintosh graphics directly, and transfer to other applications through the Windows clipboard

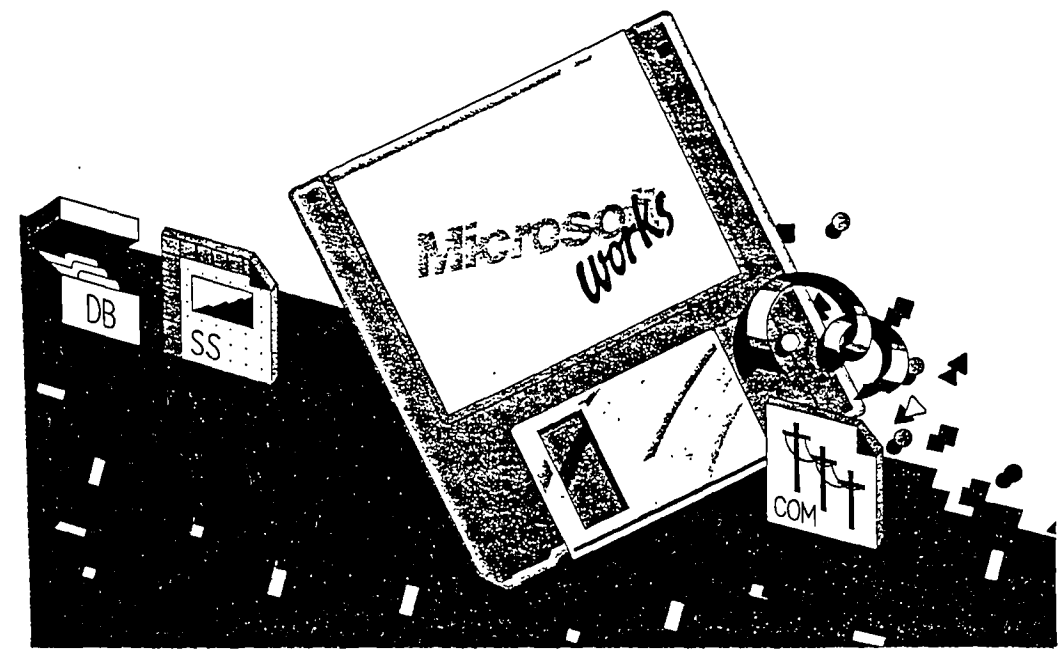
CLARIS

FileMaker Pro

Welcome to Microsoft Works — all the office tools you may ever need:

- The Word Processor with spelling checker, mail merge, and drawing
- The Database with reporting
- The Spreadsheet with charting and drawing
- Communications
- Macros and a print preview feature in all the tools

Use the Microsoft Works tools to automate your work. The limits are up to you.



Appendix 9 Audio evidence collected during Phase One and Phase Two Extension

Tapes of interviews with eight technology teachers during Phase One

Tapes of interviews with forty pupils during Phase One

Tape of interviews with two teachers during Phase Two Extension

Appendix 10 Raw data on discs for an Apple Macintosh computer (minimum System 7.1 and the appropriate software)

Data 1 - Disc with files of raw data from Initial Survey and Phase One

Data 2 - Disc with files of raw data from Phase Two and Phase Two Extension

The data contained in Appendix 9 and 10 are available on request.