Using Students' Views on Design and Technology to Inform Curriculum Review at Key Stage 3

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Abstract

This paper describes how the views of Key Stage 3 students were sought prior to the revision of the schemes of work for design and technology in Years. 7, 8 and 9. A questionnaire was issued to 346 students to learn more about how much they enjoyed their project work and also enjoyed various aspects of design and technology. They were questioned on the perceived difficulty of these projects and of the same aspects of design and technology. Finally, the importance of producing a tangible product or outcome was investigated. The results were analysed and some conclusions drawn.

Background

The English Schools Foundation (ESF) operates 15 schools in Hong Kong and offers education through the medium of English to a truly international student body. As with many other international schools around the world, the ESF curriculum adopts the English National Curriculum as a framework but:

1. whenever possible adapts the 'illustrative content' of this framework to take account of the individual needs of our students living and studying in Hong Kong (the local factor)
2. incorporates global issues, concepts and values which are not always fully reflected in the English National Curriculum (the international factor).
   (ESF Education Council, 1995)

Shatin College is one of five ESF secondary schools and it is in this establishment that the following study was undertaken.

Introduction

Whilst the review and evaluation of design and technology schemes of work is a constant, ongoing process, it is also the departmental policy at Shatin College to undertake a full and comprehensive update of course content every five years. This was last undertaken in 1995/96 and the next major review was therefore scheduled for 2000/01.

In the past, the evaluation process has consisted solely of 'top-down' teacher input, albeit influenced by informal student response to design and technology lessons, projects and activities. This time round, it was felt that a more systematic review of students' attitudes towards design and technology might provide the team with some useful and instructive feedback. As de Klerk Wolters (1989) succinctly states 'it is important to take into account students' interests, opinions and needs when developing technology curricula'.

It was therefore decided to canvass student opinion with regard to five main areas:

- the extent to which students enjoy the projects undertaken at Key Stage 3
- the perceived level of difficulty of the projects
- the perceived difficulty of various aspects of the design process
- the extent to which students enjoy different aspects of the design process
- the importance of producing a tangible 'product' at the end of a unit of study.

In choosing the above items we were influenced by the work of the National Foundation for Education Research, and in particular the approach adopted by them in their report on TEP schools in the UK (Schagen, 1999).

Methodology

The most efficient method of gathering data from a large group was felt to be a questionnaire. Multiple choice questions were utilised because of the ease and speed of response and since 'they have the advantage of rigour in the subsequent analysis' (Ali and Price, 1996). A Likert scale is the most suitable method for studying attitude patterning, however, opinions vary as to whether a four or five point scale should be employed. Classic 'Pupils' Attitudes Towards Technology'(PATT) studies have traditionally used the five-point scale but Hine (1997) discovered that students often found it easier to indicate the middle column than to make a decision if they found the question difficult. This tendency was also noted by Rennie (1987) when considering the PATT study Likert scale. A pre-test pilot was therefore conducted with a smaller sample to check this tendency and also to check the wording of the questionnaire. As a result of this, some minor modifications were made to the text and a forced-response, four-point scale was eventually chosen for the final questionnaire. The questions and responses were framed as follows (see Figure 1). The projects listed in B and C were specific to each year group (see Figure 2). The aspects of design and technology listed D and E were common to all year groups:

- research
- designing
- planning
- making (hand tools)
- using machinery
- evaluating
- written work
- timing of projects
- homework.

Figure 1.

A Are you male or female?

B How much do you enjoy working on each of these projects? (projects listed)

Very much A little Not much Not at all

C How difficult do you find each of these projects?

Very difficult Quite difficult Quite easy Very easy

D How difficult do you find the following aspects of design and technology?

Very difficult Quite difficult Quite easy Very easy

E How much do you enjoy the following aspects of design and technology? (aspects listed)

Very much A little Not much Not at all

- On some projects (e.g.control) you do not make something to take home. Is this disappointing?

Very disappointing Quite disappointing

Not very disappointing Not at all disappointing

Figure 2.

Year 7	Year 8	Year 9
Structures	Trophy	Logo Design
Basic Electronics	2D Mechanisms	Logo Chop
Marble maze	Graphics	3D Mechanisms
Key Tag (CAD)	Control (alarms)	555Timer
Control (air-con)	Electronics (switches)	Batch Production
Ballista	Mass Production	Graphics
Graphics	Soma Cube	Control (Robotics)
IDEA (pencil cases)	IDEA (toys)	IDEA (electrical goods)

Figure 3.

B &E	(Enjoyment)	Much/Not Much
C&D	(Difficulty)	Difficult/Easy
F	(Disappointment)	Disappointed/ Not disappointed

For the final percentages in each category, please refer to the results tables for Years 7, 8 and 9.

Procedures

Ideally, data would have been collected from all participants at the same time to minimise disruption and to reduce the risk of data corruption by eliminating cross-discussions between students. However, in practise this was not possible so the questionnaires were administered by subject teachers during individual design and technology lessons over a period of two weeks. Participation was both voluntary and anonymous.

Results

The responses on the questionnaires were collated by hand and the totals were entered into a spreadsheet which converted them into percentages. It was originally intended that the responses in all four columns would be presented and that the data would also be considered in terms of the gender of participants (hence question A). However, because of the large number of individual measures (over 12,800) and the limited time and resources available to analyse the data, the presentation of results was simplified. The top two and the bottom two responses in each question were totalled and polarised into forced-preference expressions (see Figure 3).

Limitations of the study

There are several weaknesses in the study. As mentioned above, the possibility of data corruption existed at the collection stage. Secondly, the samples in Years 8 and 9 were reduced in size after the Year 7 responses had been processed, due to the large amount of data involved and the time it took to process this. Thirdly, the statistical analysis is more simplistic and less rigorous than was originally intended. Nevertheless, some clear patterns have emerged which will be of use to the delivery staff when revising the Key Stage 3 units of study.

Interpretation of results

Enjoyment of projects

The data served to confirm some suspicions which were already held by teachers at Key Stage 3. In the past, concern had been expressed over the 'control' and 'IDEA' units of study in all years; their relatively low levels of student enjoyment would appear to support the need for revision across the key stage. In Year 9, the electronics unit has the lowest enjoyment rating and this too concurs with staff opinion regarding the success of that particular topic. Conversely, it is encouraging to see that projects which staff are very happy with (such as the Year 7 maze and ballista, the Year 8 trophy and the Year 9 logo) also enjoy high levels of enjoyment with the students. No revision is likely in these cases.

Difficulty of projects

It might be expected that those topics which the students find easy would be most popular but the survey does not support this. For example in Year 7, 41% of students found the ballista difficult, yet this topic had a very high 94% enjoyment rating. Similarly in Year 9, more than half the students found the mechanisms topic difficult yet it had a 75% enjoyment rating. Challenging work can, it seems, still be enjoyable. Conversely, 'control'

is seen as more 'difficult' than most other projects whilst it also has a low rating on the 'enjoyment' scale. Further research would be needed to establish the relationship between higher levels of difficulty and popularity. At the other end of the scale there are some projects which are regarded as very easy, such as mass production in Year 8 and the logo project in Year 9. The implication here is for revision to increase the rigour in these areas.

Enjoyment of aspects of design and technology

Across the key stage, written work and evaluations are the topics with the lowest enjoyment rating. In what is essentially a practical subject, it is not surprising that written work is relatively unpopular, but evaluative work is an essential aspect of designing and making and staff need to look again at how this is approached and delivered.

Difficulty of aspects of design and technology

In this area there were no extreme results which suggest the need for revision, although it is interesting to note that the perceived difficulty of 'making' increases in Year 8 and the difficulty of 'machining' increases in Year 9. This may simply be due to the fact that the work becomes more demanding and increasingly technical as the students increase in age.

Importance of a tangible product

The data concerning the importance attached to the production of a 'tangible product' is interesting. Disappointment is high in Year 7 if there is no tangible outcome (76%) and this diminishes steadily through Year 8 (67%) to a low of 43% in Year 9. This may have implications for the scheduling of work across the key stage, if pupil motivation is to be maximised.

Finally, it is reassuring to see how positively design and technology is viewed by Year 7 students but equally it is disappointing to see that this situation diminishes somewhat in Year 9.

Perhaps most encouraging of all is the fact that the core activities of designing and making (both with hand tools and machinery) appear to be consistently popular across the entire key stage. This presents a strong argument in favour of retaining a practical, materials-based approach to the subject as opposed to kit-based or 'Blue Peter' manufacturing. From the students' perspective, designing and making would appear to remain central to the subject, a philosophy which concurs with staff opinion.

KS3 D&T SURVEY - YEAR 7 (n=180)

ENJOYMENT OF CURRENT PROJECTS

PROJECT	MUCH	NOT MUCH
STRUCTURES	86%	14%
ELECTRONICS	90%	10%
MARBLE MAZE	95%	5%
KEY TAG (CAD)	86%	14%
CONTROL	59%	41%
BALLISTA	94%	6%
GRAPHICS	75%	25%
IDEA	51%	49%

FIND PROJECTS DIFFICULT/EASY

PROJECT	DIFFICULT	EASY
STRUCTURES	26%	74%
ELECTRONICS	34%	66%
MARBLE MAZE	22%	78%
KEY TAG (CAD)	18%	82%
CONTROL	37%	63%
BALLISTA	41%	59%
GRAPHICS	39%	61%
IDEA	21%	79%

ENJOYMENT OF ASPECTS OF D&T

ASPECTS	MUCH	NOT MUCH
RESEARCH	49%	51%
DESIGNING	88%	12%
PLANNING	66%	34%
MAKING	86%	14%
MACHINERY	91%	9%
EVALUATING	50%	50%
WRITTEN	50%	50%
TIMING	75%	25%
HOMEWORK	66%	34%

FIND ASPECTS OF D&T DIFFICULT/EASY

ASPECTS	DIFFICULT	EASY
RESEARCH	38%	62%
DESIGNING	15%	85%
PLANNING	26%	74%
MAKING	32%	68%
MACHINERY	28%	72%
EVALUATING	29%	71%
WRITTEN	23%	77%
TIMING	29%	71%
HOMEWORK	25%	75%

DISAPPOINTMENT IF NO TANGIBLE PRODUCT

DISAPP.	NOT DISAPP.
76%	24%

KS3 D&T SURVEY - YEAR 8 (n= 86)

ENJOYMENT OF CURRENT PROJECTS

PROJECT	MUCH	NOT MUCH
TROPHY	90%	10%
2D MECHANISMS	68%	32%
GRAPHICS	61%	39%
CONTROL	52%	48%
ELECTRONICS	81%	19%
MASS.PROD.	82%	18%
IDEA	56%	44%
SOMA CUBE	83%	17%

FIND PROJECTS DIFFICULT/EASY

PROJECT	DIFFICULT	EASY
TROPHY	41%	59%
2D MECHANISMS	27%	73%
GRAPHICS	33%	67%
CONTROL	48%	52%
ELECTRONICS	47%	53%
MASS.PROD.	5%	95%
IDEA	13%	87%
SOMA CUBE	19%	81%

ENJOYMENT OF ASPECTS OF D&T

ASPECTS	MUCH	NOT MUCH
RESEARCH	56%	44%
DESIGNING	89%	11%
PLANNING	58%	42%
MAKING	83%	17%
MACHINERY	85%	15%
EVALUATING	41%	59%
WRITTEN	33%	67%
TIMING	73%	27%
HOMEWORK	48%	52%

FIND ASPECTS OF D&T DIFFICULT/EASY

ASPECTS	DIFFICULT	EASY
RESEARCH	32%	68%
DESIGNING	18%	82%
PLANNING	29%	71%
MAKING	46%	54%
MACHINERY	28%	72%
EVALUATING	44%	56%
WRITTEN	35%	65%
TIMING	35%	65%
HOMEWORK	30%	70%

DISAPPOINTMENT IF NO TANGIBLE PRODUCT

DISAPP.	NOT DISAPP.
67%	33%

KS3 D&T SURVEY - YEAR 9 (n=80)

ENJOYMENT OF CURRENT PROJECTS

PROJECT	MUCH	NOT MUCH
LOGO	79%	21%
LOGO CHOP	78%	22%
3D MECHANISMS	75%	25%
ELECTRONICS	56%	44%
BATCH.PROD.	68%	32%
GRAPHICS	77%	23%
CONTROL	59%	41%
IDEA	49%	51%
MIRROR	77%	23%

FIND PROJECTS DIFFICULT/EASY

PROJECT	DIFFICULT	EASY
LOGO	10%	90%
LOGO CHOP	25%	75%
3D MECHANISMS	56%	44%
ELECTRONICS	43%	57%
BATCH.PROD.	31%	69%
GRAPHICS	32%	68%
CONTROL	48%	52%
IDEA	25%	75%
MIRROR	42%	58%

ENJOYMENT OF ASPECTS OF D&T

ASPECTS	MUCH	NOT MUCH
RESEARCH	47%	53%
DESIGNING	89%	11%
PLANNING	47%	53%
MAKING	87%	13%
MACHINERY	81%	19%
EVALUATING	35%	65%
WRITTEN	35%	65%
TIMING	66%	34%
HOMEWORK	41%	59%

FIND ASPECTS OF D&T DIFFICULT/EASY

ASPECTS	DIFFICULT	EASY
RESEARCH	24%	76%
DESIGNING	38%	62%
PLANNING	33%	67%
MAKING	36%	64%
MACHINERY	42%	58%
EVALUATING	36%	64%
WRITTEN	33%	67%
TIMING	42%	58%
HOMEWORK	23%	77%

DISPPOINTMENT IF NO TANGIBLE PRODUCT

DISAPP.	NOT DISAPP.
43%	57%

Figure 4.

Across Key Stage 3: Complete revision of how IDEA is approached and delivered.

Modification to the delivery of control technology whilst still utilising the existing capital equipment for this subject.

Review of how evaluation is approached and implemented.

Year 8: Mass Production unit modified to increase rigour.

Year 9: Logo project modified to increase rigour.

Complete review of the electronics project.

Complete review of the 3D Mechanisms project.

What happens next?

Departmental staff have discussed the findings and considered them in relation to their own experiences and feelings towards the existing scheme of work and how it is delivered. Some of the agreed changes were based on pupil responses, some as a result of staff input, and some were based on a combination of the two. The following decisions were eventually made with regard to the review of the Key Stage 3 curriculum (see Figure 4).

Each member of the department volunteered to take on one of the above reviews and to prepare new teaching materials to accompany the revised unit of study. Most of this work will take place in the summer term after examination candidates have left, and it is the intention that new units of study are in place in time for September 2001.

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