JUST A BIT THICK - OR IS THERE MORE TO IT?

Harry Grainger

University of East Anglia

Whilst research giving voice to student perspectives on Mathematics is fairly widespread and, in conjunction with this, much research has focussed on student difficulties in the learning of Mathematics, very little if any research has asked the average student who "just failed" for their perspective. The work described in this paper details a small project aimed at gaining insight into some of the student perspectives and issues associated with failure to gain a grade C in GCSE. Mathematics. The national average grade at GCSE is a D (in the maintained non-selective sector.)

INTRODUCTION

Although research on student attitudes and learning in secondary Mathematics is widespread and comprehensive, see for example (Nardi and Steward, 2001) (Boaler, 1998) (Pollard and Triggs, 2000), this research has concentrated on pre-sixteen pre-GCSE students or on students taking A level mathematics. However at a national level English maintained secondary schools are concerned with raising the GCSE pass rate and in particular the percentage of students achieving a grade A-C in Mathematics. Given that approximately twenty percent of those sitting the examination achieve a grade D it seems logical to ask some of these students what they felt were the major issues that hindered them in achieving a grade C.

Data on Mathematics was collected from fifty-one students attending a college of further education (aged sixteen to eighteen) who were retaking GCSE mathematics for the first time, generally alongside A level studies in subjects other than Mathematics or Science. The data on school level issues was collected through semi-structured small group interviews and a questionnaire administered during lesson time, with follow up interviews to clarify ambiguities. The students were also asked to assess the difficulty of questions in a GCSE Mathematics paper on a Likert- scale and to elaborate, verbally or in writing, why they graded certain questions as 'hard or too hard'. Again this was supported with small group or individual interviews to allow for elaboration and clarification.

STUDENT VIEWS AND INSIGHTS

A small group of students were interviewed to identify some of the school level issues that they felt were important to their Mathematics performance; these are shown in table one. Overwhelmingly the student response focused on the ' Teacher ' stating directly that the teacher was bad, or had changed during the period of the GCSE course. Feeling that a lack of help and lack of time to develop understanding were also significant factors.

Table 1: School issues affecting peformance

Change teacher	Other pupil behavior	time	Dyslexic issues	Early school experiences	lack of help or bad teaching	Self inflicted
9girls 7boys	4girls 8boys	11girls-7boys	3girls-3boys	1girl-3boys	10girls – 7boys	1girl-5boys

Although only a small sample was interviewed, the feelings expressed clearly echo the findings of Boaler (ibid.), and, given that the students in this sample all come from different secondary schools, seem to be saying something about the curriculum offer or school priority for this category of student.

QUESTION LEVEL RESPONSES

All fifty-one students were asked to assess all twenty-seven questions on an Intermediate level non-calculator paper from the June 2003 exam series. The responses are given in table 2 below.

Unsurprisingly topics traditionally associated with the higher tier papers or with students that are expected to achieve at least a C, appear as 'hard' or too 'hard' (e.g.: questions 18, 21 23 and 27). However what is interesting about these questions is that when some of the students were helped through them, a common response, one which is familiar to classroom practitioners, was "oh! is that what they want?" This I would suggest echoes the work of Cooper (1998) or more recently Boaler (2003) on the issue of Mathematics in context or more significantly - whose context?

Table 2

Student response

question.no	easy	0k	tricky	hard	too hard	Topic
1	26	19	0	6	0	Algebra simp. And expand
2	15	19	8	7	2	No.pat. And form.
3	36	15	0	0	0	Numberline fract.dec.-venos
4	38	13	0	0	0	Twowayentry
5	17	18	16	0	0	Fract.size
6	14	22	14	1	0	Freq.table mean
7	9	32	7	2	1	Rotate/ scale factor
8	5	13	29	4	0	Alg. Constr.
9	10	14	22	5	0	Fract add/. Subtract
10	20	16	11	4	0	Int.ext angles
11	10	8	23	4	6	Operation/ squaring
12	4	22	20	2	3	Plan elevation drawing.
13	17	8	19	7	0	Time dist.graph
14	7	8	33	3	0	Place value
15	5	25	17	4	0	Comp.interest
16	6	14	13	16	2	Solve
17	17	22	5	4	3	Seq. And algebra
18	0	5	23	14	9	Inequality and graph
19	22	14	10	2	3	Transforma.
20	8	13	22	8	0	Loci
21	0	22	14	5	10	Dimensions
22	20	22	5	4	0	Questionnaire
23	0	16	22	6	7	Stand.form
24	0	14	25	7	5	Powers/indices
25	0	16	20	12	3	Angle theorem
26	0	7	19	23	2	Statistics
27	0	14	14	20	3	(a+b)squ.

Some questions, however which were graded as manageable, e.g.: question 15, on probing proved to be equally as difficult but for different reasons. For this question although the simple image of the car (see below) of the question was familiar to the student, at the same time it seemed to distract from a careful analysis of the question being asked and led to incomplete and or wrong solutions being generated.

Q 15

--The question Text would go here----------

Similarly, responses to other questions, which related to long-standing topics, for example, the addition and subtraction of fractions or rotation of triangles (questions 9 and 19) were positive. But in this case the very familiarity of the questions seemed to be a hindrance to careful analysis.

Discussion around this with the students suggested that they had been asked to do "hundreds of these types of question" and by implication if they did enough they would understand them. It seemed not only did their teachers believe this but that the students had assimilated this idea as well.

Another small group were subsequently interviewed in an attempt to further explore some of their feelings towards one of the question papers that they had sat the previous summer. The responses are detailed below in table 3. The questions and response categories were not predetermined as in the questionnaire but were drawn from discussion, which this time allowed the categories ' not taught well' and ' not taught ' to emerge, possibly in place of 'hard or too hard' in Table 2.

Table 3

Quest.	don't underst.			not taught well			no calc.?		not taught
1	1			2					
2	1			2					
11							1		
12									
13	1						1		
14	4								5
15							3		
16	2			1			1		
17									
18	2			4					6
19									2
20									
21	1			2					9
22									
23	1			7					
24							3		
25	2			6					1
26				8					
27	4			2					6

Again the preponderance is of the form "not taught well " which included "going too fast" or "not taught", particularly for the higher numbers or "harder" questions. An interesting inclusion is the "no calculator" category, despite the fact that this was a non-calculator paper. In this case some students were genuinely aggrieved that questions they felt were accessible, were denied to them through what they perceive as unnecessary bureaucracy.

SOME FINDINGS AND ISSUES

So what has all this shown us except the blindingly obvious that grade D students find GCSE Mathematics papers difficult? Well, tentatively I would suggest it also flags up again that success at GCSE for border-line students is highly dependent on a complex interaction between school organisation, the mechanics of the delivery of the curriculum, and the contextual demands of the exam paper itself.

For most of the students in this survey the 'teacher' was a major issue. Obviously schools are under pressure to deliver exam performance for both external audience and internal progress into A level, and at this point have to allocate scarce resources (good teachers) as they see best. Unfortunately this might be at the expense of the student group that could ultimately provide the key to substantially improving the overall pass-rate in Mathematics.

A second key issue for the students were topics they perceived as "not taught well" which often was the coded response for "time". However whilst teachers are under enormous pressure to deliver a syllabus including coursework across two short academic years, it may be that in the long run allowing more time for students to develop their understanding, and working for understanding rather than 'getting through the syllabus' is more productive. Lastly the contextual problems encountered by these students and the problems associated with questions seemingly becoming too familiar might be helped if the pedagogic focus was shifted. I.e.: to shift the focus away from content towards understanding; individual or small group work focussing on conceptual issues was what the students felt they needed, rather than just more practice

REFERENCES

Boaler, J. 1997. *Experiencing School Mathematics: Teaching styles, sex and setting. Buckingham*: Open University Press.

Boaler, J. 2003. *When Learning no Longer Matters: Standardized Testing and the Creation of Inequality*. Phi Delta Kappan, 84 (7), 502 - 508

Cooper,B. & Dunne, M. 1998. "Anyone for Tennis? Social class differences in children's responses to National Curriculum Mathematics testing" *The Sociological Review*, 46, 1,115-148.

Nardi, E. & Steward, S. 2003. Is Mathematics T.I.R.E.D.? A Profile of Quiet Disaffection in the S secondary Mathematics Classroom, *British Educational Research Journal*, 29 (3), 345 - 367

Pollard, A & Triggs, P. 2000. *What Pupils Say - Changing Policy and Practice in Primary Education*. Continuum Press.