

## **MAKING MATHEMATICS HARD: STUDENT VIEWS FROM A CARIBBEAN PERSPECTIVE**

Patricia George

School of Education, University of Leeds

*This paper reports an initial finding from a study which explored students' perceptions of mathematics in a Caribbean setting. The most frequent reason given by students for not liking mathematics was because it was hard. This in itself is not surprising, but what was surprising was that there appeared to be an implicit feeling by some students and explicitly stated by others that it was the teacher who was 'making mathematics hard'. The paper looks at what 'making mathematics hard' might mean to students.*

### **THE STUDY: CONTEXT AND METHODS**

The study reported in this paper forms part of a PhD research looking into student views about mathematics from a Caribbean perspective. There had been reports in the academic literature in the Caribbean of students 'underachieving' in mathematics (given in Layne, 2002, p21). Newspaper article headlines such as 'Mathematics Paralysis' (Antigua Sun, 13/10/03) and 'Why are so many of us not good at maths?' (Jamaica Observer, 15/02/04) also served to highlight a perceived problem in the mathematics teaching-learning process in the region. This 'underachievement' was usually made in reference to pass rates at the CXC CSEC[1], exams most often taken at the end of secondary school. Whilst various explanations have been put forward as to possible reasons for this perceived underachievement, very little in the way of actual research-based evidence have been offered. It is within this context that it was thought worthwhile to carry out a study which looked into what views of mathematics Caribbean students hold, what factors may be involved in the formation of these views, and how these views may impact their approach to learning and performance in mathematics.

Most of the fieldwork for the study was conducted in Antigua & Barbuda (A&B), where CXC CSEC results in mathematics over the past 15 years fairly closely mirrored regional averages. The overall study was conceived as an ethnographic multi-site case study of the main secondary schools in A&B. The main data collection methods used were documentary evidence, a student survey, classroom observations of selected schools, and group student interviews. Data collection proceeded more or less in the order outlined, as it was hoped that subsequent methods would be informed by previous methods. The actual student survey sample consisted of one 4<sup>th</sup> form class (the penultimate year of secondary school) of 11 of the 13 main secondary schools, which gave a total of 286 respondents (117 boys and 169 girls). Fourth form was chosen as these students would have had one of the longest current experience of school mathematics, and hence it was felt that their views of mathematics might be more 'fixed'.

## AN INITIAL FINDING

Most of what will be reported here came initially from the student survey, although other data were also explored and incorporated. The first mathematics-related question in the survey was a closed question asking students whether they liked maths with *Yes* and *No* categories provided, and an adjunct open question inviting students to give a reason for their answer. Of the 276 students who responded to this question, 63% (or 174) said *Yes*, and 37% (102) said *No*, although there were highly significant gender differences here (112 boys and 164 girls responded, 77% (86) of the boys said *Yes*, whereas 54% (88) of the girls said *Yes*;  $\chi^2 = 14.301$ ,  $df = 1$ ,  $p = 0.000$ ). The most frequent reason given by students for their response was coded as Ease/Difficulty, with 84 responses coded in this category. Eighteen reasons were coded as Easy and 66 coded as Difficult. Sixty-two of the 66 reasons coded as Difficult had come from students who had responded *No* to the closed question, which represents 61% (62 of 102) of the students who had responded *No*.

A 5- point Likert-scale type question had also been included later in the survey, asking students to indicate the extent of their agreement with the statement *I like maths*. These two apparently similar questions had been included as a means to determine some sense of the internal reliability of the survey instrument. The results of this question were analyzed in relation to those of the closed question, and the following table shows the findings in terms of student numbers for students who responded to both questions:

Do you like maths? I like maths	Yes	No	Totals
Strongly Agree + Agree	<b>132</b>	<b>8</b>	<b>140</b>
Neutral	<b>28</b>	<b>40</b>	<b>68</b>
Disagree + Strongly Disagree	<b>2</b>	<b>48</b>	<b>50</b>
Totals	<b>162</b>	<b>90</b>	<b>258</b>

(Correlation co-efficient  $\rho = 0.752$  at  $p < 0.01$ )

As might have been expected, given greater choice students diversified their responses more, with 68 students now choosing the previously unavailable *Neutral* category. However a closer look at the table showed that there was a greater movement of students to this category amongst those who had previously responded *No* to *Do you like maths?* (now 48, down from 102) than amongst those who had previously responded *Yes* (now 132, down from 174). This finding led to a questioning of the grounded-ness of the reasons for saying *No* students had given, the most frequent of which had been that students found mathematics difficult. Students had made statements such as ‘It is difficult I try hard to understand but is still hard for me’; ‘Because it is too hard and I cannot understand it’; ‘I think its (*sic*) hard, and am usually behind in it’; ‘Because it just seems hard to me although it is easy’ (all from

female students). There appeared to be 2 main senses in which 'hard' was being used by students in relation to the mathematics, the first, a sort of 'no way in hard' (e.g. first 2 student statements here), and the second a 'no way out hard' (the last 2 statements). A 'no way in hard' reflected a certain impenetrableness into the mathematics and coming to understand it, a feature which was not amenable even to the best of their efforts. These students were finding few, if any, routes into the mathematics. A 'no way out hard' gave a sense in which students had been able to find routes into the mathematics, i.e. they had known times of coming to understand mathematics, but now, for a variety of reasons, were finding scarce routes out of the mathematics i.e. coming to understand. The last student's statement highlights her confusion in this respect as a subject that should be easy (perhaps from past experiences where she had been able to find routes in), had now, for her, become hard (was unyielding in allowing routes out).

In investigating the grounded-ness of this student view of mathematics as hard, student responses to other later questions on the survey were also analyzed. What was found was that there appeared to be a fair proportion of students whose dislike of mathematics was not 'fixed', and that this dislike may be more connected to the 'circumstances' of the mathematics than to mathematics itself. There did seem to be a 'will' or a 'want' of students to like mathematics, but that at times they (might) have been 'prevented' from doing so. The following, a more extended sample from the survey of a (male) student's responses, brings out this idea:

*Q: Do you like maths?*

R: 'No, it is hard to understand: keep in memory even though you revise.'

*Q: Describe what usually happens in your school mathematics classes.*

R: 'In math class I get bored instantly probably because I don't understand or teacher does not explain properly what we are supposed to do.'

*Q: What do you like most about your school mathematics classes?*

R: 'Doing a[n] equation or problem I understand.'

*Q: What do you like least about your school mathematics classes?*

R: 'Doing something I don't understand.'

*Q: Describe what happened in your favourite mathematics lesson ever.*

R: 'In my favorite (*sic*) math class ever I understood everything she taught and the teacher actually made the class interesting and making me actually enjoying the math class.'

*Q: What could be done to make maths more interesting to you?*

R: 'Teacher actually taking time to explain and making class lively.'

That students (and most Western societies) perceive mathematics as hard is not an uncommon view (e.g. Boaler, 1997, p300). What was however somewhat surprising to me was that there appeared to be a feeling amongst some students, usually implied

(e.g. in the excerpt above), but also explicitly expressed by others that it was the teacher who was ‘*making* the mathematics hard’, that is, the level of difficulty of the mathematics was teacher-dependent. The following excerpt from a student interview gives a more explicit statement:

Int: ... Do you find that the change in teacher, a change in teacher let’s say from 1<sup>st</sup> form to 2<sup>nd</sup> form in maths, do you find that that confuses you any, or... it makes things better, or...

G1: ‘Tall [Not at all], it makes things better. From 1<sup>st</sup> to 2<sup>nd</sup> was good, then the 3<sup>rd</sup> form teacher I had, it was a bit of problem because he made maths kind of difficult.

Int: You think he made it difficult, more difficult than it was?

G1: Yes, but moving on to 4<sup>th</sup> form and meeting the teacher that is there now, she, I think she is bringing it back down to where I work in the 1<sup>st</sup> and 2<sup>nd</sup> form.

Int: Okay, so bringing it back down meaning the 3<sup>rd</sup> form teacher was...

G1: He was making it difficult, and he should... ‘am, the teacher that I have now she bringing it showing us the easier way.

So, although students did not always refer to the teacher in giving a reason for why they liked or disliked mathematics, later questions on the survey and student interview data did bring out the teacher as a large part of *the* mathematics students experienced and *how* students experienced mathematics.

One of the more confounding factors in students’ experience of school mathematics is the teacher (e.g. Ruthven, 2001). The teacher is a factor which is at times easy to overlook, or perhaps intentionally avoided due to the complexities involved in dealing with it. Wiliam & Bartholomew (2004, p279-80) have noted the ‘tricky business’ of educational reform largely due to the inextricable link of a teacher’s personality with his/her daily practice. Other studies have pointed out the crucial role of teachers in facilitating learning, both in their pedagogical approach, and also in the way they treat students (Boaler, 2000; Nardi & Steward, 2003). In the present study, in trying to draw out and characterize students’ views and experience of mathematics from a Caribbean perspective, collected data repeatedly brought out and overwhelmingly reminded of the teacher-factor in just such experiences.

But, how might teachers be ‘making mathematics hard’ for students? Student statements (from survey data) which suggest at some answers include ‘I just don’t understand it unless it is brought down [to] a level of understanding’ (female), and ‘Because it is a brain buster to me the teacher don’t take time to teach us. They always saying that we’re behind’ (male). There is some similarity with these responses and those previously given here by other students, i.e. that the level of the mathematics was too high (a feature not perhaps without language implications), and that the pace of lessons was too fast. The following excerpt from classroom observation field-notes provides some evidence of this first:

The teacher tells the class that they will be starting the topic 'Consumer Arithmetic', and subtopic 'Profit and Loss'. He introduces the topic by asking students what in their minds a profit is. Some students reply in unison that it is a gain. One girl continues saying that it is when you sell something for more than you bought it for. The teacher then dictates from a book to the class: 'A profit is when your revenues exceed your expenses.' One girl (sitting near where I was) says 'Okaaay...' [drawn out, sort of as if, 'If you say so...' - possibly not understanding the words?]

What seems apparent is that there is a mis-match of purposes in the classroom teaching-learning process. Teachers have a structured approach to their teaching, students often less so to their learning. Hence, gaps were being made or further widened as teachers were not necessarily always meeting students where they were, i.e. the starting points of the teaching to the learning were sometimes so different that students could not make the connection or 'bridge' the gap (Pickering, 1995, as used in Boaler & Greeno, 2000, p194). It is not always clear whether students considered this, i.e. '*making* mathematics hard', a deliberate act on the part of teachers or not, but there are instances where students refer to the need for teachers to explain properly (e.g. extended student survey response earlier), or to 'listen to students', which suggests that there was some feeling that teachers themselves were not always making the effort. Some students did think that they would be able to understand mathematics better if their present teacher was more patient, and/or presented the mathematics in a simpler way, or alternatively if they had a different teacher. Given how largely teacher-directed these mathematics classrooms are from student descriptions (not discussed here) it is clear that opportunities to like mathematics or not, to see mathematics as hard or not are overwhelmingly mediated by teachers. The teacher is the purveyor of these students' mathematics, supplying what mathematics the students get, how it is and should be known and/or understood, and ultimately how that mathematics is experienced. In fact there is a real conflict in the classroom as teachers and students work at different aims, some teachers to get through the syllabus, (some) students in a 'quest for understanding' (Boaler, 1997, p292) the mathematics. The result of these conflicts is that often, in the mathematics classroom there is little convergence of aims.

In being the main 'makers' of mathematics in the classroom, teachers are for these students the main actors in preparing, engaging in, enacting and producing the mathematics that students saw/experienced and ultimately come to know. In effect, teachers were the main (almost only) mediators of the students' school mathematics, and the main (almost only) mediating tool being used was language. In '*making* mathematics hard', teachers were preparing, engaging in, carrying out, and producing a mathematics that some students were finding few if any routes into. Accordingly, in sum, although there appeared to be some willingness on the part of students to like and become engaged with the mathematics, they were finding mathematics hard, and this was further compounded by (some) teachers who appeared to them to be '*making* mathematics hard'.

## NOTES

1. The Caribbean Examinations Council (CXC) is a Caribbean-region body responsible for administering the Caribbean Secondary Examinations Certificate (CSEC) exams. These exams are taken by most of the English-speaking Caribbean countries, and they replaced the former GCE which (at the time of the formation of CXC) had previously been the exams taken at the end of secondary school.

## REFERENCES

- Antigua Sun Newspaper (13/10/03) 'Mathematics Paralysis' article available electronically at <http://www.antiguasun.com/paper/?as=view&srch=mathematics+paralysis&srchSType=&dr1=&dr2=&CFID=1032991&CFTOKEN=56785108>
- Boaler, J. (1997) 'Reclaiming School Mathematics: the girls fight back' *Gender and Education*. Vol. 9 no. 3 p285-305
- Boaler, J. (2000) 'Mathematics from Another World: Traditional Communities and the Alienation of Learners' *Journal of Mathematical Behavior*. Vol. 18 no4 p379-397
- Boaler, J. & Greeno, G. (2000) 'Identity, Agency, and Knowing in Mathematics Worlds' in Boaler, J. (Ed.) *Multiple Perspectives on Mathematics Teaching and Learning*. Ablex Publishing, Westport, CT, USA
- Jamaica Observer newspaper (15/02/04) 'Why are so many of us not good at maths?' article available electronically at <http://www.jamaicaobserver.com/search/results.asp?stype=simple&stext=why+are+so+many+of+us+not+good+at+maths%3F&Submit.x=7&Submit.y=5>
- Layne, A. (2002) 'Determining and Explaining Sex Differences in Achievement in Higher Education in the Commonwealth Caribbean' *YouWe* no.8 p18-24 Publication of the Office of the Board of Undergraduate Studies (OBUS), University of the West Indies (UWI), Jamaica; also available electronically at [www.uwicentre.edu.jm/obus/YouweQ8.pdf](http://www.uwicentre.edu.jm/obus/YouweQ8.pdf) retrieved 24/11/03
- Nardi, E. & Steward, S. (2003) 'Is Mathematics T.I.R.E.D? A Profile of Quiet Disaffection in the Secondary Mathematics Classroom' *British Educational Research Journal*. Vol. 29 no.3 p345-367
- Ruthven, K. (2001) 'Issues of cultural diversity in school mathematics' *International Journal of Mathematical Education in Science and Technology*. Vol. 32 no.3 p355-364
- William, D. & Bartholomew, H. (2004) 'It's not which school but which set you're in that matters: the influence of ability grouping practices on student progress in mathematics' *British Educational Research Journal*. Vol. 30 no.2 p279-293.