MATHEMATICS EDUCATION AND APPLIED LINGUISTICS: WORKING GROUP REPORT

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INTRODUCTION

The aim of this second meeting of the working group was to engage in issues arising from applied linguistics research. The session focused on an example of data from a project in which Brian Street is involved. Having circulated the data beforehand, Brian invited a discussion around some of the issues a group of mathematics may be able to address in a more informed way, or at least in a different way, from an applied linguist. This short report begins with a brief outline of the data discussed, followed by Brian's reflections on the discussion and how it took his thinking forward.

AN OUTLINE OF THE DATA

The data comes from field data collected in The Leverhulme Numeracy Programme. It is an example of what we term a 'numeracy event' and concerns Aaysha. The data comes from field notes made by Alison Tomlin during visits to Aaysha's home.

The Context

At the time of this story, Aaysha was 5 years old. She lived with her two younger siblings and with both parents in a locally well-known very run down hostel for homeless people. The family came to the UK one and a half years ago from Pakistan and are currently living in relatively poor conditions… . Alison, the researcher, met Mr and Mrs Anwar and their three children in a room with a single bed and two hard chairs…. The family language is Urdu; Mr Anwar is studying English at the local college but is not yet fluent, and Mrs Anwar is at home with the three children. Aaysha's English is now fluent, where at the start of her Reception year she had very little English. Her father said with some humour, "She's the interpreter now". Gregory, (1999), indicates that for many migrant families young children may act as mediators or interpreters.

Both parents had worked for an insurance company in Pakistan. Mr Anwar was a senior manager, with responsibilities including actuarial issues, recommending changes to premium policies and levels. Mrs Anwar was a manager but lower ranking. He has an MA in statistics and 'loves statistics'. His insurance exams were USA accredited. He is hoping they will be accepted here, and will look for work in insurance when his English is up to it. Mrs Anwar said she did some things at home with Aaysha such as counting things in the flat. Aaysha helps with cooking by measuring things in terms of cups. Aaysha chooses books from the library and

counts how many books she's got. Aaysha plays teacher with her nursery-aged sister and likes 'games' on TV. According to the school neither parent sees Aaysha in school. She is quiet at home and at school. Both the father and teacher called her 'shy'.

The Numeracy Event

Alison's field-notes contain the following item, which will be interpreted in terms of numeracy events and practices:

"I said the class didn't have many children. Aaysha tried to count them by silently running through them in her mind, totting up numbers on fingers. I noticed she finger-counted in threes, three to a finger or thumb. I asked about this: Mr Anwar says 'we' count three to a finger, so 15 to a hand, 30 in two hands. Mr Anwar's description included folding over two fingers and saying six - I think he was saying to me that it's well internalised, you know how many several fingers represent. Implication in standard maths terms would include for example speed in multiples of 3. He said one to a finger is no good because you only get up to 10. I asked if they had taught this to Aaysha, or if she'd just picked it up from watching them. There was no clear answer to this so we don't know if it was deliberately taught or picked up from home practices. I'd expect they taught it to her, since it's unlikely (cf. English adults) her parents do it enough themselves for her to 'pick up' without prompting." (*AT/Tarnside/Nida 1, 21.11.00*)

On a second visit Aaysha was asked by Alison about the event above. An interpreter gave Aaysha's views:

"She can do it on hands and she can do the school like the school what they teach and she can do both ways now. And now she is using more whatever they learn in school that way. Instead of her method". Mrs Anwar commented, through the interpreter, "She's learning much faster you know, whatever they teach in school, instead of … whatever she learns from home".**(***Home interview with 'Mrs Anwar' and daughter 'Asha', Year 1 pupil at Tarnside CE Primary, on 1.6.01 with interpreter and Alison Tomlin*) (A fuller selection from the transcript in which this interaction took place is available)

Questions

Some of the questions Brian was interested in discussing with mathematics educators include:

- does it add anything to call this a 'numeracy event' ?
- what does it tell us about home- school relations?
- is it helpful to see it as an example of 'code switching'?
- 'what is going on' in mathematical terms?

- is the finger counting at home different from that at school in significant mathematical ways? eg 'solving problems vs patterns and calculation procedures

BRIAN'S ACCOUNT OF THE DISCUSSION WHICH ENSUED

From one perspective it could appear that Aayesha is simply using the joints of her fingers as single points of reference, so that her 'counting in threes' is actually counting in ones and is no different from that of the classroom practice whereby each finger is a unit. The combination work that mathematicians find fascinating about this example may be comparable between Aayesha seeing 'three' in a finger and school teachers seeing five in a hand. However, all of the mathematicians we have spoken with do emphasise the significance of learners coming to recognise part/ whole relations and are alert to the possibility that different techniques for 'counting' may actually facilitate or 'afford' 'more sophisticated' mathematical operations: these include seeing patterns, moving from iconic to symbolic meaning, deploying higher order multiplicative procedures rather than the simpler cognitive functions of 'counting'. The question then arose 'what are the affordances' of Aayesha's finger counting scheme and how do they differ from those of the classroom? From the evidence we have, it is not clear whether Aayesha is aware of the multiplicative structures signalled by the affordances of using a finger to represent three. Her father, however, does demonstrate this, by 'folding over two fingers and saying six'. It is this patterned use of the procedure that made some mathematicians interpret is as 'more sophisticated' than the procedure required in classrooms at this age. For some, then, this small numeracy event provides evidence that home numeracy practices may offer greater affordances than schooled numeracy practices.

If we take this as an indicative example of a much larger phenomenon regarding home school relations, then it becomes extremely significant: it can help us know what to look for in other apparently small 'events' as we explore the relationship between home and school practices more generally, in literacy and numeracy – and in other communicative modes. The first step in the present case is to ask what we know about the event – Aayesha's finger counting – and its context, what we need to know to make these broader points and how we can know. We know, for instance, that Aayesha appears to have spontaneously resorted to her finger counting to answer a 'real' question – the researcher's interest in how many pupils there were in her class. This event, then, was located within home numeracy practices – using fingers to count in threes in a manner her parents had brought with them from Pakistan. When we asked the researcher to return to ask further questions, the 'event' changed its character: firstly, it became even further embedded in our research practices than even the first event; and secondly it began to take on some of the characteristics of 'schooled numeracy practices'. The question-answer routines are very familiar to classroom researchers and the attempt to elicit explicit meanings about the activities are typical of classroom discourse patterns, whilst the mathematics at play has been recontextualised from those of home to those of pedagogic practice.

This recognition also alerts us to the problem of how the 'event' has been construed in the first place. For the researchers Aayesha's finger counting is a 'telling case' of a 'numeracy event', for the kinds of reasons we have outlined above and elsewhere (Baker et.al., forthcoming; Street, 2000). But was it an 'event' for Aayesha and her family? The visit of a researcher is clearly an 'event of some kind – though not necessarily associated by those visited with 'numeracy'. The researcher, Alison, says on her second visit:

AT	And I really only have one big question and it's about how you count. One time when I came 'Asha', you were counting the children in the class. You were saying I said I can't remember how many children are in your class and you started to count up. And you were saying the names of the children to yourself and you were counting with three to a finger. Do you remember?
INT	[URDU]?
PAT	[URDU] one, two, three, four, five [URDU] one, two, three, four, five.

We cannot necessarily expect Aaysha to 'remember' the 'event' but she does take up Alison's request to engage again in the actual activity of finger counting. This raises the question of whose interpretation we are working with when we label any such activity. In this case the labelling of it as a 'numeracy event' clearly stems from the research frame – neither in everyday life nor in classroom settings is the concept of a 'numeracy event' particularly salient. It is, then, an etic concept – one imposed from outside on the data. Indeed, the very selection of the activity as data, amidst the stream of life activities, is itself a researcher construct, as is all ethnography. The idea that we simply 'observe' what is going on and then, secondly, 'analyse' it is one of the methodological myths that has been challenged by the 'reflective turn' in social science (Agar, 1996). We now recognise that the every selection of activities and events as of interest is already guided by our theoretical constructs. This does not, as believed previously, 'contaminate' the 'pure' data but rather signals the dialogic and constructive nature of data collection in the social sciences. For present purposes this methodological aside is crucial because it indicates what we need to make explicit, to dredge up from our assumptions, before we can address such questions as 'how can critical literacy [or numeracy] be enacted in the classroom?' One answer in this case, then, is that we would need to make explicit the underlying framing concepts that lead us to select particular 'events' as salient. Our definition of the event puts constraints on our description of it. The research team's interest here is to attempt to make the link between 'events' and 'practices', so the focus on/ construction of the 'finger counting event' was made because it appeared productive for fulfilling this purpose – as indeed it has proved to be.

The 'practices' we are interested in are those of home and school and how they may differ or overlap. We hypothesise that where these differ between home and school more for some children than for others – classically for children from lower class backgrounds and those from some ethnic minority backgrounds, in contrast with professional white middle class backgrounds – then the switch between home and

school may generate problems that can lead to underachievement. All children, of course, arrive at school with a variety of registers, dialects or ideolects and all therefore have the potential to recognise when different 'codes' are being called for. Such code recognition, as in the evident case of bilingual speakers, can be immensely productive, leading for instance to metalinguistic awareness, recognition of language varieties as resources etc. However, where such code differences are treated as value differences – as is often the case in class uses of language or in some minority usages – then the resource becomes a problem. We hypothesise that this is frequently the case and may help explain the underachievement of children from working class and minority backgrounds. Further, such code switching is not restricted only to formal language varieties – the concept may also be applied to the discourses and procedures associated with formal and informal mathematical knowledge (cf Ginsberg et. al. 1996). From a slightly different point of view, the issue here, may be seen as concerning the lack of recognition of achievement, rather than underachievement. This view might lead us to a point beyond the slightly Bernsteinian line of 'underachievement associated with class or ethnic difference'. Indeed in the teaching of literacy and arguably of mathematics, a focus on recognising difference is likely to be more productive since it links directly into both classroom action and research reflexivity.

In the present case, Aaysha's home procedures for counting, whilst having considerable potential to facilitate her mathematical development, are ignored by the school which wants to replace them with its own procedures and codes. Aaysha, from the interview data, appears to have learned these adequately and can now 'do both'. But from a pedagogic point of view some significant opportunities may have been missed here – the opportunity to enhance metalinguistic awareness, explicit skills in code switching, use of a variety of mathematical resources etc - and it is likely that for other children, without the cultural capital that Aaysha's parents brought with them from Pakistan, such marginalising of home practices could be more detrimental.

FINAL COMMENT

The preceding thoughts are Brian's account of what he took from discussion that took place in Nottingham. We would be interested to receive accounts or comments from others who were present.

NOTE

The Leverhulme Numeracy Programme is a five year research programme, (1997-2002), that focuses on pupil attainment in numeracy and is based at King's College London. The research consists of a core longitudinal project and five focus projects linked to it and to one another. Each of the five focus projects seeks to explore in depth explanations of pupil underachievement in one or more of the broad areas of classroom, teacher, school and home, using subsets of the schools involved in the longitudinal core project and supplemented by other schools as appropriate. Focus 4, 'School and Community Numeracies' has three researchers, Alison Tomlin and Brian Street (King's College London) and Dave Baker (University of Brighton).

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