

# Mathematics as social

## DAVE BAKER AND BRIAN STREET

A comment on 'What is numeracy?', Barwell, 24(1): We would like to debate a number of issues associated with literacy and numeracy and with developing a 'social' perspective on numeracy, particularly in relation to four points arising from Barwell's intervention:

- the use of the terms mathematics and numeracy
- the notion of text as it is applied to these domains
- whether road signs can usefully be described as numeracy, literacy or more broadly 'semiotic'
- relationships between ethnography of numeracy and education.

In addressing these issues we will attempt to clarify what we see as the meanings of numeracy practices, the relationship between activity, events and practices; and what it means to mathematise

### The use of the terms mathematics and numeracy

Barwell claims that the term 'numeracy' is not used widely in mathematics education and he asks whether there is therefore a distinction implicit in our use of the term, between numeracy and mathematics. The Leverhulme Research Team simply chose to use the term 'numeracy' because this was prevalent in UK educational circles at the time of the project, being used, for instance, in the National Numeracy Strategy. We tend to use the term interchangeably with mathematics and have done so in this response to suit the text

However, the distinctiveness of our usage is less to do with any distinction between numeracy and mathematics than with a focus on numeracy practices. Here, we will use numeracy practices to cover both numeracy and mathematics practices. The social practice approach that underpins our research leads us to be interested not in numeracy *per se* but in numeracy practices - not in mathematics *per se* but in mathematics practices. Using this approach, we believe, enables us to avoid some essentialising definition of mathematics or of numeracy and instead to focus on the practices, words and events people actually engage in. As we say in the article:

We see numeracy practices (like literacy practices) as more than the behaviour that occurs when people 'do' mathematics or numeracy. Numeracy practices are not only the events in which numerical activity is involved, but are the broader cultural conceptions that give meaning to the event, including the models that participants bring to it. (Baker *et al.*, 2003, p. 12)

We ask the question, what is gained by looking at numeracy/mathematics from such a 'social' perspective? We attempt to answer in terms of the explanatory power such terms and concepts may offer us in understanding children's underachievement in schooled numeracy. A broad analysis

of the use of the term 'practices' is given in Baynham and Baker (2002).

### Numeracy as text?

Barwell uses the concept of 'text' to attempt to locate numeracy with respect to literacy. He re-works a statement by Barton and Hamilton (1998, p. 3) regarding the 'situated' nature of literacy and substitutes the term 'numeracy' in their account. This leads him to ask:

[W]hat is the text? Literacy is defined through reference to text (which some have broadened to include visual texts; see, for example, Gee, 1996, p. 144). Is text a part of numeracy events? (p. 21)

He answers this by suggesting that numeracy practices might be a 'subset' of literacy practices.

A clue to a more satisfactory analytic framework for relating numeracy to literacy is provided by the passing reference to Gee's work in social semiotics. The study of sign systems in their social contexts and in particular of 'multi modality' in the field of social semiotics by Kress and his colleagues (Kress and van Leeuwen, 1996), has extended this insight and might be helpful here. Kress argues that the dominant approach to communication has over-stressed language at the expense of other 'modes' of communication that may be more salient in contemporary society. By 'mode' he means: "a regularised organised set of resources for meaning-making" (Kress and Jewitt, 2003, p. 1) such as image, gaze, gesture, movement, music, speech and writing. Computers and advertising, for instance, are amongst the high profile areas that use a mix of modes in which language is only one component.

Literacy practices, whilst dominantly focussed on a written mode, are almost always embedded in oral language and frequently use a visual mode, as in layout or in the relationship of images to written language. This, we suggest, provides a useful framework for considering the communicative aspects of numeracy and for dealing with Barwell's concern to relate numeracy practices to literacy practices. Numeracy practices, from this perspective, can be thought of as enacted in a number of different modes such as speech, writing and visual representation (*cf.* Street, forthcoming). A particular numeracy event may involve a mix of such modes, similarly to other acts of communication. The implications of this approach become apparent when we examine a further issue raised by Barwell, the example of road signs.

### Road signs: numeracy, literacy, multiple modes

Barwell takes an example of a variety of road signs to discuss whether everyday numeracy practices are also 'mathematical'. He suggests that a sign with no numbers in it, such as a triangle with silhouettes of children, and drivers' responses to it, such as slowing down or ignoring it, are best classed as 'literacy practices'. When a sign has a number included, as in a speed-limit sign, when drivers respond in a more 'numerical' way such as checking their speedometer, these behaviours he does term 'numeracy practices'. However, he still wants to distinguish these numeracy practices from 'mathematics'. To make these behaviours mathematical would, from his perspective, involve intro-

ducing a more abstract level of analysis, as is found in schooled mathematics where problems might be set regarding, for example, direction or speed.

From a 'social' perspective, however, the issue is not the distinction between numeracy and mathematics, as though the latter were in some way more abstract, but rather, on analogy with literacy, between events and practices. Whether an event such as this is a literacy event, a visual event or a numeracy event is a matter of interpretation and depends to some extent on how the observer or researcher locates it in larger patterns of practice. In our work on numeracy as social practice, we would view it as a numeracy event, in that, even though it also includes literacy events and other modes of communication, such as the visual, it contains mathematical ideas about measures of speed and communication.

From a social practice perspective, we would want to draw out from this event the nature of the *practices* in which the event is situated. If we are focusing on the numeracy dimension, then we might label it as a numeracy event within 'driving-numeracy practices', although from a different perspective researchers might choose to focus on the literacy dimension and then ask what larger literacy practices give it meaning. The researcher has to justify their 'take' in terms of the outcomes *e.g.* do we learn more about the situation by describing it in one way or another?

A numeracy perspective here might help us understand how everyday life involves decisions about distances, speeds, orders of operations, laterality and angles that are part of larger institutionalised frameworks regarding numeracy or mathematics. But a social focus on these decisions would always force us to locate them within social practices and not to see them simply in terms of an essentialising mathematics. Drivers engage in these events in a context that has many social, ideological and value-laden dimensions. In terms of speeds, they accept or defy the regulatory nature of the controls laid upon driving. That is, they accept which side they drive on, and the number on the speed limit sign tells them the speed they can travel at without possible penalty. The penalties here are related to speeds represented in numbers and society has constructed a range of institutional practices to identify them and to enforce the regulations associated with them.

Driving-numeracy-practices therefore include power relations and institutional relations of this kind. Apart from an initial driving licence test, UK institutions do not formally test the driver's abstract numeracy skills: there is no need for drivers to abstract ideas explicitly – in Barwell's words to mathematise – in order to operate effectively as a driver. There are many people, for example, who operate competently in driving (even heavy-goods vehicles (HGV)) without any formal qualifications in school numeracy. These driving-numeracy practices are, then, different from formal school-numeracy practices. As Rogers comments, in terms of his theory of adult learning (Rogers, 2003):

[...] they simply see it as completing a task (except when the tasks are closely related to schooled tasks) and they evaluate it [not by formal abstraction] but by whether they get home safely! [...] It is a continuum

and we all pop into schooled practices and out of them again. People engage in many different numeracy activities [...]; the way they do these tasks may differ from the schooled practices. (personal communication, Rogers, 2004)

Whether particular practices are better described as driving-numeracy practices or school-numeracy practices depends, then, partly on the context but also on the aims of the observer or researcher. In our case we wish to highlight aspects of such everyday behaviour that might otherwise be marginalised by an emphasis on school numeracy. But it remains a research question, rather than a matter of assertion, how far driving-numeracy practices are different from school-numeracy practices.

In addition to describing such events in terms of their numeracy dimension, we would also draw attention to the communicative practices and modes through which they are enacted. There is, as Barwell notes, a literacy dimension and there are other modes of communication too. Some of the road signs may involve no overt numbers but use words and some, as Barwell points out, may involve visual images with no words or numbers, as with the image of the child in a red triangle. Drivers have to make a complex association between such road signs outside and the speedometer inside their car. Again, they perform these semiotic feats without having to resort to explicit abstract analysis of the practices. They do not need, for instance, to be able to articulate explicitly how the dial of the speedometer relates to the speed limit. But they do need, in this case as in that of the regulatory framework, to understand and accept the numeracy practices that exist in the field of driving; to recognise semiotic associations; to understand the social values and relations implicit in the event. Recognising all of these dimensions of the event can help us understand better how people learn to engage with it, a theme we develop in the last section.

### **Ethnography of numeracy in education**

Barwell acknowledges that the ethnography of literacy can contribute to educational practice, but suggests that the same may not be true for the investigation of abstract mathematics. This concern arises from his earlier distinction between numeracy and mathematics. With respect to Aaysha's finger-counting, for instance, he suggests that a study of her numeracy practices does not necessarily "reveal anything about mathematics", which he is taking to be at an abstract level that differentiates it from what we mean when we refer to numeracy as social practice. The justification for a social perspective on numeracy practices does not, however, depend on such a distinction or such a claim. Rather, when we identified "multiples of three" in a child's "counting three-to-a-finger" as a "numeracy practice", we were trying to understand how the numeracy event we saw was situated within a broader set of culturally defined home numeracy practices. We could then ask, how such home numeracy practices may relate to and affect attainment in what is defined as school numeracy.

There may be implications here for both pedagogy – helping teachers to understand the 'affordances' that children arrive at school with – and curriculum – what counts as

schooled numeracy practices –, both of which may be broadened to relate more closely to varied cultural practices. Such an analysis is premised on a theoretical move away from the notion that there is only one mathematics, which is decontextualised and abstract, a notion on which Barwell is drawing. Instead, our approach conceptualises multiple mathematical practices of which informal mathematical practices are just one set and schooled mathematical practices another.

We do not wish to deny the beauty and power of abstract mathematics as enacted in formal mathematics practices, but rather to add them to the array of tools available for understanding people's relations to mathematics practices. An example of the way this can be done in academic mathematics practices in Higher Education is given in Baker (1996). In the case of the Leverhulme research on which we were reporting in *FLM* 23(3), we adopted this perspective and these terms in order to provide tools that could help us understand why some children underachieve in schooled numeracy. Recognising a distinction between informal numeracy practices and school numeracy practices and thereby identifying the relation between both of these, can, we suggest, help us to explain why some children engage with schooled mathematics/ numeracy and others do not, with consequences for 'success and failure'. If the mathematics as social practices approach does contribute to such

explanation, then we believe it will have made a useful contribution to educational research and practice

## References

- Baker, D., Street, B. and Tomlin, A. (2003) 'Mathematics as social: understanding relationships between home and school numeracy practices', *For the Learning of Mathematics* 23(3), 11-15
- Baker, D. (1996) 'Negotiating the university - academic mathematics practices in teacher education', in Morrison, K. *Proceedings of the Annual Congress of the Association of Mathematics Education of South Africa*, Cape Town, Republic of South Africa, AMESA, pp. 242-245
- Barton, D. and Hamilton, M. (1998) *Local literacies: reading and writing in one community*, London, UK, Routledge
- Barwell, R. (2004) 'What is numeracy?', *For the Learning of Mathematics* 24(1), 20-22.
- Baynham, M. and Baker, D. (2002) 'Practice' in literacy and numeracy research: multiple perspectives', *Ways of Knowing Journal* 2(1), 1-9
- Gee, J. (1996, second edition) *Social linguistics and literacies: ideology in discourses*, London, UK, Falmer
- Kress, G. and van Leeuwen, T. (1996) *Reading images: the grammar of visual design*, London, Routledge
- Kress, G. and Jewitt, C. (2003) 'Introduction', in Kress, G. and Jewitt, C. (eds) *Multimodal literacy*, New York, NY, Peter Lang, pp. 1-18.
- Rogers, A. (2003) *What is the difference? a new critique of adult learning and teaching*, Leicester, UK, NIACE
- Street, B. (forthcoming) 'Applying new literacy studies to numeracy as social practice', in Rogers, A. (ed) *Urban literacy: communication, identity and learning in urban contexts*, Hamburg, Germany, United Nations Educational, Social and Cultural Organisation, Institute for Education.

---

## Distinctions

The act of indicating any being, object, thing, or unity involves making an *act of distinction* which distinguishes what has been indicated as separate from its background. Each time we refer to anything explicitly or implicitly, we are specifying a *criterion of distinction*, which indicates what we are talking about and specifies its properties as being, unity, or object. [...]

## Unities

A *unity* (entity, object) is brought forth by an act of distinction. Conversely, each time we refer to a unity in our descriptions, we are implying the operation of distinction that defines it and makes it possible.

(Maturana, H. and Varela, F. (1998, revised edition) *The tree of knowledge: the biological roots of human understanding*, Boston, MA and London, UK, Shambhala, p. 40.)

---