MATHEMATICS, LANGUAGE AND DERRIDA

Tony Brown

Manchester Metropolitan University

Abstract: *Derrida' s revolutionary work in the study of language has seriously challenged the way in which we see words being attached to meanings. This paper makes tentative steps towards examining how his work might assist us in understanding the way in which our attempts to describe or capture our mathematical experiences modify the experience itself. In doing this we draw on the work of Derrida and John Mason in locating possible frameworks through which to conceptualise the relationship between language and mathematical cognition. It concludes that mathematical meaning never stabilises since it is caught between the individual's on-going experience and society's on going generation of societal norms as manifest in its use of language, in particular, those penaining to society's view of mathematics. That is, mathematics, language and the human performing them are always evolving in relation to each other.*

Recently, there was a conference dedicated to the work of Jacques Derrida Derrida was in attendance. A colleague and conference attendee, Antony Easthope, described how Derrida himself patiently sat through numerous papers speaking of his work without passing any comment. However, at the end of the conference Derrida made his own presentation. Having declared his delight to be in a conference celebrating his work he was, nevertheless, uncomfortable listening to so many people describing his work. He spoke of how, in attending the conference, he had experienced a sensation of being already dead. Having witnessed numerous attempts to sum up his work and integrate it elsewhere had made him feel as though his work had already been frozen for eternity, as if people were no longer seeking his present thinking.

In mathematics, as we survey the offerings of our students, maybe we are susceptible to the same sort of premature encapsulation, wrapping things up as we get some semblance of the thing we seek in their work, torn as we are between encouraging the gradual development of their own individual mathematical understanding, whilst ensuring they meet the social requirements of knowing certain specific ideas. Such difficulties can also arise as we attempt to capture the flow of our own mathematical thinking in to some sort of fixed form for the purposes of sharing. We can never fully express what we see. How indeed can mathematical thinking, a highly temporal commodity, be organised with reference to more stable entities, mental or otherwise? Can we freeze ideas, hold them still while we look at them? Addressing these issues is far from easy since the whole notion of finding stability is complex. In attempting to frame mathematical ideas what sort of loss do we experience?

This paper considers the relationship between mathematics and language, making particular reference to the work on language by Derrida. In taking this perspective I examine how language functions in organising mental activity and suggest that since language is so fundamental to the social formation and individual construction of mathematical ideas, it conditions all mathematical experience (cf. Brown, 1994 d, in press). In this spirit I argue that linguistic reduction is an inevitable aspect of any mathematical construction, both locating and conditioning broader cogitations. As such, loss is a necessary result of the process of stressing and ignoring that underpins any conceptualisation.

Many contemporary writers on language, like Derrida, see the generation of language as instrumental in the self-formation of society and of the individuals within it. In this perspective, language can no longer be seen as providing an unproblematic labelling of the world. Analytic philosophy's notion of language picturing reality (e.g. Russell, 1914; early Wittgenstein, e.g. 1961) no longer holds up as an adequate metaphor for the way in which language functions, although such a belief may well still govern the everyday actions of many people. How then can we see contemporary work in language as assisting us in discussing mathematical ideas? Like language, mathematics can be regarded as a social produced phenomenon and, in particular, mathematical activity can be seen as being a form of linguistic performance. For Derrida social phenomena can always be read as a text. Consequently, in this perspective, mathematical activity finds itself subject to the scrutiny of modem day critiques of language which emphasise its situation in history, in culture and in personal accounts. The human subject engaged in mathematics is positioned in a number of co-existing social agendas which flavour the style of engagement. Insofar as we see mathematical meaning being generated in the mind we cannot escape the formative influences on the mind. Also, we cannot partition off a section of the mind and label it "mathematics".

Until recently, the dominant traditions of mathematics teaching have focused on how mathematics is, rather than on how it is seen. Teaching media are customarily treated as if they give access to something actually there. The parameters of mathematical activity are clearly delineated, where the symbols assume an unproblematic relation with the concepts they represent. Recent work in mathematics education research, however, has focused more on how participants experience the mathematics classroom. Such "insider" views of mathematics consciously build in some sort of selfreflective dimension. Since participants are necessarily governed by certain social practices I suggest such views are always embedded in a culture. That is, mathematics only manifests itself in activity governed by culturally specific norms (e.g National Curriculum mathematics or university mathematics) (see Brown 1996 b. It seems insider perspectives are becoming more prominent as the absoluteness of mathematics itself is brought into question. Mason (e.g. 1994) has spoken of researching problems, both mathematical and professional, from the *inside.* Constructivists have focused more on the individuallearner's understanding the mathematical tasks they face. Meanwhile Skovsmose (1994) has commenced the groundwork in formulating a philosophy of critical mathematics education to examine ways in which discourses operate within mathematics education. Part of his task has been to uncover the way in which mathematics education conceals its intentions beneath the language it employs in declaring its project.

Here I shall focus on the position taken by Mason in associating mathematics with language, as an example of a writer in mathematics education moving away from assumptions of language picturing reality. In fact he sees a clear distinction between mathematical experience and the linguistic description of it. The following quotes give a flavour of his view:

Words generate more words in explanation, but often draw us away from the experiences from which they stem. Mason (1994, p.176)

Express to yourself in action (by doing it) and in words (by talking to yourself or a colleague) a role for continuing the

following array ..... Honsberger quoted by Mason (1989, p.3)

On the one hand we have the experience, on the other, the description of it in words. In my conversations with him, John Mason defends the content of his mind as not being reducible to description in words. Whilst I may report on my experience as a mathematician, in so doing, I insert a gap between experience and report, resulting in the precise nature of my experience being rather elusive, being partly lost, at least as regards its capturing in language.

How then can we locate mathematical meanings in relation to mathematical and linguistic performance by humans? Traditionally, the task of the teacher and learner may be seen as sharing a preexisting mathematics not susceptible to individual interpretation. Such an account is governed by notions where the teacher seeks to direct the student's attention to a specific way of seeing an objectively understood mathematics. Truth is embedded within the mathematics and the student seeks to locate this. Meanwhile, "insider" views of mathematical problems, as exemplified in the work of Mason, focus on directing the student on a journey around problems and reflecting on the experience of doing mathematics. Whilst the emphasis is more on the student reconciling his or her experience with ways of describing it, Mason argues, the attempt to describe in words might draw the student away from the mathematical experience itself. The teacher's intention is rather less didactic but this may not necessarily imply a less conventional view of the underlying mathematics. Mason follows Gattegno in seeing truth gravitating around personal awarenesses, that is, truth is located in the mind of the
indi vidual.

So where mathematics is located? In more traditional views the mathematical meaning is independent of individual human performance. Meanwhile, according to Mason, the emphasis is on the individual human's personal awarenesses of mathematics. Nevertheless, both appear to see the description of mathematical activity in words as being outside the realm of mathematics itself.

Contemporary accounts of language provide a rather more transcendental view of language that infiltrates, whilst coalescing, the reality it serves. I wish to argue that the framing of mathematical experience in words by individuals should be seen as an integral part of the mathematics itself, inseparable from less visible cognitive activity. I shall briefly mention the hermeneutics of Ricoeur and Gadamer before developing Derrida's more radical post-structuralist position.

Ricoeur and Gadamer assert that experience itself is conditioned by any attempt at a linguistic framing. For them language mediates truth. That is, whilst they are happy with the notion of truth, they see this truth as being obscured by our attempts to access it. The chief consequence of this for our current analysis is that mathematical experience and description of it in words are drawn closer together. Phenomenology has offered an approach, supportive of their hermeneutic framework, which assists us in discussing how the individual confronts and works with mathematical ideas. Here, the material existence of the world is fully accepted but it only presents itself according to some particular phenomenology subsequent to being carved up in a time dependent categorisation by an individual. The material world lights up as it is touched by the human's gaze. Objectivity itself is historically created defined in terms of the way in which the individual consciousness perceives the material. This

partitioning of the material world into phenomena is closely related to the descriptions made in respect of it Mathematical objects then, present within such thinking, are not unproblematic entities for all to see, but rather, are understocx.l differently by each individual. The distinction between such phenomena and the perception of them is softened with phenomena and perception evolving together through time. In this perspective mathematical ideas, as located through notation, are not endowed with a universal meaning, but rather, derive their meaning through the way in which an individual attends to them.

Thus mathematical "object" and human "subject" are seen in a more complementary relation as part of each other. The emphasis in this phenomenological formulation is on the individual's experience of grappling with social notation within his or her physical and social situation. This provides a framework, seen from the individual's point of view, in which the distinction between the individual and the social is softened. In building his or her understanding, the individual is obliged to work through the social filter of language. My strategies for making sense of and acting in the world are always underpinned by cultural stylising derived through language, whether I be mountain climbing, dancing or doing mathematics. All such activities can be seen as specific discursive "spaces" (Stronach and Maclure, 1996, p. 262). For a fuller discussion see Brown (1994 a, 1994 c, 1996 a).

Derrida (1978, pp. 278-293) similarly claims that you can only observe the linguistic performance of others from the home base of your own linguistic frame. One is always positioned within culturally derived ways of seeing and so experience itself is textual insofar as it is understocx.l through inherited schemata embedded in language usage (cf. Brown, 1994 b d). In short, language is always about a world already conditioned by language. Any human performance can be read as a "text" in the philosophical sense of the word. Indeed, Derrida famously asserts (1976, p. 158), "there is nothing outside of the text", nor are there truths to provide points of anchorage. He sees differential structures as being inherent in explicit language, consciousness and unconsciousness. Like Lacan (1977) he identifies this as a general feature of the mental world, with both conscious and unconscious being structured like a language. The mental world, so seen, is a system of differences, part of which is claimed by explicit linguistic structuring (Derrida, 1982). It should be stressed, however, Derrida does not dismiss the experience itself, rather, experiences are in a constant state of flux conditioned by attempts to associate them with a never ending linguistic flow. He would see mathematical involvement as necessarily textual, brought about through human partitionings of the world - a framing that is, in a sense, already there, brought about through cultural linguistic heritage. "My own words take me by surprise and teach me what I think" (Merleau-Ponty, quoted by Derrida, 1978, p. 11). Derrida builds on this quote in discussing how inscription in words (and maybe also in symbols, in diagrams) orients psychologically produced phenomena. If I may risk using his own, rather slippery, words:

If writing is inaugural it is not so much because it creates, but because of a certain absolute freedom of speech, because of the freedom to bring about the already there as a sign of the freedom to augur. A freedom of response which acknowledges as its horizon the world as history and the speech which can only say: Being has already begun .. (Writing) creates meaning by enregistering it, by entrusting it to an engraving, a groove, a relief, to a surface whose essential characteristic is to be infinitely transmissible. Not that this characteristic is always desired, nor has it been; and writing as the origin of pure historicity, pure traditionality, is only the tel os for a history of writing whose philosophy is always to come. Derrida (1978, p. 12)

I take Derrida to mean, crudely, that inscription in writing functions closely in relation to the psychological phenomena it locates and, indeed, becomes part of it. In reading Derrida one never gets to what he means but rather one experiences the on-going sensation of being moved on before you are ready. His words never frame the final version of his "present" thinking. In this respect, Derrida's position is not that far away from the the more moderate line of Gadamer and Ricoeur who peffilit an on-going renewal within the co-evolution of phenomena and perception. However, Derrida's refusal to allow any anchorage in truth makes his work quite distinctive and more radical in its ability to reject orientation around universal structures. Derrida's position takes language well beyond its traditional scope towards embracing the whole of human experience. Objections sometimes arise when we attempt to nudge language into this extended domain. For example, on the surface at least, such views appear unsatisfactory to those who wish to defend the power of their own mathematical experiences as being outside the realm of language. Nevertheless, Mason does speak of manifestations in the "outer" which have some sort of association with "inner" experience, indeed he seems distinctly Buddhist when he suggests that we need to acknowledge "a world of experience that is not material, not phenomenal, but inner, with access through what we are able to read in the outer" (Mason, 1994, extended version, p. 7). This, I feel, invites a degree of compatibility between his understanding and the line taken by Derrida.

We need, however, to ask about the nature of this association and question how these outer manifestations attach themselves. Are they like the tips of icebergs (i.e. part of the thing being signified) or like road signs (i.e. separate to the thing being signified)? I suggest words, diagrams and other manifestations of mathematical activity, can be seen as functioning in either way, according to current interest and the emphasis one assumes. Indeed they may be seen as two points on the hermeneutic cycle connecting ways of seeing experiencing and ways of describing (Brown, 1991). The physical environment, for example, is textual, in Derrida's sense, insofar as the human eye organises it differentially. Thus "seeing" is always in relation to an a priori conditioning. Any attempt at inscription reflects this broader but maybe more elusive differentiality. As with Saussure (1966), Derrida sees the signifier/signified duality as inseparable. But as with Lacan (1968), Derrida sees relatively stable signifiers being associated with a fluid underbelly, comprising a signified field which sweeps out to occupy the whole of consciousness, and indeed, the unconscious. Both presence and absence are located by the signifier. The loss incurred in the attempt to articulate remains attached to the signifier seeking to replace it. Meanings are derived only through retrospective examination of the flow of signs. The component signifiers do not have implicit meanings, only relational associations with other signifiers in the chain. There are no independently existing meanings in the chain since any attempt to frame in words, any attempt to "mean", creates a gap between "being" and attempts to explain it. Lacan speaks of an indefinite sliding of meaning to convey the "impossibilities" of attaching one word with one meaning. We have no truths to provide orientation apart from those generated through this system of differences. Derrida (1981, translator's introduction, p. ix) suggests that selfpresent meanings are illusions brought about through repressing the differential structures from which they spring. However, as a note of caution Derrida seems to have back-tracked a little from the extreme way of thinking many associate with him:

... it was never our wish to extend the re-assuring notion of text to a whole extra-textual realm and to transform the world

into a library by doing away with all boundaries, all frameworks, all sharp edges (Derrida, 1991, p. 257).

In describing mathematical experience we may suspend the "presence" of the experience, in a sense, but the experience itself was textual (i.e. understood differentially) and thus already a suspension, so no more nor less the "real" experience. There is no experience outside the text, only a retroactive constructions of it asserted by the individual. To make strict distinction between experience and description of it in words, as Mason appears to, requires a relatively restrictive view of language. A more phenomenological account of language sees the spoken word as rather more like a tip of an iceberg, that is, as part of the thing it signifies, in particular, the silent cognitive activity taking place around it. Whilst Mason's distinction might offer a valuable rhetorical device in initiating or analysing mathematical performance, such a distinction suppresses the historicity endemic in anything commonly recognised as mathematical performance, or even mathematics itself, and thus obscures the values associated with this (cf. Derrida, 1989). In particular, the linguistic forces driving (and being driven by) mathematical constructing get squeezed out of the picture. Mathematical constructing, I would suggest, is always linguistic to a degree, oscillating in a hermeneutic circle, between more or less sturdy linguistic frames.

Both hermeneutics and its radical form, post-structuralism offer accounts which, through being more flexible in their understandings of language, engage with the material qualities of the world. Phenomenology, as present in the hermeneutics of Ricoeur, accepts the material world but intercepts perception before it assumes shared notions of categorising this material world into objects. Poststructuralism meanwhile uses language itself (or more accurately textuality, i.e differentiality) as its home base and so subjects meet in their shared use of the manifestation of this in speech or writing. In both these theoretical perspectives, associations between language and reality resist stability between signifier and signified. Rather, both reality and language are caught in an historical process of mutual formation which is never complete, nor even pauses long enough for one to map the other. In such a perspective, the historicity present in both the genesis and the current performance of mathematics is recognised. As such there is no mathematics outside language.

In this perspective, the learning of mathematics moves away from being concerned with recreating existing ideas but instead emphasises the tightly knit relation between language and understanding. On this point Mason and Derrida seem close. In assuming the teacher's task himself, Mason is concerned with enabling his students to generate their own mathematical experiences. That is, he does not explain the mathematics in his head but rather, initiates an activity which he hopes will enable his students to experience some mathematics and in this, perhaps, encounter certain ideas. He sees learning as a journey of self discovery.

" . .it is important to re-search, re-collect, re-connect, re-learn, re-integrate, and re-cast insights in the discourse of the times. I see working on education not in terms of an edifice of knowledge, adding new theorems to old, but rather as a journey of discovery and development in which what others have learned has to be re-leamed, re-integrated and reexpressed in each generation" (Mason, 1994, p. 177).

Ideas are not inherited prepackaged and intact, but rather, each new generation will engage in tasks that

give rise to new understandings of what might be seen as old ideas. There is a need to work on ideas, they cannot just be "received". This way of thinking bears a striking similarity with some of Derrida's recent work:

Inheritance is never a *given,* it is always a task. .. there is no backward looking fervour in this reminder, no traditionalist flavour, Reaction, reactionary or reactive are but interpretations of the structure of inheritance. That we *are* heirs does not mean that we *have* or that we *receive* this or that, some inheritance that enriches us one day with this or that, but that the *being* of what we are *is* first of all inheritance, whether we like it or know it or not. Derrida (1994, p. 54).

Whilst the student's task may well oscillate between fitting language to mathematical experience and bringing meaning to language through reflection on one's own experience, both experience and linguistic production forever continue, resisting attempts to settle on a particular version. Mathematical meaning never stabilises since it is caught between the individual's on-going experience and society's on going generation of societal norms as manifest in its use of language, in particular, those pertaining to society's view of mathematics. Mathematics, language and the human performing them are always evolving in relation to each other. There is no final *version* to be learnt, since we lack universal truths to hold this *in* place. I conclude with a quote another post-structuralist thinker, writing shortly after the student uprising *in* Paris *in 1968:*

Just as psychoanalysis, with the work of Lacan, is in the process of extending the Freudian topic into a topology of the subject (the unconscious is never there in *its* place), so like wise we need to substitute for the magisterial space of the past- which was fundamentally a religious space (the word delivered by the master from the pulpit above with the audience below, the flock, the sheep, the herd) - a less upright, less Euclidean space where no one, neither teacher nor students, would ever be in *hisfinal place* (Barthes, 1977. p. 205).

In short, within the very limits of the teaching space as given, the need is to work patiently tracing out a pure form, that of *afloating;* a floating which would not destroy anything but would be content simply to disorientate the Law. The necessities of promotion, professional obligations .. , imperatives of knowledge, prestige of method, ideological criticism - everything is there, but floating (Ibid. p. 215).

NOTE

REFERENCES

Barthes, R.: 1977, *Image, Music Text,* Fontana/Collins, Glasgow.
Brown, T.: 1991, 'Hermeneutics and mathematical activity', *Educational Studies in Mathematics, 22,* 475-480.
Brown, T.: 1994 a, 'Creating and knowing mathematics through language and experience', *Educational*

Studies in Mathematics, 27, 1, 79-100.

Brown, *T.:* 1994 b, 'Describing the mathematics you are part of: a post-structuralist account of mathematica1learning' in P. Ernest (Ed.).: *Mathematics, Education and Philosophy: An International Perspective,* Falmer, London, 154-162.

Brown, *T.:* 1994 c, 'Towards an hermeneutic understanding of mathematics and mathematical learning', in P. Ernest (Ed.), *Constructing Mathematical Knowledge: Epistemology and Mathematical Education,* Falmer, London, 141-150 ..

Brown, *T.:* 1994 d, 'Mathematics living in the post-modem world', *Proceedings of PME 18,* University of Lisbon, 2, 144-151.

Brown, *T.:* 1996 a, 'Intention and significance in the teaching and learning of mathematics', *Journal for Research in Mathematics Education* 27,52-66.

Brown, T.: 1996 b, 'The cultural evolution of mathematics', *Proceedings of PME 20,* University of Valencia

Brown, *T.:* in press, 'The phenomenology of the mathematics classroom, *Educational Studies in Mathematics.*

Derrida, J.: 1976, *OfGrammatology,* Johns Hopkins, London.

Derrida, J. : 1978, *Writing and Difference,* University of Chicago Press, Chicago.

Derrida, J.: 1981, *Dissemination,* University of Chicago, Chicago.

Derrida, J.: 1989, *Introduction to Hussert's "The Origin of Geometry",* University of Nebraska Press, Lincoln.

Derrida, J.: 1991, 'Living on the border lines' in Kamuf, P. (Ed.) *A Derrida Reader: Between the Blinds.* Columbia University Press, New York.

Derrida, J.: 1982, *Margins of Philosophy,* Harvester Wheatsheaf, London.

Derrida, J.: 1994, *Spectres of Marx, Routledge.*

Foucault, M.: 1972, *The Archaeology of Knowledge,* Routledge, London.

Gadamer, H.G.: 1962, *Truth and Method,* Sheed and Ward, London.

Habermas, J.: 1972, *Knowledge and Human Interests,* Heinemann, London.

Lacan, J.: 1977, *Ecrits: A Selection*
Speech and Language in Psychoanalysis

Mason, J.: 1994, 'Researching From the Inside in Mathematics Education: Locating an I-You Relationship', *Proceedings of PME* 18, University of Lisbon, 1, 176-194.

Mason, J.: 1989, 'Mathematical abstraction as the result of a delicate shift of attention', *For the Learning of Mathematics,* 9, 2-8.

Ricoeur,P.: 1981, *Hermeneutics and the Human Sciences,* Cambridge University Press. Russell, B.:1914, *Our Knowledge of the External World.* George Allen and Unwin, London. Saussure, F. de.: 1966, *A Course in General Linguistics,* McGraw-HilI, New York.

Schutz, A.: 1962, *The Problem of Social Reality,* Martinus Nijhoff, The Hague.

Skovsmose,O.: 1994, *Towards a Philosophy of Critical Mathematics Education,* Kluwer, Dordrecht.

Stronach, I. and M. Maclure, 1996, 'Mobilising meaning, demobilizing critique? Dilemmas in the deconstruction of educational discourse' , *Cultural Studies,* 1, 259-276.

Wittgenstein, L.:1961, *Tractatus Logico-Philosphicus,* Routledge, London.