

SEMIOTICS AND MATHEMATICS EDUCATION WORKING GROUP

A report on the meeting at Nottingham University, March 1997.

Convenors: Paul Ernest, Exeter University; Adam Vile, South Bank University.

This meeting consisted of three short presentations by members of the working group illustrating, through various perspectives, ways in which the semiotic lens can be applied to mathematics teaching and learning. The aim of the session was to explore a variety of semiotic points of view and to look for commonalities and differences in theoretical perspectives and methodologies with the intention of constructing some shared understanding of the various semiotic terminology and registers in the context of mathematics education research. Brief reports of the sessions are included below.

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Margaret James - A description of a classroom episode and an analysis of the students' responses informed by Barthes' theory of denotative and connotative semiotic systems.

Barthes' theory of denotation and connotation concerns itself with a particular form of pairwise relations between semiological systems. Meaning-making in one system may be hindered or facilitated by meaning-making in the other. In particular, the presence of one system may hinder the noticing of the other system.

I analyzed a classroom episode from this theoretical perspective. I was working with an evening GCSE class on linear graphs and the related equations. Initially the students had been working at producing equations describing the relationship between the x and y coordinates of the lines (often the students would produce a chain of signification which included an intervening table). Subsequently, my intention was for them then to do some work reflecting on the texts that they had created in order to construct relations between, for example, sets of graphs of parallel lines and the repetition of the gradient parameter in the equations.

I analyzed the students' responses to this and explained my theorizing of the design of the subsequent teaching intervention. I reached the unstartling conclusion that when students are not looking at something then they do not see it, whereas if they are, they do.

Margaret's contribution was an illustration of the way in which a given theoretical perspective, in this case from Barthes, can provide a language and point of view for the analysis of classroom incidents. Such analysis can, and in this case did, lead to fruitful interpretations and action.

Tansy Hardy· *Making meaning/identity' Lacanian style.*

I reported on my search for accounts for phenomena identified in my researches in maths education, and how I have used Jacques Lacan's 'Graph of meaning' (Zizek 1989) as a tool to develop such accounts. A Lacanian, post-structuralist account gives primacy to the production of meaning and so enables me to develop an account for how we as teachers work on signifiers that surround us in maths education to create meaning of our practices.

I used Lacan's framework, which views signs in relation to one another, focussing on a chain of signifiers and considers how we move within a chain of signifiers, to look at how I (the meaning maker) see myself in relation to these signs; how I position myself in relation to this order. This chain of signifiers becomes ordered through the intervention of a certain nodal point which 'quilts' them, stopping them sliding and fixing their meaning. In Lacan's graph, this nodal point, the master signifier gives meaning to some other signifier.

I considered how the process of identification of myself in relation to any symbolic order can account for teachers' sense of limitation of their practice and control from elsewhere. In the graph of meaning above I view the master signifier O and myself in relation to it. I produce meaning for the hollow symbols through O which pins their meaning down. This happens retroactively. This gives me a sense of 'so that's what it all means !' I then identify myself in relation to this master signifier. Do I belong to the symbolic order formed? Am I inside or outside ? If the symbolic order was that of Mathematics by viewing some key element of mathematics I will identify myself in relation to this order - either I see myself as a 'mathematician' or 'not mathematician.

Similarly I gave an example of viewing through the master signifier 'child-centred learning' to give meaning to my classroom interactions.

Drawing on the observation that teachers with very diverse forms of practice may use the same signifier to describe their teaching. I gave similar accounts for teachers' identification of their practice as 'practical' or their teaching and assessment of Mal at GCSE as 'integral'. The way they created meaning for the signifier 'practical work' or 'integral' is determined by the master signifier (and the field and chain of signifiers they work within). This works like a form of selective hearing and seeing - considering only certain aspects of children's mathematical activity, acknowledging only particular characteristics of their work, being aware of only certain aspects of one's teaching interactions, hearing only certain words from within documentation. This selective viewing can influence, or more strongly, determine one's interpretation of events and lead to radically different assessments.

Tansy's contribution illustrates how a Lacanian perspective allows a focus on macro-issues such as the underpinning ideology reflected in the meaning of key terms to be suffused through a whole discourse or rhetorical practice. Thus a semiotic approach to mathematics education is concerned with more than micro-level sign-uses and meanings.

(A more complete version of Tansy's report may be found on the Web Page)

Olwen MacNamara - *A Saussurian perspective on the analysis of mathematical activity*. There has been a growing recognition in the 20th century that of all semiological systems language is of prime importance in the construction of reality. Saussure, working at the turn of the century, recognised that language was the medium the individual used to analyse his/her view of reality and also to describe the world (s)he saw. He recognised that the study of language was, however, more problematic than the study of other sciences since:

"The object is not given in advance of the view point: far from it. Rather, one might say that it is the viewpoint adopted which creates the object. Furthermore, there is nothing to tell us in advance whether one of these ways of looking at it is prior to or superior to any of the others" (F. de Saussure: *Cours de Linguistic Generale*, Duckworth, London. 1983 p.23).

In Saussure's analysis it would appear that words are not simply labels attached to pre-given objects/material things of the world. Consequently, linguistic/mathematical concepts are not simply private pictorial images which mirror aspects of 'ontological reality'.

Saussure's model of the linguistic sign was entirely cognitive, it was that of a two-sided psychological entity which comprised the signifier, or sound image, and the signified, or associated concept / meaning. Importantly, the signifier and signified in this model are not to be confused with either the physical sounds relating to the signifier, nor the actual referent relating to the signified. Unlike most linguists of his time, Saussure deliberately excluded all contact with the non-linguistic referent. This was not, I think, a sign of his latent radical constructivist tendencies; rather, it reflected his view that the referent was external to the linguistic system. In the interpretation of the sign what mattered to Saussure was the connections internal to the system: the psychological relations that the sign held with associated signs and also with the signs that surrounded it in a sentence.

It seems clear that we cannot delimit the language of learning from what is learnt or from the learner's perspective. It is too restrictive a question to ask whether mathematics is, or is not, a language. Mathematical constructs and the language in which they are conceived of, and here I include both internal thoughts and also formulated and documented ideas, are inextricably interdependent within mathematical activity.

Olwn's contribution illustrates how a semiotic perspective can accommodate and go beyond a cognitive approach to mathematical concepts. It also reminds us of the importance of clarifying the disparate meanings of terms in semiotics and the disparate models and perspectives taken by the different seminal contributors to the field of study from de Saussure and Peirce, to Vygotsky, Eco, Barthes, Lacan, Halliday, and so on.

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It is hoped that during future meetings there will be opportunities to explore other semiotic perspectives and to look in greater detail at methods of interpretation and analysis from a variety of perspectives in terms of the ways in which those perspectives may be of value in the search to make sense of discourse and activity in the context of mathematics learning.

The semiotic working group World Wide Web page has been updated and may be found at the following URL: http://www.sbu.ac.uk/~vileawa/Semiotic_WG/*This* will act as the focal point for the group. On this page there is a statement of purpose, news, programs for past and future meetings, a bibliography of related works, papers and reports resulting from group activities, e-mails and links to other semiotic sites. Of course discussion may also continue via the mathematics education mailing list. The working group will meet again at the next BSRLM meeting.

A shared goal members of the group are working towards in the compilation of a special issue of the Philosophy of Mathematics Education Journal on Semiotics and Mathematics Education, with informal short papers and reflections of work-in-progress as well as more finished papers. Non-members of the group interested in the topic are invited to submit ideas for contributions to the editor Paul Ernest at the address below. The World wide web address holds all past issues of the Philosophy of Mathematics Education Journal/newsletter.