

# The discursive use of gestures in university mathematics lecturing

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In a number of publications (e.g. Viirman 2011, in press) I have examined the teaching of functions in university mathematics, viewed as a discursive practice. In these studies I have used the commognitive framework of Sfard (2008) to investigate various aspects of the discursive practices of seven university teachers from three different Swedish universities. More specifically, I have used Sfard's characterisation of discourses in terms of *word use*, *visual mediators*, *narratives* and *routines* (Sfard 2008, p. 133ff) to describe and analyse the teaching practices of the teachers. Previous publications have covered, for instance, word use (Viirman 2011) and routines (Viirman in press). One characteristic that I have so far not studied specifically, however, is the teachers' use of visual mediators, and in this short communication I wish to discuss my plans for an analysis of this aspect, and in particular of the teachers' use of gestures in their teaching.

While the role of gesture in mathematics teaching and learning has generated increasing research interest over the last 20 years, little of this research has focused on university mathematics teachers' use of gesture. In my study I intend to use Sfard's commognitive theory as my theoretical starting point, thus viewing the teaching as a discursive activity. Concerning gestures more specifically, I will use a semiotic approach (e.g. Sabena 2008), viewing gestures as semiotic resources used by the teachers in their teaching practices, and studying how they are intertwined with other semiotic resources such as spoken language and written signs and symbols (ibid, p. 19). For purposes of classification, I intend to use the typology of McNeill (1992), dividing gestures into five basic categories: iconic, metaphoric and deictic gestures, beats and cohesives.

The data available for analysis is the same as in the previous papers mentioned above: about 12 hours of videotaped lectures taken from various first-semester courses in mathematics, on topics related to the teaching of functions. These topics range from basic algebra through linear algebra to calculus. The main aim of the study is to describe and analyse the discursive use of visual mediators, and in particular gestures, in the teaching practices of the teachers. It has been shown in my previous papers that while the teaching practices of the seven teachers are highly similar in form – traditional lectures with teachers using “chalk talk” (Artemeva & Fox 2011) – they nevertheless display major

differences when studied in greater detail. However, these differences mostly appear regarding the use of routines, while the word use, types of visual mediators such as graphs, diagrams and symbols, as well as types of narratives are relatively similar. It has been conjectured by McNeill (1992) that the gestures used within a given mathematical domain may have a shared overall structure, and a secondary aim of the study is to investigate whether the participating teachers' use of gesture in their teaching practices lends support to this hypothesis or not.

I have not done any proper analysis of the uses of gestures yet, but observations made during the analyses conducted for the previous papers suggest that there are specific gestures associated with certain types of discursive actions, and with certain types of diagrams. For instance, set diagrams of functions (two blobs side by side representing domain and range, with an arrow between them from left to right representing the function) are often accompanied by a sweeping motion of one hand along the arrow, suggesting motion from domain to range; this in turn could be seen as indicative of a process view of functions. Furthermore, it has been shown elsewhere (Artemeva & Fox 2011) that it is a common feature of "chalk talk" to use pointing gestures to draw students' attention to specific parts of the written narrative. This type of gesture is used also by the teachers in this study, and appears to serve the same purpose.

## References

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