

STUDYING THE DISCOURSE OF SCHOOL MATHEMATICS OVER TIME: SOME METHODOLOGICAL ISSUES AND RESULTS

Candia Morgan^{*}, Sarah Tang^{*}, Anna Sfard^{**}

^{*}Institute of Education, University of London, UK; ^{**}University of Haifa, Israel

Key words: discourse, examinations, methodology

The project “The Evolution of the Discourse of School Mathematics”¹ seeks to investigate how the nature of participation in mathematical discourse expected of students in England has changed over the past three decades. We have chosen to use the examinations taken by almost all students at the end of compulsory schooling (aged 16 years) as our lens. The General Certificate of Secondary Education (GCSE) examination is widely used as a gatekeeper for further education and employment as well as being a key accountability measure for schools. It thus has high-stakes consequences for schools, teachers and students and, as such, has a strong influence on the curriculum and pedagogy experienced by students through much of their secondary school career (Broadfoot, 1996).

The project rests on a theoretical orientation that understands doing mathematics as participating in mathematical forms of discourse (as a consumer and producer). Hence our analytic approach focuses on discourse, examining the forms of language and other communicative modes involved in engaging with the examinations. In our poster at CERME7 (Morgan & Sfard, 2011), we presented a preliminary analytical framework for identifying characteristics of examination texts. The overall structure of this framework was based on Sfard’s characterisation of mathematical discourse as consisting of vocabulary and syntax, visual mediators, routines and endorsed narratives (Sfard, 2008). This was augmented by questions to be posed to the texts and detailed analytical tools also derived from Sfard’s communicative theory of mathematical activity and from multimodal social semiotics and systemic functional linguistics (Halliday, 1978, 1985; Kress & van Leeuwen, 2001; Morgan, 2006).

A major challenge in beginning this project, however, was to develop this framework into an analytical tool with a sufficient degree of delicacy to distinguish between texts and sufficient robustness to enable it to be applied efficiently and reliably. See Tang, Morgan & Sfard (2012) for an account of the process of development of the framework, focusing in detail on the analytical categories *specialisation* and *objectification* of discourse. Since beginning the project we have come to realise more clearly the challenges it poses and the complexity of the variables involved. Time is a crucial variable defined by our original aims. We have therefore sampled examination papers from eight points in time between 1980 and 2011, chosen

¹ Funded by the Economic and Social Research Council, grant no. RES=062-23-2880

following a review of curriculum and assessment policy and practices in order to capture key changes during the period. This sample consists of 31 question papers containing a total of 558 questions. On the one hand this is a large sample of questions, yet, as the questions range across all parts of the school curriculum, the number of questions on any topic area is relatively small and, even within a single area of the curriculum, the mathematical focus of questions set in different papers can vary considerably. In attempting to look at variation over time, therefore, it has been necessary to find a way of looking that enables comparisons across the full range of the curriculum.

In this poster presentation we will exemplify a small part of the developed analytic framework, focusing on the specialised mathematical nature of the discourse. The fundamental question with which we interrogate the data is: to what extent and in which ways do the examinations demand that students participate in specialised mathematical discourse, using and producing texts with characteristics of such a discourse. We will present indicators used to address this question, exemplifying their application to examination questions from different years and topic areas, together with quantitative results showing variation in this aspect over time.

REFERENCES

- Broadfoot, P. M. (1996). *Education, Assessment and Society*. Buckingham: Open University Press.
- Halliday, M. A. K. (1978). *Language as Social Semiotic: The Social Interpretation of Language and Meaning*. London: Edward Arnold.
- Halliday, M. A. K. (1985). *An Introduction to Functional Grammar*. London: Edward Arnold.
- Kress, G., & van Leeuwen, T. (2001). *Multimodal Discourse: The modes and media of contemporary communication*. London: Arnold.
- Morgan, C. (2006). What does social semiotics have to offer mathematics education research? *Educational Studies in Mathematics*, 61(1/2), 219-245.
- Morgan, C., & Sfard, A. (2011). *The evolution of school mathematics discourse as seen through the lens of GCSE examinations*. Poster presented at the Seventh Congress of the European Society for Research in Mathematics Education.
- Sfard, A. (2008). *Thinking as Communicating: Human development, the growth of discourses, and mathematizing*. Cambridge: Cambridge University Press.
- Tang, S., Morgan, C., & Sfard, A. (2012). *Investigating the evolution of school mathematics through the lens of examinations: developing an analytical framework*. Paper presented at the 12th International Congress on Mathematical Education, Topic Study Group 28 on Language and Mathematics, Seoul, Korea.