Project title: Critical analysis of the languages of functional and graphical change in secondary mathematics classrooms

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Discipline: Mathematics Education

Research area/keywords: classroom language, functions, discourse

Suitable for: Full time or part time applicants

Project background and description
Describing the mathematical behaviour of graphs in progressively more sophisticated classroom language is a challenging skill for teachers of secondary school mathematics (Smith and Bretscher, 2018). How does a teacher respond to student descriptions such as:

"The graph grows bigger"

"The slope goes up"

"It increases more up to 400"?

Terms such as ‘increase’ and ‘growth’ have different meanings in the mathematical and everyday language registers. When teachers and students construct short phrases to describe types of growth, the words and grammar they use may lead to different foci: on endpoints, on overall impression, on comparing incremental changes or on the relationship between variables (Thompson, 1994; Watson and Harel, 2013). They may also use gestures to direct attention to local perceptual features or to indicate deictically a feature that they do not yet have words for (e.g. Hähkiöniemi, 2007).

This project examines the ways that language and gestures are used by teachers and students to shift attention to relevant features of a functional relationship. Whereas recent research (e.g. Şahin-Gür and Prediger, 2018) has focused on calculus, this project will compare two stages of the mathematics curriculum: precalculus and early calculus. In English and Welsh classrooms, these two stages manifest as A-level and GCSE courses of study. For A-level mathematics, teachers introduce early calculus concepts of increasing and decreasing functions and of gradient as a number, a variable and a function. The new GCSE mathematics curriculum includes pre-calculus concepts of slope and growth including recognition of linear, quadratic, exponential and hyperbolic graphs. This project will examine the similarities and the progression in the language used by students and teachers in these two phases, using case studies and linguistic
methods of studying classroom discourse (see for example Ingram, 2014).

This project is suitable for a candidate with prior experience of teaching mathematics at upper secondary level. A good level of written academic English is required to engage with mathematics education literature and linguistic analysis. The candidate will need to negotiate access to case study classrooms and so must be eligible for an appropriate DBS certificate to work with children.

Background reading/references


How to apply for this project

1. Read the Guide for applicants to check eligibility, especially entry and English language requirements.
2. Informal enquiries can be directed to the Director of Research.
3. Complete an application form, and send to the Director of Research by 8th March 2019.