Mathematics Education Research Group of Australasia
43rd MERGA Conference 2021
5 – 8 July 2021
National Institute of Education
Nanyang Technological University
Singapore
MERGA 43: Quick Reads

Insights into the pedagogical practices of out-of-field, in-field, and upskilled teachers of mathematics

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"Out-of-field" teaching is an international phenomenon that seems particularly prevalent in the teaching of mathematics. This paper contributes to research into the effectiveness of professional development programs that are designed to meet the specific needs of out-of-field teachers. It reports on aspects of a larger study evaluating the impact of the Professional Diploma in Mathematics for Teaching (PDMT), a large-scale, government-funded, nationally consistent program offered to out-of-field teachers of mathematics in Ireland.

The PDMT is a 2-year part-time university postgraduate program that aims to develop out-of-field teachers' knowledge of mathematics content and pedagogy. Participants complete ten modules of undergraduate mathematics and two year-long modules of mathematics pedagogy. To evaluate the program's impact, we draw on Desimone's (2009) conceptual framework as a heuristic for studying teacher professional development in terms of changes in knowledge, attitudes and beliefs, and approaches to pedagogy. The focus of this paper is on pedagogical practices that support conceptual understanding and problem solving, in line with the recently reformed secondary school mathematics curriculum in Ireland.

As it was not possible to observe lessons before and after teachers experienced the PDMT, we instead designed a cross-sectional case study to address the following research question: *What similarities and differences can be observed between the pedagogical practices of out-of field, upskilled, and in-field teachers of mathematics?* Thus, we compared three groups of teachers: (a) those currently teaching mathematics out-of-field (n=2); (b) those who had been upskilled to fully qualified status by completing the PDMT (n=2); and (c) those who had always been fully qualified, in-field teachers of mathematics (n=2). These six teachers were recruited from six different schools. Each was observed and video-recorded while teaching three consecutive junior secondary mathematics lessons. The videos were analysed using the Productive Pedagogies framework (Lingard et al., 2001).

The three groups of teachers were *similar* in that all scored highest on the Productive Pedagogies dimension of Supportive Classroom Environment and lowest on the dimension of Connectedness – a finding consistent with other studies of mathematics classrooms. There were *differences* between groups on the dimensions of Intellectual Quality and Connectedness, with in-field and upskilled teachers tending to score higher than out-of-field teachers. For example, in-field and upskilled teachers asked questions requiring higher order thinking, while out-of-field teachers' questions asked for rehearsal of routine procedures. Similarly, in-field and upskilled teachers set tasks for which students had to construct a solution method, while tasks set by out-field teachers made use of well-defined algorithms. Thus, the study provides tentative insights into changing pedagogical practices of formerly out-of-field teachers.

References

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