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Mathematics-for-teaching in pre-service mathematics teacher education: the case of financial mathematics

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ABSTRACT

Mathematics-for-teaching in pre-service mathematics teacher education: The case of financial mathematics

Mathematics-for-teaching (MfT) is complex, multi-faceted and topic-specific. In this study, a Financial Mathematics course for pre-service secondary mathematics teachers provides a revelatory case for investigating MfT. The course was designed and taught by the author to a class of forty-two students at a university in South Africa. Eight students, forming a purposive sample, participated as members of two focus tutorial groups and took part in individual and group interviews.

As an instance of insider research, the study makes use of a qualitative methodology that draws on a variety of data sources including lecture sessions and group tutorials, group and individual interviews, students' journals, a test and a questionnaire.

The thesis is structured in two parts. The first part explores revisiting of school mathematics with particular focus on compound interest and the related aspects of percentage change and exponential growth. Four cases are presented, in the form of analytic narrative vignettes which structure the analysis and provide insight into opportunities for learning MfT of compound interest. The evidence shows that opportunities may be provided to learn a range of aspects of MfT through revisiting school mathematics.

The second part focuses on obstacles experienced by students in learning annuities, their time-related talk, as well as their use of mathematical resources such as timelines and spreadsheets. A range of obstacles are identified. Evidence shows that students use timelines in a range of non-standard ways but that this does not necessarily determine or reflect their success in solving annuities problems. Students' use of spreadsheets reveals that spreadsheets are a powerful tool for working with annuities.

A key finding with regard to teachers' mathematical knowledge, and which cuts across both parts of the thesis, is the importance of being able to move between compressed and decompressed forms of mathematics.

The study makes three key contributions. Firstly, a framework for MfT is proposed, building on existing frameworks in the literature. This framework is used as a conceptual tool to frame the study, and as an analytic tool to explore opportunities to learn MfT as well as the obstacles experienced by. A second contribution is the theoretical and empirical elaboration of the notion of *revisiting.* Thirdly, a range of theoretical constructs related to teaching and learning introductory financial mathematics are introduced. These include separate reference landscapes for the concepts of compound interest and annuities.

Keywords

mathematics for teaching, mathematics teacher education, teachers' knowledge, pre-service, secondary, financial mathematics, revisiting