Examining online community of practice amongst pre-service Mathematics teachers to promote critical thinking through ICT in the mathematics classroom

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Summary of PhD work

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1. INTRODUCTION

1.1 Background

Mathematics remains vital in forming and shaping society and should be taught at every level of education (Angraini et al., 2023). However, due to the unequal education system as a result of the legacy of Apartheid, strong academic performance in mathematics in South African schools continues to remain a challenge for the majority of historically poor learners (Roberts, 2017; Philander, 2018; Spaull, 2015; Sayed and Soudien, 2023).

Despite the government's effort to invest, investment in ICT does not automatically improve learner performance (Saal & Graham, 2023). Current evidence indicates that despite access to and availability of technology in South African Mathematics classrooms, effective integration of technology into teaching and learning is challenging (Li et al., 2018; Saal & Graham, 2023).

In the same vein, government and non-governmental organisations have invested billions of rands in Continuous Professional Development (CPD) programmes to improve teachers' Mathematics content knowledge through workshops and interventions in an attempt to address poor learner Mathematics performance (Taylor, 2021). However, the literature suggests that most CPD has a limited effect on results as CPD programmes in South Africa are often viewed as ineffective due to it being unevaluated, providing little to no feedback, having a one-size-fits-all approach, providing little to no meaningful interactions and not being relevant to teacher's real-world contexts (Gaillard, 2019; Gore & Rosser, 2020).

Furthermore, the DoE states that Initial Teacher Education (ITE) programmes or institutes have a role in encouraging pre-service students to form their own CoP (DoE, 2015). A plethora of studies indicate that ITE programmes do not always produce well-prepared teachers for the South African context and its classroom realities (Sayed et al., 2016; Nkambule, 2020; Taylor, 2021; Ndebele, 2024; Barnett & Teise, 2024). Additionally, current research shows that ITE programmes have not prepared mathematics teachers to teach the CAPS curriculum (Taylor, 2021). Instead, ITE programmes, including CPD, mainly emphasise and focus on mathematics content instead of how to teach the content with the use of technology, which is needed in the 4iR classroom (Saal & Graham, 2023; Saal et al., 2022). Although much is written

about mathematics, CoPs, and ICT, little is written about developing pre-service mathematics teachers to use ICT to promote critical thinking in the mathematics classroom through a CoP within the CAPs framework.

1.2 Problem Statement

Mathematics education is crucial globally for invention, productivity and forming society (Angraini et al., 2023; Hafni et al., 2020; Kusharyadie et al., 2023; Junianto & Wiljaya, 2019; Siahaan et al., 2023; Li et al., 2019). In South Africa however, results from the TIMMs, ANA and NSC is evidence of poor learner performance in Mathematics. According to the DoE, several factors like the legacy of apartheid, the COVID-19 pandemic and learners lack of critical thinking, which is vital in the 4iR classroom, hinders quality Mathematics teaching and learning to take place. Interventions such as CPD and ICT investment and engagement failed to yield significant favourable results (Gaillard, 2019; Saal & Graham, 2023).

1.3 Research Questions

The following main question guides this proposed research:

- How can CoPs enhance the integration of ICT to improve critical thinking skills in Mathematics education among pre-service teachers in South Africa?

The following sub-questions provide further context for the proposed research:

- What are the current challenges faced by pre-service Mathematics teachers in integrating ICT into their teaching practices within the CAPS framework?
- How do pre-service Mathematics teachers perceive the role of CoPs in their professional development and ability to integrate ICT effectively?
- What strategies can be employed within CoPs to foster critical thinking skills through the use of ICT in Mathematics education?

Aims and objectives

In this proposed research, the following is the primary aim:

- To investigate the role of CoPs in enhancing ICT to improve critical thinking skills in Mathematics education among pre-service teachers in South Africa.

To accomplish the primary aim, the following objectives must be met:

- To identify the specific challenges pre-service Mathematics teachers face in integrating ICT within the CAPS framework.
- To explore pre-service Mathematics teachers' perceptions of the effectiveness of CoPs in their professional development and ICT integration.
- To evaluate the impact of CoPs on the professional development of pre-service Mathematics teachers in terms of ICT integration and critical thinking skill enhancement.
- To identify and recommend strategies within CoPs that can effectively foster critical thinking skills through ICT use in Mathematics education.
- To develop a framework for the implementation of CoPs aimed at supporting pre-service Mathematics teachers in ICT integration within the CAPS framework.

PRELIMINARY ACTIVITY TIMETABLE

	Activity	**Completion Date**
1.)	Submit proposal	23 September 2024
2.)	CHAPTER 1 Introduction	30 November 2024
3.)	CHAPTER 2 Literature Review	28 February 2025
4.)	CHAPTER 3 Conceptual Framework	30 May 2025
5.)	CHAPTER 4 Methodology	31 July 2025
6.)	DATA COLLECTION	31 August 2025
7.)	CHAPTER 5 Findings	30 November 2025
8.)	CHAPTER 6 Discussion	28 February 2026
9.)	EDITING OF THESIS	31 March 2026
10.)	SUBMISSION OF THESIS	30 April 2026