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HOW COMPETENT MATHEMATICS TEACHERS DEVELOP PEDAGOGICAL CONTENT KNOWLEDGE IN STATISTICS TEACHING

BY

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CERTIFICATION

This thesis has been examined and approved as meeting the required standard of scholarship for the fulfilment of the Degree of Doctor of Philosophy in Mathematics Education.

Prof. G. O. M. Onwu

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DECLARATION OF ORIGINALITY

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Declaration

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TABLE OF CONTENTS

CHAPTER 1

Introduction

CHAPTER 2

2.0 LITERATURE REVIEW

CHAPTER 3

3.0 RESEARCH METHODOLOGY AND PROCEDURE

CHAPTER 4

4.0 DATA ANALYSIS AND DISCUSSION

ABSTRACT

This study is concerned with how competent mathematics teachers develop pedagogical content knowledge (PCK) in statistics teaching. Pedagogical content knowledge was used as the theoretical framework that guided the research and data collection.

The study's methodology consisted of two phases. In the first phase, the six identified mathematics teachers undertook a conceptual knowledge written exercise. The result of this exercise was used to select the best four performing teachers for the second phase of the study. The second phase consisted mainly of lesson observations, interviews, written documents in the form of completed questionnaires, written diaries or reports, document analysis designed to produce rich detailed descriptions of participating teachers' PCK in the context of teaching statistics concepts at school level. The concept mapping exercise was used to indirectly assess participating teachers' content knowledge and their conceptions of the nature of school statistics and how it is to be taught. The qualitative data obtained were analysed to try to determine individual teachers' content knowledge of school statistics, related pedagogical knowledge, knowledge of learners' conceptions in statistics teaching, knowledge of learners' learning difficulties as well as how they developed their PCK in statistics teaching. The analysis was done based on iterative coding and categorisation of responses and observations made to identify themes, patterns, and gaps, in school statistics teaching. Commonalities and differences if any, in the PCK profiles of the four participating teachers were also analysed and determined.

The results of the study showed that overall, individual teachers develop their PCK in school statistics teaching by:

(a) formally developing their knowledge of the subject matter in a formal undergraduate educational programme, as well as subject matter content knowledge during classroom practice;

(b) using varied topic-specific instructional skills such as graphical construction skills in teaching statistical graphs;

(c) using diagnostic techniques (oral questioning and pre-activity, class discussions and questioning) and a review of previous lessons to introduce lessons, and to determine learners' preconceptions in statistics teaching ;

(d) Using teaching strategies that can help to identify learners' learning difficulties as well as intervention to address the difficulties;

(e) continually updating their knowledge of school statistics by attending content knowledge workshops and other teacher development programmes designed to improve content knowledge and practice.

Keywords: pedagogical content knowledge (PCK), subject matter content knowledge, pedagogical knowledge, instructional strategies, conceptions, learning difficulties, competent teachers, data handling, procedural knowledge, conceptual knowledge.

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES