

Proficiency in Pedagogical Content Knowledge in Mathematics: Secondary School Mathematics Teachers' Interpretations of Students' Problem Solving Strategies in Kenya

Khakasa Marguerite Miheso-O'Connor

Abstract

This study investigated pedagogical content knowledge (PCK) proficiency among mathematics teachers in Kenyan secondary schools. Levels of proficiency were established by examining teachers' interpretations of students' problem solving strategies. Data collection process involved selecting a sample of teachers, exploring their content knowledge, perceptions and observing them at work. Accordingly the study adopted a mixed research design. The central thesis of the study was that effective instruction in mathematics depended on teachers' level of proficiency in pedagogical content knowledge. Nairobi province and Kakamega district, whose selection was based on logistical reasons, formed the primary study locations. Study instruments included questionnaires, classroom observation schedules and interviews. Validation of these instruments and reliability of results were acceptable at; $r = +0.890$ and $\alpha = 0.892$ respectively. The study was guided by three objectives: (1) to determine levels of teacher proficiency in PCK, (2) to establish a relationship between proficiency in PCK and teaching experience and (3) to establish factors that influence the status of teacher's proficiency in PCK. Data was analyzed using both qualitative and quantitative methods. Categories of Fluent, Standard and Mediocre were used to classify findings on levels of proficiency. When data was analyzed, the findings showed that teachers' levels of proficiency in PCK were multidimensional across the components of pedagogical content knowledge and across the study mathematical objects both at personal and group levels. Proficiency of teachers in subject matter knowledge was found to be Fluent, but their ability to transform content into forms that were comprehensible to learners was found to be Mediocre. The cumulative effect of these variations on teacher proficiency in pedagogical content knowledge in mathematics was found to be Standard. The study concluded that, these mixed proficiency levels in pedagogical content knowledge in mathematics caused teachers' evaluative acts at classroom level to be weak. This in turn leads to the observed persistent poor performance of students in secondary school mathematics. Based on this observation, the study argues that, foundational knowledge specifically in mathematical knowledge for teaching was necessary for these cadre of teachers to support them progress knowledgeably towards increased levels of PCK proficiency. The study recommends that a mathematics education course should be established to replace the existing methods unit and that the learning process be cyclic to replace the existing linear model. According to the study, this approach would address the dynamic nature of mathematics education as well as support teachers to progress systematically towards expertise in mathematical knowledge for teaching.

Full text: <https://ir-library.ku.ac.ke/handle/123456789/540>