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The development of topic specific pedagogical content knowledge in out-of-field natural sciences teachers in a rural context

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ABSTRACT

In many countries, there are instances where teachers are teaching content at a level for which they are not qualified. This phenomenon is called teaching 'out-of-field' (OOF). OOF teaching is a common occurrence in low socioeconomic environments, especially in rural areas. However, the practice of OOF teaching remains under-studied and under-researched. There are a great number of complexities necessitating, for example, high attrition rates of qualified science graduate teachers in rural areas as a result of migration to urban areas, resource allocation, and absorption of science graduates into industries. More commonly, Junior Secondary Schools in rural areas are left with no choice but to appoint teachers out-of-their field of expertise.

This study was aimed at improving the teaching of Natural Sciences teachers who were teaching OOF at Junior Secondary level in the rural Eastern Cape. The theoretical framework was based on Pedagogical Content Knowledge (PCK), which explains how teachers transform content knowledge into a teachable form. PCK can be studied at several different levels; domain, subject and topic. The level of PCK studied for this study was Topic Specific Pedagogical Content Knowledge (TSPCK). Validated TSPCK and content knowledge instruments in the topic of particulate nature of matter were used to test content knowledge and quality of teachers' TSPCK before and after an intervention was carried out. The intervention was targeted at improving the quality of teachers' TSPCK in the topic of intervention and consequently their content knowledge. The TSPCK instruments completed by teachers before and after the intervention were scored using a criterion-based rubric. The quality of enacted TSPCK (eTSPCK) before and after the intervention was measured through qualitative in-depth analysis for TSPCK episodes displayed in teachers' video-recorded lessons. The identified teaching segments containing TSPCK episodes were then subjected to a rubric for analyzing eTSPCK. TSPCK scores generated by rubrics for both TSPCK and eTSPCK had inter-rater reliability 0.86 and 0.84 respectively. The results of this study have revealed an improvement in the CK, PCK and the ePCK of teachers in the topic of the particulate nature of matter. This finding provides a path for improving the effectiveness for teachers who face the challenge of out of field teaching.

Key Words: Out-of-field teaching, Pedagogical Content Knowledge, Topic specific Pedagogical Content Knowledge, Natural Sciences, Junior Secondary Level, Rural areas, the Particulate nature of matter