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Examining the impact of secondary level mathematics teachers' pedagogical content knowledge on students' understanding: Focus on symbols and variables

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Teachers' pedagogical content knowledge (PCK) is particularly important to grant for the students' understanding of algebra at the acquisition stage. Secondary level mathematics teachers show many deficiencies and possess poor PCK in teaching algebraic symbols and variables. The purpose of this study was to examine the mathematics teachers' PCK in the classroom practices qualitatively. Sixteen lessons were observed and post-lesson interviews were conducted with eight teachers. The data collected were descriptively analyzed using the reflexive thematic analysis method. The results revealed that the mathematics teachers' PCK of algebra in algebraic symbols and variables were very poor at the students' transiting stage, from arithmetic to algebra. Further, the study results showed that teachers' content related PCK is limited in building mathematical concepts in the students' minds, addressing the misconceptions and understanding of the students' thinking in terms of symbols and variables. Moreover, the research findings revealed that binding to the text book, repeating the definitions in the explanations and using irrelevant terms unnecessarily were considerably impacted on the students' lack of understanding in abstract concepts, symbols and variables. Study results found that mathematics teachers do not possess sufficient knowledge to use appropriate teaching strategies that restrict the students' misconceptions of algebraic symbols and variables. Finally, as shown by the study, the teachers' inability to realize the students' challenges and struggles in understanding abstract concepts are strongly influences the students' lack of understanding in algebra.

Keywords: Algebra, Algebraic symbols, Pedagogical content knowledge, Secondary level mathematics teacher, Variables.