MATHEMATICAL KNOWLEDGE AND HIGHER ORDER THINKING SKILLS FOR TEACHING ALGEBRAIC PROBLEM SOLVING

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Abstract

Solving algebraic problems is a complex process that is influenced by various factors including teachers' instruction. The present intense interest in research on teachers' knowledge and proficiencies demands that future problem-solving research pay close attention to the mathematical and pedagogical knowledge and proficiencies a teacher should possess. This study explores the Prospective Mathematics Teachers' mathematical knowledge for teaching algebraic problem solving and examines the extent to which the prospective teachers integrate the Higher Order Thinking Skills (HOTS) in teaching algebraic problem solving. The descriptive quantitative approach and the case study model were used in this study. The study was conducted with 66 Prospective Mathematics Teachers (PMT) who were undergoing their practical teaching in secondary schools, Malaysia. Out of 66 PMT, only three of them were chosen in order to get information related to what extent does PMT integrate HOTS in teaching algebraic problem solving. The data for this study was obtained using the written task-based questionnaire. The data obtained were analysed in accordance with the content analysis by focusing on the issues related to mathematical knowledge for teaching, heuristics or strategies during solving algebraic problem solving, and ways of PMT integrate HOTS in teaching algebraic problem solving as highlighted in the literature. Findings showed that a number of strategies were employed by PMT in teaching algebraic problem solving. There were seven categories that emerged as their dominant ways of thinking strategy in teaching how to solve the problem. However, two main strategies that were used by PMT are exploratory and Polya's methods. PMT in this study tended to explain everything in solving the algebraic problem. Only one PMT employed a group work method and another PMT employed a practical work method. In addition, two PMTs used questioning technique in teaching algebraic problem solving. These findings indicated that PMT in this study were not familiar with algebraic problem-solving methods (e.g., heuristics, strategies) that are accessible to students. Findings showed that the three PMT that were chosen in this study had established HOTS in teaching the algebraic problem solving. Their activities of teaching and learning the problem involved the link between Representation, Concept and HOTS. Our analyses shows that the relation between the above three key constructs are complex and that PMT need support in understanding these relationships in the context of non-routine problems.

Keywords: Mathematics Teachers, Mathematical Knowledge for Teaching Algebraic Problem Solving, Higher Order Thinking Skills, Representation, Mathematical Concepts.

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