UNIVERSITI TEKNOLOGI MARA

THE RELATIONSHIP BETWEEN CONTENT TEXTBOOK ANALYSIS AND STUDENTS' ACHIEVEMENTS IN THE TOPIC OF RATIO AND PROPORTION

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ABSTRACT

This study investigates the relationship between the distribution of mathematics textbook content and student achievement in the topic of ratio and proportion under the Malaysian KSSR curriculum. Prior research highlights that textbooks often prioritize procedural approaches, which can limit students' conceptual understanding and reasoning skills. To explore this, a sequential mixed-methods design was employed in three phases. Phase One involved a content analysis of Form One mathematics textbooks using the Level of Cognitive Demand (LCD) framework, categorizing problems into three dimensions: missing value, comparison, and qualitative. Phase Two assessed 302 students using 12 proportional reasoning test items. Phase Three consisted of interviews with three students to gain deeper insight into their thinking processes. Participants were sampled randomly from a population of 1,424 Form One students in the Kapar area of Klang, Selangor. The textbook analysis revealed a heavy emphasis on missing value problems (57.9%), which were mostly at Level 2, focusing on procedural understanding. In contrast, comparison and qualitative problems were less frequent but tended to appear at higher cognitive levels (Levels 3 and 4), particularly qualitative problems, which were all at Level 4. Student performance aligned closely with textbook emphasis. The highest scores were recorded for missing value problems ($M = 7.82$), followed by comparison ($M = 2.37$), and the lowest for qualitative problems ($M = 0.61$). This suggests that students are more proficient in procedural tasks but struggle with conceptual and reasoning-based problems. A significant positive correlation was found between the frequency of a problem type in textbooks and student achievement in that type. These findings underscore the importance of balancing procedural and conceptual content in textbooks and teaching practices to enhance students' proportional reasoning and problem-solving abilities.

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1.1 Introduction

Malaysia’s education has evolved over the decades, transitioning from KBSR to KSSR, and corresponding changes have been made to school textbooks (Parmjit et al., 2020). The current KSSR Math textbooks, developed in 2014/15 with significant government expenditure, aim to provide quality education nationwide (Parmjit et al., 2020). Despite the 2022 PISA average results indicating a decline in Malaysia's performance in mathematics, reading, and science compared to 2018, only 41% of students achieved at least Level 2 proficiency in mathematics, which is notably lower than the OECD average of 69% (OECD, 2023).

Additionally, only 1% of Malaysian students emerged as top performers in mathematics by attaining Level 5 or 6 on the PISA mathematics test, contrasting with the OECD average of 9% (OECD, 2023). Among the assessed topics tested, ratio and proportion has taken a significant portion, indicating its importance in identifying mathematics proficiency. Therefore, this is a critical issue regarding Malaysian students' understanding of mathematics that must be addressed and taken seriously.

1.2 Research Background

Mathematics is an important subject for students because mathematics is a core subject to help along students to learn new concepts without have difficulties, as mathematics is knowledge that has a relation among concepts (Diba & Prabawanto, 2018). According to the idea of Freudenthal, mathematics needs to connect to reality, stay close to children, and should be relevant to society due to mathematics plays main role in human life (Panhuizen & Maria, 2003). The critical topic in mathematical curriculum is ratio and proportion (Andini & Jupri, 2017). Ratio and proportions play a crucial role in students’ comprehension of various mathematical and sciences subject (Barbara et al., 2016).