UNIVERSITI TEKNOLOGI MARA

MATH4KIDS: A DIGITAL GAME-BASED MATHEMATICS COURSEWARE FOR YEAR 4 STUDENTS BASED ON SELF-DETERMINATION THEORY

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ABSTRACT

Mathematics is a fundamental subject in the Kurikulum Standard Sekolah Rendah (KSSR) that helps pupils develop logical thinking and problem-solving skills. However, Year 4 pupils often face difficulties in learning Mathematics due to limited classroom practice, teachers' reliance on paper-based exercises, and the lack of interactive multimedia learning materials. These challenges reduce pupils' motivation, confidence, and understanding, particularly when learning abstract topics such as fractions, decimals, and percentages. To address these issues, this project developed MATH4KIDS, a Digital Game-Based Learning (DGBL) courseware for Year 4 pupils based on Self-Determination Theory (SDT). The objectives were to identify the courseware requirements, design and develop the courseware, and evaluate its functionality and usability. This courseware is a web-based application that consists of educational videos, interactive notes, quizzes, game-based learning activities, achievement badges, and progress tracking, developed using the ADDIE instructional design model. Functionality testing was conducted using test cases, while expert evaluation involved three experts. User evaluation was carried out using questionnaires completed by 30 Year 4 students selected through a convenience sampling technique. The results showed that all functional test cases were successfully passed. Expert evaluation indicated positive results for the functionality, interface, learning content, gamification elements, and implementation of SDT. The usability evaluation also revealed a positive user acceptance, because mean scores were in the range from 3.97 to 4.63 out of five points on a Likert scale. Overall, MATH4KIDS successfully achieved its objectives by providing an engaging and motivating learning environment for Year 4 pupils. The findings suggest that the courseware has strong potential to support Mathematics learning in primary education. Future improvements include expanding the learning content, introducing additional game-based activities, and improving multimedia resources and system navigation.