



Boosting Year 4 Science Education: A Dynamic Blend of Paper-Based and Computerized Board Games

Kah Ching Sim & Mohd Kamal Othman*

Faculty of Cognitive Sciences and Human Development, Universiti Malaysia Sarawak,
Malaysia.

ABSTRACT

This study examines using Paper-Based and Computerised Board Games with collaborative learning to enhance science learning involving 48 Year 4 participants from National-Type Chinese Primary Schools (24 Male and 24 Female). The study utilises a mixed-methods approach combining quantitative (pre-tests, post-tests, questionnaires) and qualitative (classroom observations, interviews) data to investigate the unique strengths of these pedagogical approaches. Paper-based Board Games with Collaborative Learning (CL) showed the most substantial impact on academic performance, motivation, and social interaction compared to Computerised Board Games with collaborative learning. The research suggests that paper-based board games might be a more effective tool for educators using CL to create engaging learning experiences in science for young students. Additionally, no significant difference between genders was observed in the learning scores. Further research with more extensive and diverse samples, longitudinal studies, and exploration in different contexts are recommended to broaden the understanding of these methods' effectiveness across various settings and learning goals.

Keywords: pedagogy, paper-based board games, computerised board games, collaborative learning, academic performance, learning motivation, social interaction, national-type Chinese primary schools

ARTICLE INFO

Email address: omkamal@unimas.my (Mohd Kamal Othman)

*Corresponding author

<https://doi.org/10.33736/jcshd.6761.2024>

e-ISSN: 2550-1623

Manuscript received: 6 March 2024; Accepted: 27 March 2024; Date of publication: 31 March 2024

Copyright: This is an open-access article distributed under the terms of the CC-BY-NC-SA (Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License), which permits unrestricted use, distribution, and reproduction in any medium for non-commercial purposes, provided the original work of the author(s) is properly cited.

1 INTRODUCTION

Despite the Malaysian government's laudable efforts to foster science and technology (STEM) education through various national initiatives, including the National Education Policy, the 3rd Core of the Eleventh Malaysia Plan, the Malaysia Education Blueprint 2013-2025 (Abdullah, 2021), science curriculum revisions from Year 1 to Year 6 (Sulaiman et al., 2017) and STEM education policy (Jamel et al., 2019), international assessments paint a concerning picture of declining science performance (Aliyu, 2020; Suhaili et al., 2020). While the National STEM Centre advocates for adopting inquiry-based learning approaches (Ong et al., 2021), a reliance on traditional, exam-oriented teaching methods persists (Shah et al., 2017; Abdullah et al., 2017). This emphasis on rote memorisation often hinders students' genuine comprehension and engagement with scientific concepts, creating challenges in developing higher order thinking skills (HOTS) (Phang et al., 2020; Mat & Yusoff, 2019). Additionally, students' motivation in learning science tends to be driven by exam results rather than a genuine desire to understand (Phang et al., 2020), further contributing to a superficial grasp of scientific knowledge. Moreover, the persistent perception of science as a dull and challenging subject remains challenging, potentially hindering students' grasp of science concepts and impeding effective teaching techniques (Teppo et al., 2021; Virata et al., 2019).

This research addresses these challenges by exploring the potential of gamification by using board games as a supplementary tool to enhance science learning among primary school students in Malaysia. Board games leverage gamification's inherent motivational and collaborative benefits (Zakaria et al., 2022; Le et al., 2018), fostering engagement and positive learning experiences. This study investigates two forms of board games: Paper-Based Board Games (PBBG) and Computerized Board Games (CBG). PBBG offer readily accessible and cost-effective solutions, fostering social interaction and communication among players. Conversely, CBG provides opportunities for increased engagement, interactivity, and multimedia integration (Aditya et al., 2021; Liu & Lu, 2021).

Social Interaction as the Cornerstone of Collaborative Learning: Cultivating Growth in Science Education

Collaborative Learning (CL) is characterised by intentional group work, where students work in small groups towards a shared learning goal. This necessitates co-labouring, requiring them to actively engage with each other, exchange ideas, and contribute collectively to achieve the task (Major, 2020). CL strategies like peer-based learning activities and social collaboration projects (Urrea et al., 2022) create an environment where students can leverage their strengths and diverse perspectives to deepen their collective understanding of scientific concepts. Positive social interaction within CL offers many benefits for students. For example, students solidify their understanding of scientific principles by engaging in discussions, explaining concepts to peers, and receiving feedback (Tocaimaza-Hatch & Santo, 2020). Furthermore, social interaction stimulates critical thinking and problem-solving skills as students collaboratively analyse information and reach shared conclusions (Hult, 2019). CL fosters effective communication as students learn to articulate their thoughts clearly, listen actively to their peers, and present information persuasively. Working within groups helps students develop teamwork, conflict