Faculty of Cognitive Sciences and Human Development

Collaborative Learning of Year 4 Science Subject Using Board Games

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Collaborative Learning of Year 4 Science Subject Using Board Games

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A thesis submitted

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DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Malaysia Sarawak. Except where due acknowledgements have been made, the work is that of the author alone. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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ABSTRACT

In an educational landscape increasingly influenced by technology, this research investigates collaborative gaming using a digital and non-digital format to uncover their potential to elevate students' academic performance, learning motivation, and social interaction within the Science classroom. This research employs a pre-test-post-test between-groups design to investigate the gender differences and the effectiveness of Conventional Teaching (CT), Collaborative Learning (CL) strategies in the context of teaching the Year 4 Science curriculum through Paper-Based Board Games (PBBG) and Computerized Board Games (CBG). The study engages a diverse group of 10-year-old participants from National-Type Chinese Primary Schools to comprehensively analyze the gender differences by comparing the change scores and mean scores for CT with the PBBG and CBG. Through a combination of quantitative methods encompassing pre-tests, post-tests, and questionnaires, while qualitative approaches involve classroom observations and interviews, the distinction of CT, PBBG and CBG with CL is explained. The findings reveal that there are no gender differences between teaching methods. In contrast, a significant difference was detected between the academic performance, social interaction and learning motivation, facets of CT, PBBG, and CBG, specifically in science education. Notably, the PBBG group exhibits a higher mean score and lower standard deviation, implying a more robust perception of academic performance, social interaction and learning motivation. The implications of this research reverberate across the educational landscape, offering valuable insights to educators, curriculum designers, and educational technology developers in pursuing innovative Science education approaches. Recognising the inherent value of PBBG and CBG, with CL, educators are poised to harness their potential to create engaging and impactful learning experiences for 10-year-old participants

within National-Type Chinese Primary Schools. This approach enhances their grasp of scientific concepts while nurturing essential collaborative skills.

Keywords: Conventional Teaching (CT), Paper-Based Board Games (PBBG), Computerized Board Game (CBG), Collaborative Learning (CL), academic performance, learning motivation, social interaction, 10-year-old participants, National-Type Chinese Primary Schools

Pembelajaran Kolaboratif Mata Pelajaran Sains Tahun 4 Menggunakan Permainan Papan Berkomputer dan Permainan Papan Berdasarkan Kertas

ABSTRAK

Dalam landskap pendidikan yang semakin dipengaruhi oleh teknologi, kajian ini menyiasat permainan kolaboratif menggunakan format digital dan bukan digital untuk mendedahkan potensi mereka untuk meningkatkan prestasi akademik, motivasi pembelajaran dan interaksi sosial pelajar dalam kelas Sains. Kajian ini menggunakan reka bentuk pra-ujian-pasca antara kumpulan untuk menyiasat perbezaan jantina, dan keberkesanan strategi Pengajaran Tradisional (PT), Pembelajaran Kolaboratif (PK) dalam konteks pengajaran kurikulum Sains Tahun 4 melalui Permainan Papan Berdasarkan Kertas (PPBK) dan Permainan Papan Berkomputer (PPB). Kajian ini melibatkan sekumpulan peserta berumur 10 tahun yang pelbagai dari Sekolah Rendah Cina Jenis Kebangsaan untuk menganalisis secara komprehensif perbezaan jantina, sebagai membandingkan skor perubahan dan skor min untuk PT dengan PPBK dan PPB. Melalui gabungan kaedah kuantitatif yang merangkumi ujian pra, ujian pasca dan soal selidik, manakala pendekatan kualitatif melibatkan pemerhatian dan temu bual bilik darjah, perbezaan PT, PPBK dan PPB, dengan PK dijelaskan. Dapatan kajian menunjukkan bahawa tiada perbezaan jantina antara kaedah pengajaran yang terlibat. Sebaliknya, perbezaan yang signifikan dikesan antara prestasi akademik, interaksi sosial dan motivasi pembelajaran, aspek PK, PPBK dan PPB, khususnya dalam pendidikan Sains. Kumpulan PPBK mempamerkan skor min yang lebih tinggi dan sisihan piawai yang lebih rendah, menunjukkan persepsi yang lebih mantap terhadap prestasi akademik, interaksi sosial dan motivasi pembelajaran. Implikasi kajian ini bergema merentasi landskap pendidikan, menawarkan pandangan berharga kepada pendidik, pereka

kurikulum dan pembangun teknologi pendidikan dalam mengikuti pendekatan pendidikan Sains yang inovatif. Menyedari nilai semula jadi PPBK dan PPB, dengan PK, para pendidik bersedia untuk memanfaatkan potensi mereka untuk mencipta pengalaman pembelajaran yang menarik dan memberi kesan untuk peserta berumur 10 tahun dalam Sekolah Rendah Cina Jenis Kebangsaan. Pendekatan ini meningkatkan pemahaman mereka tentang konsep saintifik sambil memupuk kemahiran kolaboratif yang penting.

Kata kunci: *Permainan Papan Berdasarkan Kertas (PPBK), Permainan Papan Berkomputer (PPB), Pembelajaran Kolaboratif (PK), pencapaian akademik, motivasi pembelajaran, interaksi sosial, peserta berusia 10 tahun, Sekolah Jenis Kebangsaan Cina*

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LIST OF ABBREVIATIONS

AR	Augmented Reality
ASATSC	Asian Student Attitudes towards Science Class
AT	Activity Theory
CBG	Computerized Board Games
CL	Collaborative Learning
CSCL	Computer-Supported Collaborative Learning
CT	Conventional Teaching
DSKP	*Dokumen Standard Kurikulum Dan Pentaksiran*
HOTs	Higher Order Thinking Skills
IBSE	Inquiry-Based Science Education
IoT	Internet of Things
IR 4.0	Industrial Revolution 4.0
IS	Importance of Science
MCSCL	Mobile Computer-Supported Collaborative Learning
MOE	Ministry of Education
MSLQ	Motivated Strategies for Learning Questionnaire
PBBG	Paper-Based Board Games
PISA	Program for International Student Assessment
PLC	Professional Learning Community
SC	Science Confidence
SCT	Social Constructivism Theory
SE	Science Enjoyment