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ENHANCING MEDIA AND INFORMATION LITERACY THROUGH EXPERIENTIAL GAME-BASED LEARNING

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ABSTRACT

Purpose – Media and Information Literacy (MIL) education plays a crucial role in combating misinformation and disinformation in the digital era. This study explores an innovative pedagogical approach by integrating Experiential Learning Theory (ELT) into non-digital game-based learning to bridge gaps in MIL knowledge and skills among Malaysian secondary and tertiary students, while also addressing the digital divide. Given that current MIL interventions often rely solely on self-assessment, this study emphasises the need for more objective assessment methods to measure actual learning outcomes.

Methodology – A one-group pre-post-test mixed-methods research design was employed. A total of 95 participants from secondary and tertiary educational institutions in Malaysia engaged in an ELT-informed MIL board game intervention. The impact on MIL knowledge was assessed using a structured MIL knowledge test and a qualitative feedback survey.

Findings – Results indicate that the intervention positively influenced MIL knowledge acquisition, as indicated by statistically significant improvements in post-test scores. Qualitative feedback further revealed enhanced understanding of MIL concepts, strengthened sense of responsible digital citizenship, and affirmation of the experiential game-based approach as an effective learning method.

Significance – This study offers valuable insights into the application of ELT within non-digital game-based MIL education, particularly across diverse educational levels in Malaysia. It presents a scalable and cost-effective model for fostering critical thinking and ethical media engagement, offering practical recommendations for educators, community-based organisations, and policymakers in advancing MIL education nationwide.

Keywords: Media and information literacy, experiential learning, non-digital game-based learning, knowledge efficacy.

INTRODUCTION

Media and Information Literacy (MIL) education provides a practical, skills-based approach to addressing the challenges of misinformation in today's digital age (Dame Adjin-Tettey, 2022; Monsees, 2023; Nieminen, 2024). UNESCO (2019) defines MIL as the ability to locate, organise, and critically evaluate media and information. As such, MIL is essential at both school and tertiary levels to cultivate these skills from an early stage and sustain them throughout a learner's academic journey. At the school level, MIL focuses on foundational competencies, such as identifying credible sources, understanding digital safety, and recognising media bias—skills that prepare students for safe and responsible media engagement (Costa et al., 2018). At the tertiary level, MIL expands to include advanced capabilities, including critical analysis, ethical content creation, and media critique, equipping students to participate more effectively in public discourse and digital content creation (Cernicova-Buca & Ciurel, 2022). Research shows that individuals trained in MIL are better able to evaluate the authenticity of content and detect misinformation (Scheibenzuber et al., 2021). They are also less likely to share false information (Dame Adjin-Tettey, 2022; Pinto da Mota Matos et al., 2016), more aware of the ethics of information dissemination (Fedorov & Mikhaleva, 2020), able to identify cognitive biases (Hashim et al., 2022), and comprehend the broader societal impact of media (Lim & Nekmat, 2008). These competencies are essential for developing informed and responsible citizens.

According to the Digital Global Overview Report 2024, Malaysia has one of the highest internet adoption rates (97.4%) and social media penetration rates (83.1%) among youth. This widespread access underscores the urgent need for MIL education. However, existing studies reveal that Malaysian tertiary students demonstrate only moderate levels of media literacy (Chin & Hasmah, 2019) and show limited motivation to counter misinformation (Hasmah & Chin, 2020; Simon Kemp, 2023). Among secondary school students, a lack of awareness regarding appropriate online behaviour, hesitation in confronting issues such as body shaming on social media, and limited digital citizenship skills—such as creating digital identity with integrity—have also been observed (Tajuddin et al., 2024). These findings reveal distinct gaps in MIL knowledge and skills across all educational levels in Malaysia warranting further investigation.

Pedagogical strategies are crucial in delivering effective and lasting MIL education. Active learning approaches, particularly experiential and game-based learning, have shown promise in fostering sustained engagement with MIL concepts (Cernicova-Buca & Ciurel, 2022; Tan et al., 2023). Although evidence on their effectiveness remains mixed, some academics advocate for educational games as a means to enhance students' critical thinking in identifying fake news while also boosting motivation and interest (Cernicova-Buca & Ciurel, 2022; Scheibenzuber & Nistor, 2019; Pimmer et al., 2020). Despite the recent proliferation of fake news-related games, few have explicitly integrated MIL principles or drawn on experiential learning theories in their design and implementation (Basol et al., 2021; Micallef et al., 2021; Roozenbeek & van der Linden, 2018, 2019).

Furthermore, many digital games and online learning tools fail to address the persistent digital divide within communities. Teachers, particularly in rural and remote areas, face significant challenges in maintaining close contact with students who have limited internet connectivity and restricted access to digital devices (Loganathan et al., 2021; Nicola et al., 2020). In contrast, non-digital, gamified teaching

methods have proven effective in promoting social support and interaction, which enhance the learning experience and improve comprehension (Cortés et al., 2024; Ip & Cooperstock, 2011; Naik, 2014; Xiang et al., 2025).

Current MIL interventions rely heavily on self-assessment tools, allowing participants to evaluate their own knowledge and skills (Basol et al., 2021; Pandian et al., 2020; Schilder et al., 2016). However, self-assessments are inherently subjective and susceptible to bias. Learners may either overestimate or underestimate their abilities due to factors such as self-confidence, a desire to provide socially acceptable responses, or a limited understanding of their own knowledge gaps. These limitations highlight the need for more objective and quantitative methods to accurately assess the effectiveness of MIL programmes.

This research aims to address these gaps in MIL education by integrating Kolb's Experiential Learning Theory with a non-digital, game-based learning approach. The study offers empirical insights and proposes a practical framework for implementing MIL education across different student levels in Malaysia. By focusing on board games as an experiential learning tool, this study evaluates their effectiveness in improving students' MIL knowledge and skills. To guide this inquiry, the study poses the following research questions:

1. To what extent does experiential game-based learning, through the use of an MIL board game, influence the acquisition of MIL knowledge among students?
2. Does the effectiveness of experiential game-based learning differ among lower secondary, higher secondary, and tertiary level students?
3. What are students' perceptions of experiential game-based learning using the MIL board game?

MIL Education in Malaysia

MIL education has evolved differently across Asia and other developing regions, shaped by each country's unique socio-cultural context, digital infrastructure, and educational landscape (Lim & Nekmat, 2008). In Malaysia, MIL education is mainly driven by both government initiatives and non-governmental organisations (NGOs). Government efforts—include the *Click Dengan Bijak* (Click Wisely) campaign and the Malaysia ICT Volunteer programme, initiated by the Malaysian Communications and Multimedia Commission (MCMC)—aim to cultivate responsible digital citizens and support the country's transition into a smart digital society (MCMC, 2020). In this regard, equipping Malaysian students with MIL competencies is crucial to combat misinformation in the digital era.

Despite its growing importance, the integration of MIL into Malaysia's national curriculum remains a significant challenge, as MIL has not yet been formally incorporated into the official education syllabus (Hashim et al., 2022; Pandian et al., 2020). Therefore, most MIL education in Malaysia take the form of independent training programmes and supplementary activities at both secondary and tertiary education levels.

Community-based organisations have also played a vital role in advancing MIL education. One notable example is ARUS Academy, a Malaysian social enterprise that established the Society of Media and Information Literacy Educators (SMILE) and launched the Media Education for All (ME4A) movement in January 2021. Through this initiative, ARUS Academy developed the Media Education Academy

and designed online MIL courses based on the UNESCO MIL curriculum, which trained over 3,000 secondary school teachers (ARUS Academy, 2021). Their outreach includes nationwide online and offline campaigns—such as roadshows and boot camps—to raise public awareness of MIL (The Star, 2021; Yiswaree Palansamy, 2021). This research collaborates with ARUS Academy to explore the application of experiential learning within a non-digital game-based MIL training programme. Specifically, it investigates the use of the *FollowMe* board game—designed to enhance MIL skills through interactive gameplay—as part of this initiative.

Although MIL education has yet to be formalised within Malaysia’s national curriculum, ARUS Academy’s initiatives represent a promising step toward equipping students with essential MIL competencies. The implementation of experiential learning through non-digital games offers a practical pedagogical approach. However, a continued reliance on self-assessment methods highlights the need for more objective evaluation methods, in line with UNESCO’s MIL Competency Matrix. To ensure alignment with global standards, the MIL knowledge framework embedded in the *FollowMe* board game is adapted from UNESCO’s MIL curriculum (UNESCO, 2013, 2019). The board game incorporates the following three core learning objectives (LOs):

LO1: Understand the ethics of spreading or sharing information.

LO2: Understand the role of media and its societal impact as the fourth estate.

LO3: Critically analyse and identify the authenticity of content.

These learning outcomes aim to prepare students across educational levels to navigate the increasingly complex digital landscape with greater media and information literacy.

Game-Based Learning in MIL

Game-based learning (GBL), as both a form of serious games and an educational strategy, has demonstrated positive impacts on student engagement, motivation, and learning outcomes (Connolly et al., 2012; Qian & Clark, 2016). It plays a vital role in fostering 21st-century competencies—particularly critical thinking, creativity, collaboration and communication, media literacy, and technological proficiency (Qian & Clark, 2016)—prompting educators to adopt innovative teaching methods in diverse learning contexts. Several scholars have incorporated GBL into MIL curricula or training programmes, reflecting its growing potential as an effective pedagogical approach (Costa et al., 2018; Micallef et al., 2021; Scheibenzuber & Nistor, 2019). A prominent example is the award-winning “Bad News” game (Roozenbeek & van der Linden, 2019) which initially showed promise in inoculating approximately 15,000 online participants against misinformation. While studies observed that psychological resistance to online misinformation varied significantly by age, no notable differences were found across educational levels (Roozenbeek & van der Linden, 2019). However, subsequent studies reported limited effectiveness of such games in higher education settings (Pimmer et al., 2020; Scheibenzuber & Nistor, 2019). For instance, Pimmer et al. (2020) examined two games—*Bad News* and *Fakefinder*—among undergraduate business students. While participants showed improvement in detecting fake news, they struggled to identify how fake news spreads. Similarly, Scheibenzuber and Nistor (2019) found no significant learning gains through *Bad News*, though students reported increased motivation and a positive perception of the training. These mixed results emphasise the need for further research on GBL’s effectiveness in MIL education across educational levels and age groups, and the contextual factors influencing its success.

Cernicova-Buca and Ciurel (2022) used a GBL approach to develop resilience against disinformation among communication students. The study found that students responded positively to the game experience; however, the researchers emphasised the need for complementary strategies and targeted interventions—across both formal and informal learning settings—to develop critical thinking and authentic media literacy skills for long-term educational sustainability. Micallef et al. (2021) also demonstrated the use of game interventions in enhancing news literacy, particularly by analysing user interactions with social media-based news articles over a 19-month period. Findings revealed that players retained MIL skills when they continued playing, indicating the importance of repetition and sustained engagement. Similarly, the *Go Viral* pre-bunking intervention game showed promising results, indicating improved ability to detect and resist COVID-19 misinformation and a reduced willingness to share false content, even one week after gameplay (Basol et al., 2021). These findings indicate GBL's potential in enhancing critical thinking to combat fake news, though further research and the development of rigorous assessment frameworks remain necessary (Schilder et al., 2016).

While digital GBL has become increasingly prevalent, it often fails to reach learners in rural or underserved areas who lack stable internet access and digital devices (Loganathan et al., 2021; Nicola et al., 2020). In contrast, non-digital gamified approaches—such as board games—have proven effective in promoting social interaction and support, thereby enriching the overall learning experience (Ip & Cooperstock, 2011; Naik, 2014). Recent studies indicate that non-digital games can lead to better knowledge acquisition and reduced cognitive load compared to digital games. They also offer a cost-effective solution for teaching subjects such as mathematics and economics (Cortés et al., 2024; Xiang et al., 2025).

The literature indicates that GBL is suitable for MIL education, especially when integrated with constructivist pedagogies such as experiential learning, which fosters critical thinking and deeper knowledge acquisition. While digital games continue to play an important role, addressing the digital divide requires the inclusion of non-digital gamified learning tools. These tools ensure more inclusive education, enabling students of all backgrounds and digital access levels to benefit from MIL training. Therefore, using non-digital board games as experiential learning tools represents a promising approach in evaluating MIL intervention outcomes within a comprehensive MIL assessment framework.

Experiential Game-Based Learning

Experiential learning theory originated from constructivist thought, drawing from educational theorists such as Jean Piaget, John Dewey, and Kurt Lewin (Evans, 2019). One of the most influential models is the Experiential Learning Cycle by David Kolb (1984), which posits that learning is a continuous process shaped by the transformation of experience. According to Kolb, the learning cycle consists of four sequential stages: Concrete Experience, Reflective Observation, Abstract Conceptualisation, and Active Experimentation. This model suggests that individuals learn by engaging in experiences, reflecting on them, drawing conceptual insights and then testing these insights through further action (Kolb, 1984; Kolb et al., 2000). Experiential learning assumes that learning is a dynamic and ongoing process. Learners encounter new experiences, reflect internally, and adapt or replace pre-existing ideas based on critical analysis and practical engagement. This iterative process encourages continuous dialogue, feedback, and application in real-life contexts, fostering deeper critical thinking (Dimmitt, 2017; Fosnot & Perry, 2005).

Experiential learning theory also provides a strong foundation for supporting game-based learning design. The integration of game-based and experiential learning approaches has been shown to enhance

educational outcomes in both academic and organisational settings (Odendaal, 2018). Fernández-Sánchez et al. (2023), for instance, combined game-based learning with the experiential learning cycle and found that active engagement, when supported with structured guidance (scaffolding), significantly improved learners' understanding and retention.

Although experiential game-based learning has demonstrated success in various fields—such as sustainable development (Dieleman & Huisingsh, 2006; Ho et al., 2022), business and accounting (Ahn, 2008; Sugahara & Lau, 2019), engineering (Zapalska, 2021), project management (Saenz & Cano, 2009), library instruction (Kaneko et al., 2018), and disaster prevention (Tsai et al., 2020)—there remains a notable lack of empirical research within the field of Media and Information Literacy (MIL). While these approaches have consistently enhanced learner engagement, motivation, decision-making, and critical reflection, their application to MIL—particularly through board games as instructional educational tools—has yet to be thoroughly explored or validated in educational research.

This study applies Kolb's Experiential Learning Cycle (ELT) (Kolb, 1984; Kolb et al., 2000) within the context of an MIL board game-based learning intervention. The four ELT stages—Concrete Experience, Reflective Observation, Abstract Conceptualisation, and Active Experimentation—are integrated across three rounds of gameplay and associated learning activities.

Round 1: Concrete Experience

This initial phase corresponds to the Concrete Experience stage of Kolb's Experiential Learning Cycle (ELT). Students are introduced to the MIL board game through hands-on participation, engaging with its mechanics and objectives under teacher guidance. A trial round allows students to explore the gameplay and interact with peers, promoting discussion and active engagement. These shared experiences provide a foundational base of direct involvement, which is essential for the reflective and conceptual phases that follow.

Round 2: Reflective Observation and Abstract Conceptualisation

The second round integrates the Reflective Observation and Abstract Conceptualisation stages of the ELT cycle. Building on their experiences from Round 1, students participate in teacher-led discussions to reflect more deeply on their gameplay. These structured reflections encourage students to share personal interpretations, analyse key moments, and explore how game scenarios relate to real-world media and information issues. This round is crucial as students begin to develop new insights and link game-based scenarios to broader societal contexts.

Round 3: Active Experimentation

The final round corresponds to the Active Experimentation stage. Here, students apply the knowledge and insights gained in the earlier rounds by designing their own MIL-focused lesson plans or creating MIL projects. These applications involve tackling real-world information disorder cases and navigating ethical challenges related to media and information use. Through collaborative work and interactive discussions, students test their strategies, receive feedback, and refine their understanding, demonstrating practical application of MIL concepts in authentic settings.

METHODOLOGY

Previous studies on MIL interventions have largely relied on quantitative self-assessment methods focused on a single educational level, often lacking comparisons across different educational levels, and yielding inconsistent results (Roozenbeek & van der Linden, 2019; Scheibenzuber et al., 2021). To address these limitations, the present study adopts a mixed-methods design that includes participants from various educational levels, enabling cross-level comparisons and strengthening the evaluation process through triangulation, thereby enhancing the credibility and robustness of the findings (Creswell & Plano Clark, 2018). In response to the known limitations of self-assessment in MIL research—particularly its susceptibility to subjectivity and bias (Schilder et al., 2016)—this study incorporates objective measurement tools in the form of pre- and post-tests. These assessments were used to determine actual knowledge gains, thereby addressing Research Questions 1 and 2 (RQ1 and RQ2) with empirical, quantitative evidence. To complement this, qualitative feedback was collected from participants to explore Research Question 3 (RQ3), offering insights into learners' perceptions and experiences with the MIL board game.

The use of a mixed methods approach provides a more comprehensive understanding of the research problem by integrating both numerical and narrative data. This design supports the process of triangulation—validating and corroborating findings from multiple sources (Dawadi et al., 2021; Onwuegbuzie & Johnson, 2006). In particular, this study used a convergent parallel design, in which quantitative and qualitative data were gathered concurrently, analysed independently, and then compared during the interpretation phase. This method allows for the identification of consistencies or divergences between datasets, thereby enhancing the depth, nuance, and reliability of the study's conclusions (Creswell & Plano Clark, 2018).

Instruments

This study employed two main instruments for data collection: A) MIL Knowledge Pre-and Post-Test and B) Demographic Survey Questionnaire and learning feedback on the outcome.

A) MIL Knowledge Pre- and Post-Test

The MIL knowledge test comprised 20 items adapted from the UNESCO MIL assessment framework (UNESCO, 2013, 2019) focusing on three key learning outcomes (LOs). The test was modified from Zou'bi's (2021) MIL impact assessment to suit the local educational context. Each correct response was awarded 5 marks, amounting to a total of 100 marks. The distribution of questions across LOs was as follows:

- LO1 (Understanding the ethics of sharing information): 5%
- LO2 (Understanding the role of media and its societal influence): 55%
- LO3 (Critical analysis and content authenticity): 40%

The test consisted of two parts: Part A: Multiple-choice questions (50 marks), and Part B: Filling-in-the-blanks responses requiring critical analysis of the appropriateness of selected media content and related messages (50 marks). Participants were given 20 minutes to complete the test. For the post-test, the sequence of questions was randomised to minimise the influence of memory recall and to ensure a more accurate assessment of knowledge acquisition.

B) Survey Feedback Form

Qualitative feedback was collected using a survey questionnaire that included both demographic questions and one open-ended item designed to elicit participants' perceptions on the learning experience. The open-ended question asked: "What is the most important takeaway from the whole board game learning experience process?" To ensure content validity, the questionnaire was reviewed by three academic experts in the field of media studies. Based on their suggestions, the instrument was revised, and specific items were refined for clarity and relevance. The qualitative responses were analysed using thematic analysis following the six-phase approach recommended by Creswell and Plano Clark (2018):

Phase 1: Familiarisation with the Data – Reviewing responses and noting initial ideas.

Phase 2: Generating Initial Codes – Labelling meaningful segments of text.

Phase 3: Constructing Themes - Organising related codes into broader themes and sub-themes.

Phase 4: Reviewing Themes – Refining themes and developing a thematic map.

Phase 5: Defining and Naming Themes – Clearly articulating the meaning of each theme.

Phase 6: Producing the Report – Presenting the analysis in line with the study's research questions and theoretical framework.

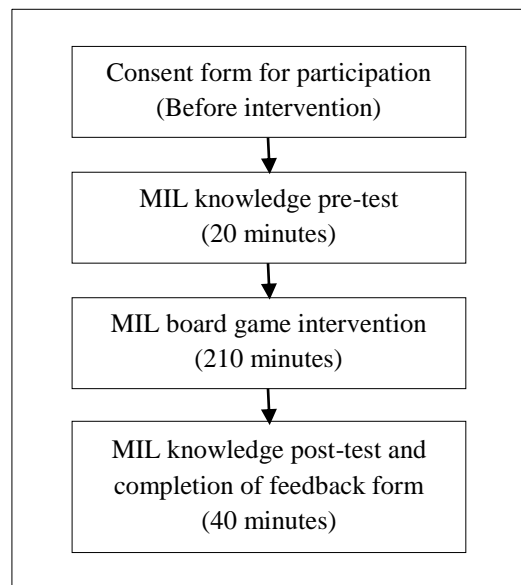
Data Collection

Participants and Sampling

To assess the impact of experiential learning through board games on MIL knowledge acquisition, this study focused on Malaysian students across secondary and tertiary education levels. Participants were purposefully selected to represent a range of educational levels—lower secondary, upper secondary, and tertiary—to enable comparative insights into learning outcomes across age and academic maturity. The inclusion criterion required participants to be: aged between 13 and 24 years; currently enrolled in secondary or tertiary education; with little or no prior experience in MIL board game-based learning. Individuals who did not meet these criteria were excluded from the study. Participants were recruited on a voluntary basis and attended one of three *FollowMe* board game workshops organised by ARUS Academy. The workshops were held in October 2023 at three separate locations: first, at a secondary school in Kota Kinabalu, Sabah, followed by a secondary school in Alor Setar, Kedah, and lastly, at a private college in Kajang, Selangor. Prior to participation, all students were informed about the study's objectives and procedures and were asked to sign a consent form, affirming their voluntary involvement and understanding of the study. This recruitment process ensured that the selected sample was aligned with the study's objectives and appropriate for the MIL board game intervention. A total of 98 students participated in the workshops. Their demographic information is presented in Table 1. Each session followed a structured schedule: 20 minutes for the MIL knowledge pre-test, 210 minutes for the MIL board game intervention, followed by 40 minutes for the post-test and completion of the feedback form (see Figure 1).

Figure 1

Data Collection Procedure



RESULTS

After excluding three missing or incomplete responses, the final sample size for analysis was N=95. The demographic distribution of the participants is presented in Table 1 as follows:

Table 1

Demographic Information of Participants

Demographic Profile		N	%
Age range	13 to 14	11	11.6
	15 to 18	56	58.9
	19 to 24	28	29.5
Gender	Female	71	74.7
	Male	24	25.3
Ethnicity	Chinese	40	42.1
	Malay	24	25.3
	Native	26	27.4
	Others	5	5.3
Education level	Lower secondary education (Form 1-3)	45	47.4
	Higher secondary education (Form 4-5)	22	23.2
	Tertiary education	28	29.5

Quantitative Data Analysis

To address Research Question 1 (RQ1), a paired samples t-test was conducted to compare participants' MIL knowledge before and after the board game intervention. Results revealed a statistically significant improvement in MIL knowledge from the pre-test ($M = 81.84$, $SD = 14.84$) to the post-test ($M = 84.26$, $SD = 12.67$), with a negative mean difference (-2.42). The analysis yielded $t(94) = -1.93$, $p = .028$ (one-tailed), supporting the hypothesis that the intervention would enhance MIL knowledge (Tolmie et al., 2011) (refer to Table 2 and Table 3).

A correlation analysis between pre-test and post-test scores showed a moderate positive correlation ($r = 0.61$, $p < .001$) indicating that participants who performed well in the pre-test also tended to perform well in the post-test. This provides further evidence of consistent knowledge development across the sample (refer to Table 4).

To explore Research Question 2 (RQ2), separate paired t-tests were conducted within each educational group: lower secondary, higher secondary, and tertiary education, comparing the MIL pre-test and post-test scores within each group. The findings are as follows:

- Lower secondary education: Pre-test $M = 77.22$; Post-test $M = 78.89$; $p = .189$
- Higher secondary education: Pre-test $M = 80.91$; Post-test $M = 85.00$; $p = .116$
- Tertiary education group: Pre-test $M = 90.00$; Post-test $M = 92.32$; $p = .081$

No statistically significant improvements were observed within individual education levels ($p > 0.05$) (refer to Table 5 and Table 6). However, effect size analysis using Cohen's d revealed variation in impact across the groups:

- lower secondary: $d = -0.13$
- higher secondary: $d = -0.26$
- tertiary education: $d = -0.27$

These results suggest that although not statistically significant, the MIL intervention had the greatest relative effect at the tertiary education level (refer to Table 7).

Correlation coefficients across education levels also indicated moderate positive relationships between pre-test and post-test scores:

- Lower secondary: $r = 0.56$
- Higher secondary: $r = 0.57$
- Tertiary education: $r = 0.39$

These findings, presented in Table 8, indicate that participants who scored higher in the pre-test tended to maintain their relative performance levels in the post-test, across all education levels.

Table 2

Paired Samples Statistics for MIL Pre- and Post-Test Marks

	Mean	N	Std. Deviation	Std. Error Mean
MIL pre-test marks	81.84	95	14.84	1.52
MIL post-test marks	84.26	95	12.67	1.30

Table 3

Paired Samples Test for MIL Pre- and Post-Test Marks

	Paired Differences					t	df	Significance	
	Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference				One-Sided p	Two-Sided p
				Lower	Upper				
MIL pre-test marks - MIL post-test marks	-2.42	12.24	1.26	-4.92	0.07	-1.93	94	.028	.057

Table 4

Paired Samples Correlation for MIL Pre- and Post-Test Marks

MIL pre-test marks and MIL post-test marks	N	Correlation	Significance	
			One-Sided p	Two-Sided p
	95	.61	<.001	<.001

Table 5

Paired Samples Statistics for MIL Pre- and Post-Test by Education Level

		Mean	N	Std. Deviation	Std. Error Mean
Lower Secondary Education	MIL pre-test marks	77.22	45	13.80	2.06
	MIL post-test marks	78.89	45	13.05	1.95
Higher Secondary Education	MIL pre-test marks	80.91	22	18.69	3.98
	MIL post-test marks	85.00	22	13.00	2.77
Tertiary Education	MIL pre-test marks	90.00	28	8.92	1.68
	MIL post-test marks	92.32	28	5.85	1.11

Table 6

Paired Samples Test for MIL Pre- and Post-Test by Education Level

		Paired Differences					Significance			
		Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference		t	df	One-Sided p	Two-Sided p
					Lower	Upper				
Lower	MIL pre-test Secondary marks - MIL Education post-test marks	-1.67	12.57	1.87	-5.44	2.11	-.89	44	.189	.379
Higher	MIL pre-test Secondary marks - MIL Education post-test marks	-4.10	15.56	3.32	-10.99	2.81	-1.23	21	.116	.231
Tertiary	MIL pre-test Education marks - MIL post-test marks	-2.32	8.55	1.62	-5.64	0.99	-1.44	27	.081	.162

Table 7

Paired Sample Effect Size for MIL Pre- and Post-Test by Education Level

			Point Estimate	95% Confidence Interval Lower	95% Confidence Interval ^a Upper
Lower	MIL pre-test mark - Secondary Education	Cohen's d	-.13	-.43	.16
	MIL post-test mark	Hedges' correction	-.13	-.42	.16
Higher	MIL pre-test mark - Secondary Education	Cohen's d	-.26	-.69	.17
	MIL post-test mark	Hedges' correction	-.25	-.66	.16
Tertiary	MIL pre-test mark - Education	Cohen's d	-.27	-.65	.11
	MIL post-test mark	Hedges' correction	-.27	-.63	.11

Table 8

Paired Sample Correlation for MIL Pre- and Post-Test Within Each Education Level

		N	Correlation	Significance	
				One-Sided p	Two-Sided p
Lower Secondary Education	MIL pre-test mark - MIL post-test mark	45	.56	<.001	<.001
Higher Secondary Education	MIL pre-test mark - MIL post-test mark	22	.57	.003	.003
Tertiary Education	MIL pre-test mark - MIL post-test mark	28	.39	.020	.040

Qualitative Data Analysis

To address Research Question 3 (RQ3), qualitative data were collected through an open-ended survey question asking participants to reflect on the most significant takeaway from the *FollowMe* board game learning experience. The responses were analysed using thematic analysis, following six systematic phases of coding and interpretation. The analysis revealed three key themes: 1) Understanding MIL concepts and skills, 2) Development of responsible digital citizenship, and 3) Effective learning through experiential game-based learning (EGBL).

Understanding MIL Concepts and Skills

Throughout the experiential game-based learning process, the most prominent theme emerging from participants' responses was the acquisition of MIL concepts and related skills. Students described gains in their critical thinking skills, particularly in evaluating information authenticity and recognising media bias. One participant noted: *"The metaphors and symbolisms teach us how the media and information industry works, and why it is important to remain rational and neutral when perceiving information; and to spread information via ethical means"* (P66). Another highlighted the development of logical reasoning: *"I can think logically and differentiate between fake news or not"* (P91). Participants frequently mentioned the importance of verifying information sources, as reflected in the statement, *"Understand more about false information and find the right source of the information"* (P22). There was also an increased awareness of media influence and the prevalence of misinformation, particularly on social media. Students expressed growing scepticism and the ability to identify bias: *"Not all the information that goes viral on social media is true"* (P42) and *"Different types of media have different degrees of dissemination and involve different groups of people"* (P84). Finally, some responses reflected a proactive stance against misinformation, emphasising the importance of fact-checking and critical evaluation: *"Don't be easily fooled by unverified news"* (P22).

Development of Responsible Digital Citizenship

The second major theme that emerged was a growing awareness of responsible digital citizenship. Participants demonstrated a clear understanding of the ethical implications of their online behaviour, particularly the consequences of sharing false or misleading information. For instance, one participant highlighted the importance of thoughtful sharing: *"Sharing information through social media must be taken seriously"* (P3). Others emphasised the importance of verifying messages before forwarding them: *"... make sure our message is correct before sending it to a friend"* (P54). A heightened awareness of personal accountability and its impact on digital reputation was also reflected in statements, such as: *"Do not share about things that are not right and not good"* (P6), *"Be careful not to spread any fake news"* (P57) and *"What I share or post on social media will influence what people think of me"* (P8).

Effective Learning through Experiential Game-Based Learning

The third theme centred on the participants' positive perceptions of experiential game-based learning (EGBL) as an effective and engaging educational approach. Many students expressed appreciation for the interactive and action-oriented nature of the board game, which they felt promoted engagement, collaborative learning, critical thinking, and problem-solving skills. Statements such as: *"Games can also be used to learn"* (P86) and *"Learning is not only based on books but based on action too"* (P11) reflect participants' recognition of how experiential learning methods complement traditional educational practices. The game also facilitated collaboration and empathy within group settings. For

example, “The most important lesson I learned was to cooperate and tolerate each other and to be more patient” (P29) and “... show empathy ... on what they are thinking and how they feel” (P21). Beyond the immediate learning environment, the game inspired students to play an active role in combating misinformation. Several participants expressed a desire to share their MIL knowledge with others and to contribute to public awareness: “Share the importance of knowledge in media literacy” (P15) and “Increase confidence in the fight against information disorder” (P27). These responses suggest that EGBL not only supported knowledge acquisition but also empowered students to apply their learning meaningfully in real-world contexts.

DISCUSSION

This study investigated the impact of experiential game-based learning (EGBL) using a non-digital MIL board game on students’ media and information literacy (MIL) knowledge across various educational levels in Malaysia. The findings revealed a statistically significant improvement in MIL knowledge post-intervention using a one-tailed test ($p=.028$). These post-test scores provide objective evidence of participants’ enhanced understanding of MIL concepts, critical thinking skills, and awareness of media influence, thereby addressing limitations commonly associated with self-assessment methods (Basol et al., 2021; Pandian et al., 2020; Schilder et al., 2016).

The MIL board game was structured around Kolb’s Experiential Learning Theory (ELT) and facilitated students’ progression through its four stages across three rounds of gameplay:

- immersive real-world scenarios (Concrete Experience),
- encouraging critical evaluation of their decisions (Reflective Observation),
- fostering new understandings of MIL concepts like misinformation (Abstract Conceptualization),
- and applying these insights in subsequent rounds and discussions (Active Experimentation).

This iterative process likely contributed to the observed post-test improvements, support the idea that experiential learning can enhance MIL knowledge in game-based learning (Fernández-Sánchez et al., 2023). The results indicated small effect sizes (Cohen’s d) for all groups, with higher secondary students (pre-test mean: 80.91; post-test mean: 85.00, $p = 0.116$, Cohen’s $d = -0.22$) and tertiary students (pre-test mean: 90.00; post-test mean: 92.32, $p = 0.081$, Cohen’s $d = -0.27$) showing slightly greater gains compared to lower secondary students (pre-test mean: 77.22; post-test mean: 78.89, $p = 0.189$, Cohen’s $d = -0.13$). These differences, while not statistically significant, suggest that older students may engage more deeply with the reflective and conceptual stages of learning, resonating with ELT’s iterative process.

These findings align with prior research emphasizing the potential of experiential and interactive approaches in MIL education (Dame Adjin-Tetty, 2022). While no significant differences were found across educational levels, as seen in previous studies (Pimmer et al., 2020; Scheibenzuber et al., 2021), this study observed that higher secondary and tertiary groups demonstrated greater engagement with critical and ethical considerations. In contrast, younger students appeared to focus on foundational skills such as identifying credible sources and understanding safe media practices (Cernicova-Buca & Ciurel, 2022; Costa et al., 2018). These outcomes highlight the need for MIL programmes tailored to various cognitive and developmental stages to enhance skill acquisition effectively across age groups.

Qualitative analysis further supported the quantitative results, revealing that participants not only grasped MIL concepts but also adopted ethical media responsibilities aligning with studies on digital citizenship and critical media literacy (Pinto da Mota Matos et al., 2016; Tajuddin et al., 2024) as well as reflected similar insights from Fedorov and Mikhaleva (2020). Their ability to critically analyse content authenticity and identify cognitive biases emphasised the effectiveness of this intervention in cultivating discerning media consumers capable of distinguishing between true and false content (Pimmer et al., 2020; Scheibenzuber et al., 2021). The heightened awareness of media influence among participants, acknowledges the prevalence of misinformation and the significant role of media in shaping public opinion (Hashim et al., 2022). This awareness is crucial in today's digital age, where misinformation can rapidly spread across global platforms, influencing public discourse and opinion.

By committing to actively participating in combating misinformation, participants embody the proactive approach to learning through “prosuming”, as discussed by Lim and Nekmat (2008), highlighting the shift towards a more engaged and critical media audience. Additionally, the game's interactive nature fostered a collaborative and enjoyable learning environment, confirming the potential of EGBL to support MIL education through active engagement (Kiili, 2006; Micallef et al., 2021). Given its lower cost and cognitive benefits, non-digital board games appear as a viable tool in MIL education (Cortés et al., 2024; Xiang et al., 2025).

CONCLUSION

This study examined the impact of experiential game-based learning (EGBL) on media and information literacy (MIL) among Malaysian students, providing insights into the value of non-digital board games as experiential learning tools across education levels. By comparing outcomes among lower secondary, higher secondary, and tertiary students, the findings underscore the importance of tailoring MIL interventions to align with learners' cognitive and developmental stages. While older students benefited more from critical analysis and ethical content creation, younger students developed foundation competencies such as online safety and responsible behaviour (Hasmah & Chin, 2020; Tajuddin et al., 2024). Future research should continue refining MIL programmes to meet these varied learning needs.

The mixed-methods design provided a comprehensive understanding of EGBL's influence. Quantitative improvements in MIL knowledge were supported by qualitative insights that revealed participants' enhanced ethical awareness, critical thinking, and sense of digital responsibility. These findings support prior research on MIL's role in promoting digital citizenship and affirm the value of EGBL in cultivating critically engaged, ethically aware media users. As such, community-based organisations such as ARUS Academy may consider adopting this EGBL framework in their training programmes to foster critical thinking, active engagement, and empathy, thereby addressing gaps in Malaysia's current formal MIL education system (Hashim et al., 2022; Pandian et al., 2020).

This study also contributes to the MIL literature by demonstrating the efficacy of non-digital interventions in addressing challenges such as misinformation, particularly in resource constrained environments. It presents a scalable and cost-effective approach aligned with Malaysia's national digital goals, offering practical guidance for policymakers and educators in implementing EGBL strategies to foster responsible digital citizenship and help bridge the digital divide (MCMC, 2020).

Despite its promising results, this study has several limitations that point to directions for future research. First, its focus on MIL knowledge alone may not fully capture the breadth of learning outcomes. Future

studies should explore other factors influencing EGBL effectiveness, such as students' prior exposure to MIL socio-economic status, and political, cultural or ethnic backgrounds (Lim & Nekmat, 2008; Roozenbeek & van der Linden, 2019) which could offer deeper insights into learner engagement and inform more culturally responsive MIL interventions.

Moreover, adapting MIL programmes to suit specific education levels and learner needs is essential. Game content, learning objectives, instructional strategies, and assessment methods must be aligned with students' prior knowledge and context to ensure relevance and inclusivity. The sample, drawn from voluntary workshop participants across a few locations in Malaysia, limits generalisability. Expanding the sample to include a broader demographic would enhance representativeness, while refining the pre- and post-assessment tools could offer a more nuanced understanding of learning gains across education levels (Roozenbeek & van der Linden, 2019; Scheibenzuber & Nistor, 2019).

Lastly, the brief duration of the intervention may have constrained its impact. Future studies should adopt longer-term, longitudinal designs with follow-up assessments to better evaluate the sustainability of learning outcomes. Incorporating observations, interviews, and focus groups could also enrich understanding of the learning process and contextual influences. These enhancements would support the development of inclusive, effective and resilient MIL interventions capable of empowering youth to navigate the complexities of the digital age (Dame Adjin-Tetty, 2022; Micallef et al., 2021).

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REFERENCES

- Ahn, J. H. (2008). Application of the experiential learning cycle in learning from a business simulation game. *E-Learning and Digital Media*, 5(2), 146-156. <https://doi.org/10.2304/elea.2008.5.2.146>
- ARUS Academy. (2021). *Media Education 4 All*. <https://me4a.arusacademy.org.my/>
- Basol, M., Roozenbeek, J., Berriche, M., Uenal, F., McClanahan, W. P., & van der Linden, S. (2021). Towards psychological herd immunity: Cross-cultural evidence for two prebunking interventions against COVID-19 misinformation. *Big Data and Society*, 8(1). <https://doi.org/10.1177/20539517211013868>
- Cernicova-Buca, M., & Ciurel, D. (2022). Developing resilience to disinformation: A game-based method for future communicators. *Sustainability*, 14(9). <https://doi.org/10.3390/su14095438>
- Chin, Y. S., & Hasmah Zanuddin. (2019). New media literacy and media use among university students in Malaysia. *International Journal of Engineering and Advanced Technology*, 8(5), 469-474. <https://doi.org/10.35940/ijeat.E1066.0585C19>
- Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education*, 59(2), 661-686. <https://doi.org/10.1016/j.compedu.2012.03.004>
- Cortés, N., Bakit, J., Burgos-Fuster, V., Araya-Piñones, A., Bonilla, E., Veas-García, P., Jorquera, M., & Castillo-Rosales, M. (2024). Perceptions and reflections about a non-digital game-based

- learning activity for economic theory. *Learning and Instruction*, 94. <https://doi.org/10.1016/j.learninstruc.2024.102007>
- Costa, C., Tyner, K., Henriques, S., & Sousa, C. (2018). Game creation in youth media and information literacy education. *International Journal of Game-Based Learning*, 8(2), 1–13. <https://doi.org/10.4018/IJGBL.2018040101>
- Creswell, J. W. (2022). *A concise introduction to mixed method research* (2nd ed.). Sage Publishing.
- Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). Sage Publications.
- Dame Adjin-Tettey, T. (2022). Combating fake news, disinformation, and misinformation: Experimental evidence for media literacy education. *Cogent Arts & Humanities*, 9(1). <https://doi.org/10.1080/23311983.2022.2037229>
- Dawadi, S., Shrestha, S., & Giri, R. A. (2021). Mixed-methods research: A discussion on its types, challenges, and criticisms. *Journal of Practical Studies in Education*, 2(2), 25–36. <https://doi.org/10.46809/jpse.v2i2.20>
- Dieleman, H., & Huisingh, D. (2006). Games by which to learn and teach about sustainable development: Exploring the relevance of games and experiential learning for sustainability. *Journal of Cleaner Production*, 14(9–11), 837–847. <https://doi.org/10.1016/j.jclepro.2005.11.031>
- Dimmitt, N. (2017). The power of project-based learning: Experiential education to develop critical thinking skills for university students. *CBU International Conference Proceedings*, 5, 575–579. <https://doi.org/10.12955/cbup.v5.988>
- Evans, M. (2019). Doing it for real: A study of experiential and situated learning approaches in teaching journalism practice through engagement with the public domain. In *World Journalism Education Congress Proceedings*, Paris, France.
- Fedorov, A., & Mikhaleva, G. (2020). Current trends in media and information literacy in research and scientific publications of the early 21st century. *International Journal of Media and Information Literacy*, 5(2), 153–163. <https://doi.org/10.13187/IJMIL.2020.2.153>
- Fernández-Sánchez, M. R., González-Fernández, A., & Acevedo-Borrega, J. (2023). Conceptual approach to the pedagogy of serious games. *Information*, 14(2). <https://doi.org/10.3390/info14020132>
- Fosnot, C. T., & Perry, R. S. (2005). *Constructivism: A psychological theory of learning*. Retrieved from <https://gchallenge.org/wp-content/uploads/2023/05/Constructivism.pdf>
- Hashim, H., Badrul Hisham, N. A., & Salleh, S. M. (2022). *Modul pembelajaran literasi media & information untuk pelajar-pelajar media & komunikasi di Malaysia*. Pusat Kajian Media & Komunikasi, Fakulti Sains Sosial & Kemanusiaan, Universiti Kebangsaan Malaysia. <https://www.isis.org.my/2022/05/12/maklumat-palsu-dan-literasi-media-informasi-2/>
- Hasmah, Z., & Chin, Y. S. (2020). Relationship between new media literacy and motivation in solving fake news problem. *Management, & Applied Sciences & Technologies*, 11(8), 11–19. <https://doi.org/10.14456/ITJEMAST.2020.150>
- Ho, S. J., Hsu, Y. S., Lai, C. H., Chen, F. H., & Yang, M. H. (2022). Applying game-based experiential learning to comprehensive sustainable development-based education. *Sustainability*, 14(3). <https://doi.org/10.3390/su14031172>
- Ip, J., & Cooperstock, J. (2011). To virtualize or not? The importance of physical and virtual components in augmented reality board games. In: Anacleto, J.C., Fels, S., Graham, N., Kapralos, B., Saif El-Nasr, M., Stanley, K. (eds) *Entertainment Computing – ICEC 2011. Lecture Notes in Computer Science, vol 6972*. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-24500-8_64

- Kaneko, K., Saito, Y., Nohara, Y., Kudo, E., & Yamada, M. (2018). Does physical activity enhance learning performance: Learning effectiveness of game-based experiential learning for university library instruction. *Journal of Academic Librarianship*, 44(5), 569–581. <https://doi.org/10.1016/j.acalib.2018.06.002>
- Kemp, S. (2023). *Global digital overview report 2024*. <https://datareportal.com/reports/digital-2024-global-overview-report>
- Kiili, K. (2006). Evaluation of an experiential gaming model. *Human Technology*, 2(2), 187-201. <http://dx.doi.org/10.17011/ht/urn.2006518>
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall. <http://www.learningfromexperience.com/images/uploads/process-of-experiential-learning.pdf>
- Kolb, D. A., Boyatzis, R. E., & Mainemelis, C. (2000). Experiential learning theory: Previous research and new directions. In R. J. Sternberg & L. F. Zhang (Eds.), *Perspectives on cognitive, learning, and thinking styles* (pp. 227–247). Lawrence Erlbaum.
- Lim, S. S., & Nekmat, E. (2008). Learning through “prosuming”: Insights from media literacy programmes in Asia. *Science, Technology and Society*, 13(2), 259–278. <https://doi.org/10.1177/097172180801300205>
- Loganathan, T., Chan, Z. X., Hassan, F., Kunpeuk, W., Suphanchaimat, R., Yi, H., & Majid, H. A. (2021). Education for non-citizen children in Malaysia during the COVID-19 pandemic: A qualitative study. *PLoS ONE*, 16(12 December). <https://doi.org/10.1371/journal.pone.0259546>
- Malaysian Communications and Multimedia Commission (MCMC). (2020). *Malaysia’s online safety initiative*. Klik Dengan Bijak. <https://klikdenganbijak.my/en/about.php>
- Micallef, N., Avram, M., Menczer, F., & Patil, S. (2021). Fakey: A game intervention to improve news literacy on social media. *Proceedings of the ACM on Human-Computer Interaction*, 5(CSCW1). <https://doi.org/10.1145/3449080>
- Monsees, L. (2023). Information disorder, fake news and the future of democracy. *Globalizations*, 20(1), 153–168. <https://doi.org/10.1080/14747731.2021.1927470>
- Naik, N. (2014). A comparative evaluation of game-based learning: Digital or non-digital games? In *Proceedings of the European Conference on Games Based Learning* (pp. 437–445). <https://www.proquest.com/conference-papers-proceedings/comparative-evaluation-game-based-learning/docview/1674245527/se-2>
- Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, M., & Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery*, 78, 185–193. <https://doi.org/10.1016/j.ijssu.2020.04.018>
- Nieminen, H. (2024). Why does disinformation spread in liberal democracies? The relationship between disinformation, inequality, and the media. *Javnost - The Public*, 1–18. <https://doi.org/10.1080/13183222.2024.2311019>
- Odendaal, D. (2018). *A framework for using experiential learning theory to develop game-based learning* [Master’s thesis, Stellenbosch University]. <https://scholar.sun.ac.za>
- Onwuegbuzie, A. J., & Johnson, R. B. (2006). The validity issue in mixed research. *Research in the Schools*, 13(1), 48–63.
- Pandian, A., Baboo, S. B., & Jing Yi, L. (2020). Reading the 21st century world: Self-assessment of digital media literacy among secondary school students in Malaysia. *International Journal of Asian Social Science*, 10(7), 350–359. <https://doi.org/10.18488/journal.1.2020.107.350.359>
- Pimmer, C., Eisemann, C., & Mateescu, M. (2020). Fake news resilience through online games? Tentative findings from a randomized. In *Proceedings of the 17th International Conference on Cognition and Exploratory Learning in Digital Age 2020*.

- Pinto da Mota Matos, A., Festas, M. I., & Seixas, A. M. (2016). Digital media and the challenges for media education. *Applied Technologies and Innovations*, 12(2). <https://doi.org/10.15208/ati.2016.04>
- Qian, M., & Clark, K. R. (2016). Game-based learning and 21st century skills: A review of recent research. *Computers in Human Behavior*, 63, 50–58. <https://doi.org/10.1016/j.chb.2016.05.023>
- Roizenbeek, J., & van der Linden, S. (2018). The fake news game: Actively inoculating against the risk of misinformation. *Journal of Risk Research*, 22(5), 570–580. <https://doi.org/10.1080/13669877.2018.1443491>
- Roizenbeek, J., & van der Linden, S. (2019). Fake news game confers psychological resistance against online misinformation. *Palgrave Communications*, 5(1). <https://doi.org/10.1057/s41599-019-0279-9>
- Saenz, M. J., & Cano, J. L. (2009). Experiential learning through simulation games: An empirical study. *International Journal of Engineering Education*, 25, 296–307. <https://www.researchgate.net/publication/257614743>
- Scheibenzuber, C., Hofer, S., & Nistor, N. (2021). Designing for fake news literacy training: A problem-based undergraduate online-course. *Computers in Human Behavior*, 121. <https://doi.org/10.1016/j.chb.2021.106796>
- Scheibenzuber, C., & Nistor, N. (2019). Media literacy training against fake news in online media. In M. Scheffel, J. Broisin, V. Pammer-Schindler, A. Ioannou, & J. Schneider (Eds.), *Transforming learning with meaningful technologies* (Vol. 11722, pp. 688–691). Springer International Publishing. <https://doi.org/10.1007/978-3-030-29736-7>
- Schilder, E., Lockee, B., & Saxon, D. P. (2016). The challenges of assessing media literacy education. *Journal of Media Literacy Education*, 8(1), 32–48. www.jmle.org
- Sugahara, S & Lau, D. (2019). The effect of game-based learning as the experiential learning tool for business and accounting training: A study of management game. *Journal of Education for Business*, 94:5, 297- 305. <https://doi.org/10.1080/08832323.2018.1527751>
- Tajuddin, S. N. A. A., Bahari, K. A., Al-Majdhoub, F. M., Maliki, N. K., & Baboo, S. B. (2024). Developing and measuring an assessment instrument for media literacy among digital natives using Digital Intelligence (DQ) framework. *Journal of Media Literacy Education*, 16(2), 29–45. <https://doi.org/10.23860/JMLE-2024-16-2-3>
- Tan, H. S., Hew, S. H., & Tan, H. Y. J. (2023). Combat fake news: An overview of youth’s media and information literacy education. In Fauzan Mustafa (Ed.), *The 3rd International Conference on Creative Multimedia 2023 (ICCM 2023)* (pp. 47–61). Atlantis Press. https://doi.org/10.2991/978-2-38476-138-8_6
- The Star. (2021, December 5). Educators form media literacy society. *The Star*. <https://www.thestar.com.my/news/education/2021/12/05/educators-form-media-literacy-society>
- Tolmie, A., Muijs, D., & McAteer, E. (2011). *Quantitative methods in educational and social research using SPSS*. Open University Press.
- Tsai, M. H., Chang, Y. L., Shiau, J. S., & Wang, S. M. (2020). Exploring the effects of a serious game-based learning package for disaster prevention education: The case of Battle of Flooding Protection. *International Journal of Disaster Risk Reduction*, 43. <https://doi.org/10.1016/j.ijdr.2019.101393>
- UNESCO. (2013). *Global media and information literacy assessment framework: Country readiness and competencies*. United Nations Educational, Scientific and Cultural Organization (UNESCO). <https://unesdoc.unesco.org/ark:/48223/pf0000224655>
- UNESCO. (2019). *Global standards for media and information literacy curricula development guidelines*. <https://www.unesco.org/sites/default/files/medias/files/2022/02/Global%20Standards%20for%20Media%20and%20Information%20Literacy%20Curricula%20Development%20Guidelines.pdf>

nds%20for%20Media%20and%20Information%20Literacy%20Curricula%20Development%20Guidelines_EN.pdf

- Xiang, M., Zhang, L., Liu, Y., Wang, X., & Shang, J. (2025). Acquisition of math knowledge in digital and non-digital game-based learning classrooms: Impact of intrinsic motivation and cognitive load. *Entertainment Computing*, 52. <https://doi.org/10.1016/j.entcom.2024.100869>
- Yiswaree Palansamy. (2021). Over 1,200 academics join media literacy programme to fight misinformation, fake news. *Malay Mail*. <https://www.malaymail.com/news/malaysia/2021/09/03/over-1200-academics-join-media-literacy-programme-to-fight-misinformation-f/2002757>
- Zapalska, A. (2021). Designing an experiential learning with simulations and games to improve education in an undergraduate engineering major. *ASEAN Journal of Engineering Education*, 5(1), 32–43. <https://doi.org/10.11113/ajee2021.5n1.59>
- Zou'bi, R. Al. (2021). The impact of media and information literacy on acquiring the critical thinking skill by the educational faculty's students. *Thinking Skills and Creativity*, 39. <https://doi.org/10.1016/j.tsc.2020.100782>