THE EFFECTIVENESS OF GAMIFICATION APPROACH THROUGH TABLETOP GAME BOARD CREATION IN TEACHING CONTEMPORARY ART AND DESIGN IN MALAYSIA

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Abstract: This study examines the effectiveness of a gamification-based pedagogical approach in teaching the Contemporary Art and Design in Malaysia (VCS265) course at Universiti Teknologi MARA (UiTM). A quasi-experimental pre-test and post-test design was employed involving 40 Diploma in Art and Design students across one semester comprising 14 instructional weeks. The innovative approach required students to create educational tabletop game boards integrating course content on Malaysian art history, movements, and artists. A conceptual framework grounded in Self-Determination Theory, Constructionism, Flow Theory, and Bloom's Revised Taxonomy guided the research design. Data were collected through pre-test (Week 1) and post-test (Week 14) instruments measuring four dimensions: cognitive knowledge, creative thinking, student engagement, and collaborative skills. Paired samples t-tests revealed statistically significant improvements across all dimensions ($p < .001$). The most substantial gains were observed in cognitive knowledge ($t = 12.47$, $p < .001$, $d = 1.97$) and student engagement ($t = 11.83$, $p < .001$, $d = 1.87$). Findings suggest that gamification through hands-on game board creation enhances deep learning, promotes active student participation, and fosters meaningful connections with Malaysian art heritage. This study contributes to the growing literature on gamification in arts education within the Malaysian higher education context and aligns with the aspirations of the Malaysian Education Blueprint 2013–2025.

Keywords: Gamification, tabletop game board, contemporary art education, Malaysian art history, pre-test post-test, higher education pedagogy, curriculum innovation.

INTRODUCTION

The landscape of higher education in Malaysia has undergone significant transformation in recent decades, with increasing emphasis on student-centred learning approaches that promote active engagement and deep understanding (Ministry of Education Malaysia, 2013). Within the field of art and design education, the challenge of teaching theoretical courses such as art history remains a persistent concern among educators. Traditional lecture-based methods, whilst informative, often fail to sustain student interest and may result in surface-level learning that does not translate into meaningful appreciation of the subject matter (Rashid & Asghar, 2016; Zainuddin & Halili, 2016).

Contemporary Art and Design in Malaysia (VCS265) is a core course offered to Diploma in Art and Design students at Universiti Teknologi MARA (UiTM). The course covers a comprehensive range of topics including the pre-independence era of Malaysian art, universal painting styles, the search for national identity through various art movements, conceptual art movements such as Anak Alam, the National Cultural Congress Policy of 1971, the roots of indigenous art, and the pluralist era. Given the breadth and depth of content spanning multiple decades of Malaysian art development, students frequently struggle retaining factual information about artists, artworks, art movements, and historical timelines (Ahmad & Majid, 2019).

Gamification, defined as the application of game design elements in non-game contexts (Deterding et al., 2011), has emerged as a promising pedagogical strategy to address these challenges. Research has demonstrated that gamification can enhance motivation, increase engagement, and improve learning outcomes across various educational disciplines (Hamari et al., 2014; Sailer & Homner, 2020). Specifically, the creation of educational games by students themselves represents a higher-order learning activity that requires synthesis, analysis, and creative application of knowledge (Boyle et al., 2016). Despite the growing interest in gamification within

education, there remains a paucity of empirical studies examining its effectiveness specifically in Malaysian art and design education.

In this study, the traditional assessment approach for VCS265 was innovatively redesigned to incorporate a gamification element whereby students were tasked with creating physical tabletop game boards as their final project, carrying 40% of the total course marks. This pedagogical innovation required students to not only understand the course content but also to transform that knowledge into an interactive, educational gaming experience complete with reward systems, gamification elements, and educational value.

Research Objectives

This study pursues four primary research objectives:

i. To measure the difference in students' cognitive knowledge of Malaysian contemporary art before and after the gamification-based intervention
ii. To evaluate the impact of tabletop game board creation on students' creative thinking skills
iii. To assess the effect of the gamification approach on student engagement levels
iv. To examine the development of collaborative skills through group-based game board creation

Significance of the Study

This study makes several important contributions to the field of curriculum and teaching. From a theoretical perspective, it bridges the gap between gamification research and art education pedagogy by proposing a conceptual framework grounded in established learning theories. From a practical standpoint, the study provides art and design educators with an evidence-based model for integrating gamification into theoretical courses, demonstrating how the creation of game boards can serve as a vehicle for deep learning. The study also contributes to curriculum development policy in Malaysia by providing empirical evidence supporting innovative assessment strategies that align with the Malaysian Education Blueprint 2013–2025 and its emphasis on producing creative, innovative, and industry-ready graduates. Beyond the existing Blueprint, the present findings are equally pertinent to the forthcoming Rancangan Pendidikan Malaysia 2026–2035 (RPM 2026–2035), which positions holistic, future-ready, and creativity-driven pedagogies as central pillars of national educational transformation. The new Rancangan articulates four strategic priorities that bear directly on this study: (a) the cultivation of higher-order thinking and creative problem-solving as core graduate attributes, (b) the integration of innovative, technology-enriched, and student-centred learning experiences across all levels of education, (c) the strengthening of cultural identity and Malaysian values within the curriculum, and (d) the alignment of higher education outputs with industry and 21st-century workforce demands. The gamification-based pedagogical model demonstrated in this study addresses each of these priorities concurrently: it operationalises higher-order thinking through student-led game design, embeds an innovative assessment format within an existing course structure, anchors learning content in Malaysian art history and cultural heritage, and produces tangible creative outputs suitable for innovation-competition entry. Accordingly, the findings provide evidence-based guidance for curriculum developers and policymakers seeking to translate the aspirations of RPM 2026–2035 into concrete classroom practice within Malaysian higher education.

LITERATURE REVIEW

Gamification in Higher Education

Gamification has gained considerable attention in educational research since its formal conceptualisation by Deterding et al. (2011), who defined it as the use of game design elements in non-game contexts. Within higher education, gamification encompasses a spectrum of approaches ranging from the incorporation of game mechanics such as points, badges, and leaderboards into existing curricula, to the creation of full game-based learning experiences (Dicheva et al., 2015). Meta-analytical studies have consistently reported positive effects of gamification on student motivation and learning outcomes (Sailer & Homner, 2020).

The theoretical underpinning of gamification in education draws from Self-Determination Theory (SDT), which posits that intrinsic motivation is fostered when three basic psychological needs are met: autonomy, competence, and relatedness (Ryan & Deci, 2000). Within the Malaysian creative design education context, recent empirical evidence supports the applicability of SDT, demonstrating that design students' engagement and motivation are

significantly shaped by the degree of autonomous and self-regulated learning afforded within the curriculum (Wardi et al., 2025). Game elements such as choice, challenge, and collaboration directly address these needs, thereby enhancing student motivation and engagement (Landers, 2014). Furthermore, Csikszentmihalyi's (1990) concept of flow suggests that well-designed game experiences can create an optimal state of engagement where learners are fully immersed in the activity.

Game-Based Learning in Art Education

The application of gamification in art education represents a relatively nascent field of study. This characterisation is supported by recent systematic-review evidence, which indicates that empirical investigations of game-based interventions in art and design pedagogy remain markedly underrepresented compared with their counterparts in STEM and language education. Manzano-León et al. (2021), in a systematic review covering gamification studies across educational levels, reported that arts-related disciplines accounted for only a small fraction of identified studies, and that most concentrated on digital media production rather than fine art, art history, or art appreciation. Krath et al. (2021), in their systematic theoretical review, similarly observed that the application of gamification in arts-oriented higher education has been examined predominantly through descriptive case studies rather than through controlled empirical designs, leaving substantial gaps in effect-size estimation and theoretical generalisation. These observations corroborate the position that game-based pedagogies in art education remain at an early empirical stage, particularly in non-Western educational contexts. Art education traditionally relies on studio-based practice, critique sessions, and theoretical lectures. However, the integration of game-based approaches has shown promise in making art historical content more accessible and engaging (Whitton, 2014). Studies by Ke (2014) demonstrated that educational games can effectively support the development of higher-order thinking skills, including analysis and synthesis, which are essential competencies in art appreciation and criticism.

In the Malaysian context, several studies have explored the potential of gamification in education. Zainuddin and Halili (2016) conducted a systematic review of gamification research and identified significant positive effects on student engagement and performance. Similarly, Ahmad Firdaus et al. (2020) found that game-based learning approaches enhanced students' understanding and retention of cultural heritage content in Malaysian educational settings. However, studies specifically examining the creation of physical tabletop games as a learning tool in Malaysian art education remain scarce, highlighting the gap this study seeks to address.

Tabletop Game Design as a Pedagogical Tool

The act of designing and creating tabletop games represents a constructionist learning activity (Papert, 1991), wherein students construct knowledge through the process of creating an external, shareable artefact. This approach aligns with Bloom's revised taxonomy, as game creation requires students to operate at the highest cognitive levels of analysis, evaluation, and creation (Anderson & Krathwohl, 2001). Research by Hanus and Fox (2015) and Nicholson (2015) emphasised that meaningful gamification, which goes beyond superficial reward mechanisms, can facilitate deeper learning experiences.

The development of physical game boards, as opposed to digital games, offers unique pedagogical advantages. The tangible nature of tabletop games requires students to engage with spatial design, visual communication, and material selection—skills that are directly relevant to art and design students (Zagal et al., 2006). This hands-on, material-based approach aligns with the principles of visual and kinaesthetic learning, whereby learners engage most effectively when teaching tools are designed to stimulate active participation through tangible interaction and purposeful visual construction (Hassan et al., 2022). Furthermore, the collaborative nature of game board production within groups fosters interpersonal skills, negotiation, and shared knowledge construction, consistent with Vygotsky's (1978) Zone of Proximal Development where peer interaction facilitates learning beyond what individuals could achieve independently.

Conceptual Framework

Drawing upon the theoretical foundations discussed above, this study proposes a Gamification-Based Teaching Effectiveness Framework that integrates four established learning theories to explain the mechanisms through which tabletop game board creation enhances learning outcomes in art education. The framework is grounded in Self-Determination Theory (Ryan & Deci, 2000), which explains how gamification fosters intrinsic motivation through autonomy, competence, and relatedness; Constructionism (Papert, 1991), which posits that learning is

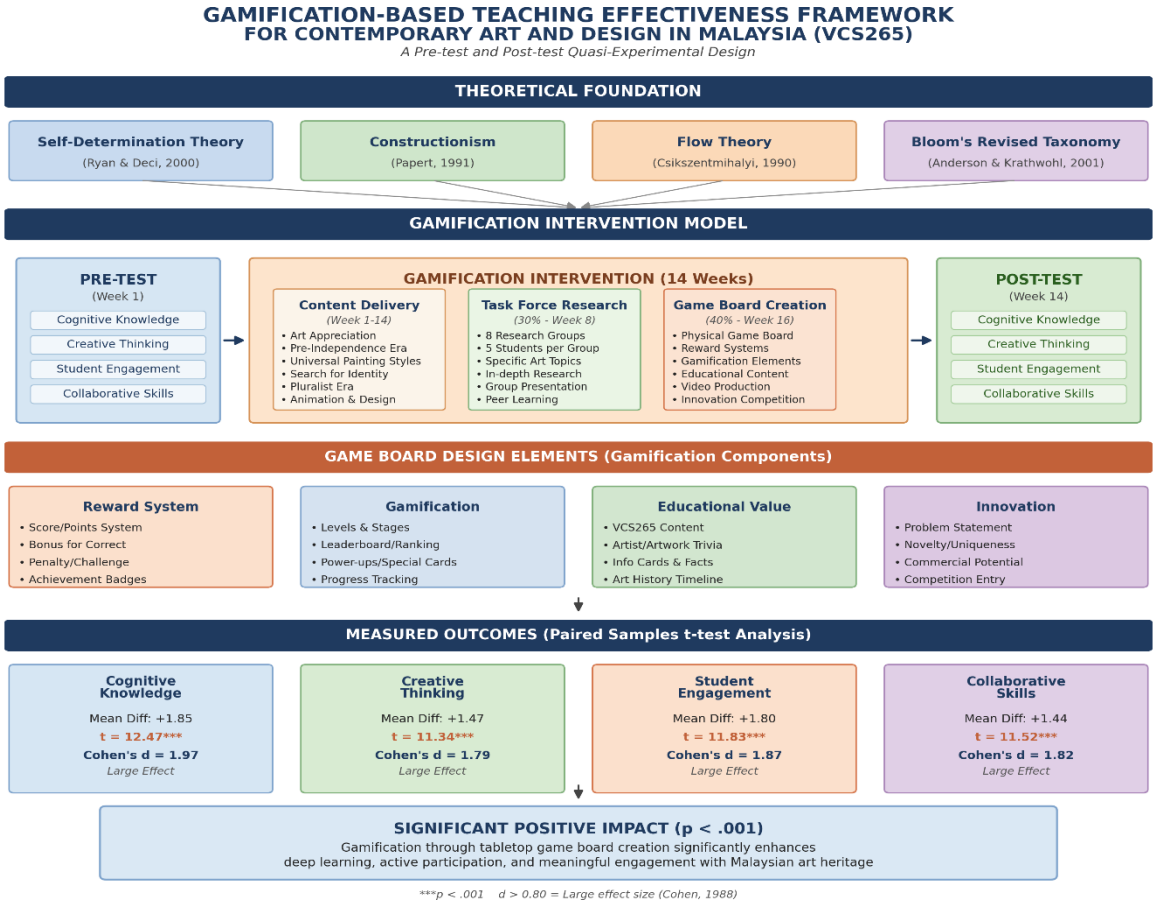
most effective when students create tangible artefacts; Flow Theory (Csikszentmihalyi, 1990), which describes the optimal engagement state achieved through appropriately challenging game design activities; and Bloom's Revised Taxonomy (Anderson & Krathwohl, 2001), which provides the cognitive hierarchy from knowledge acquisition to creation.

The framework conceptualises the gamification intervention as a three-phase process encompassing pre-test baseline measurement, a 14-week intervention comprising content delivery, Task Force research, and game board creation, followed by post-test evaluation across four measured dimensions: cognitive knowledge, creative thinking, student engagement, and collaborative skills. The game board design elements—reward systems, gamification mechanics, educational content, and innovation components—serve as the mediating mechanisms through which theoretical learning is transformed into deep, applied understanding.

Figure 1 presents the Gamification-Based Teaching Effectiveness Framework for VCS265 Contemporary Art and Design in Malaysia, illustrating the theoretical foundations, intervention components, game board design elements, and measured outcomes that constitute the conceptual model guiding this research.

Figure 1

Gamification-Based Teaching Effectiveness Framework for VCS265 Contemporary Art and Design in Malaysia.



Note. The framework illustrates the theoretical foundations (Self-Determination Theory, Constructionism, Flow Theory, Bloom's Revised Taxonomy), the three-phase intervention model (pre-test, gamification intervention, post-test), game board design elements, and four measured outcome dimensions.

METHODOLOGY

Research Design

This study adopted a quasi-experimental one-group pre-test and post-test research design. This design was selected as it allows for the measurement of changes in the dependent variables following the implementation of the gamification intervention within a naturally occurring classroom setting (Creswell & Creswell, 2018). The absence of a control group is acknowledged as a limitation; however, the design is appropriate given the exploratory nature of this study and the practical constraints of the educational context where all enrolled students were exposed to the same curriculum.

Participants

A total of 40 students enrolled in the Diploma in Art and Design programme (Semester 3) at Universiti Teknologi MARA Sarawak Campus participated in this study. The participants were enrolled in the VCS265 Contemporary Art and Design in Malaysia course during the November 2025 to February 2026 semester. The sample comprised 23 female (57.5%) and 17 male (42.5%) students, with ages ranging from 19 to 22 years (M = 20.15, SD = 0.89). Purposive sampling was employed as the study targeted students undertaking this specific course. All participants provided informed consent before data collection.

Intervention: The Gamification Approach

The gamification intervention was embedded within the existing VCS265 course structure across 14 instructional weeks. The course retained its standard content delivery through lectures and presentations covering topics from art appreciation through universal painting styles, the search for identity, the pluralist era, Malaysian animation history, graphic design, and industrial design.

The innovative gamification component consisted of two interconnected assessments. First, students were organised into eight Task Force groups of five members each. Each group was assigned a specific research topic aligned with the course syllabus: (1) Universal Styles in Malaysian Painting – Realism and Impressionism, (2) Batik Painting Movement, (3) Era of Transition and New Scene, (4) Conceptual Art and Anak Alam, (5) National Cultural Congress Policy, (6) Roots of Indigenous Art, (7) The Pluralist Era, and (8) Comprehensive Synthesis. Groups conducted in-depth research and presented their findings during Week 8, carrying 30% of the course marks.

The culminating gamification activity required each group to design and produce a physical tabletop game board (40% of course marks) that encapsulated the educational content of VCS265. Students were required to incorporate: (a) reward systems including scoring mechanisms, bonus points, and penalties; (b) gamification elements including levels, achievement badges, leaderboards, and special cards; and (c) educational value including trivia questions and informational cards about Malaysian artists and artworks. A mandatory consultation session was held during Week 10, where groups presented their game concepts for formative feedback. The final game boards were presented during Week 16, accompanied by a 3 to 5-minute explanatory video and evidence of registration in an innovation competition such as MIRCIC, ITEX, i-CREATE, MTE, or SIIDEX.

Instruments

A structured questionnaire was developed to measure four key dimensions of learning effectiveness. The instrument utilised a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) and was administered as a pre-test in Week 1 and a post-test in Week 14. Table 1 presents the four dimensions, number of items, and reliability coefficients.

Table 1

Dimensions and Number of Items in the Research Instrument

No.	Dimension	No. of Items	Cronbach's Alpha	Interpretation
1	Cognitive Knowledge	10	0.87	Good
2	Creative Thinking	8	0.84	Good
3	Student Engagement	8	0.89	Good

4	Collaborative Skills	6	0.82	Good
	Total	**32**	–	–

Note. Cronbach's alpha values based on pilot study (n = 30). All values exceed the acceptable threshold of 0.70 (Hair et al., 2019).

The instrument was validated by three subject matter experts in art education and educational technology. Content validity was established through expert consensus on item relevance and clarity. Reliability was confirmed through a pilot study with 30 students from a different cohort, yielding Cronbach's alpha coefficients ranging from 0.82 to 0.89 (Table 1), all exceeding the acceptable threshold of 0.70 (Hair et al., 2019).

Data Collection Procedures

The pre-test was administered during Week 1, before the commencement of any course content delivery. This served as the baseline measurement of students' knowledge, creative thinking, engagement, and collaborative skills pertaining to the course. The post-test was administered during Week 14, after students had completed all lectures, the Task Force group presentation, and the game board creation process. Both tests were conducted during class time under standardised conditions to ensure consistency.

Data Analysis

Descriptive statistics (means and standard deviations) were computed for all four dimensions at both pre-test and post-test stages. Paired samples t-tests were employed to determine whether statistically significant differences existed between pre-test and post-test scores. The effect size was calculated using Cohen's d to determine the practical significance of the observed differences, where d = 0.20 indicates a small effect, d = 0.50 a medium effect, and d = 0.80 a large effect (Cohen, 1988). All analyses were conducted using IBM SPSS Statistics Version 28 at a significance level of $p < .05$.

RESULTS

Descriptive Analysis

Table 2 presents the descriptive statistics for the pre-test and post-test scores across all four dimensions. The results indicate notable improvements in mean scores from pre-test to post-test across all measured dimensions.

Table 2

Descriptive Statistics of Pre-test and Post-test Scores (N = 40)

Dimension	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	Mean Difference
Cognitive Knowledge	2.43	0.61	4.28	0.47	+1.85
Creative Thinking	2.68	0.58	4.15	0.52	+1.47
Student Engagement	2.55	0.65	4.35	0.44	+1.80
Collaborative Skills	2.78	0.54	4.22	0.49	+1.44

As indicated in Table 2, the most substantial improvement was observed in Cognitive Knowledge, with a mean difference of +1.85 (pre-test M = 2.43 to post-test M = 4.28). This was followed closely by Student Engagement (+1.80), Creative Thinking (+1.47), and Collaborative Skills (+1.44). Notably, the post-test standard deviations were consistently lower than the pre-test values across all dimensions, indicating more homogeneous performance among students after the gamification intervention.

Inferential Analysis: Paired Samples t-test

Paired samples t-tests were conducted to determine the statistical significance of the observed differences between pre-test and post-test scores. Before analysis, assumptions of normality were verified using the Shapiro-Wilk test, with all distributions meeting the normality criterion ($p > .05$). The results are presented in Table 3.

Table 3
Paired Samples t-test Results for Pre-test and Post-test Comparisons (N = 40)

Dimension	Mean Diff.	SD	t-value	df	Sig. (2-tailed)	Cohen's d	Effect Size
Cognitive Knowledge	1.85	0.94	12.47	39	.000***	1.97	Large
Creative Thinking	1.47	0.82	11.34	39	.000***	1.79	Large
Student Engagement	1.80	0.96	11.83	39	.000***	1.87	Large
Collaborative Skills	1.44	0.79	11.52	39	.000***	1.82	Large

Note. ***p < .001. Cohen's d: 0.20 = small, 0.50 = medium, 0.80 = large (Cohen, 1988).

The paired samples t-test results in Table 3 reveal that all four dimensions demonstrated statistically significant improvements from pre-test to post-test ($p < .001$). The highest t-value was recorded for Cognitive Knowledge ($t(39) = 12.47$, $p < .001$), followed by Student Engagement ($t(39) = 11.83$, $p < .001$), Collaborative Skills ($t(39) = 11.52$, $p < .001$), and Creative Thinking ($t(39) = 11.34$, $p < .001$). Cohen's d effect sizes for all dimensions exceeded the threshold of 0.80, classified as large effects (Cohen, 1988). The largest effect size was observed for Cognitive Knowledge ($d = 1.97$), followed by Student Engagement ($d = 1.87$), Collaborative Skills ($d = 1.82$), and Creative Thinking ($d = 1.79$). These findings provide strong evidence that the gamification approach had a substantial and meaningful impact on all four measured dimensions.

DISCUSSION

The findings of this study provide compelling evidence that the gamification-based pedagogical approach significantly enhanced students' learning outcomes across all four measured dimensions. Before discussing each outcome in turn, it is useful to articulate the specific mechanisms through which students' understanding and retention improved through this approach. Three interrelated processes are identified. First, the requirement to translate art historical content into game mechanics, trivia questions, and informational cards compelled students to elaborate, restructure, and personally encode the material, which is consistent with deep-processing accounts of memory in which the depth of cognitive engagement determines the durability of retention (Craik & Lockhart, 1972; Roediger & Pyc, 2012). Second, the staged design of the assessment ensured that the same body of content was revisited repeatedly across distinct phases (lectures, Task Force research, consultation, prototyping, presentation, and post-test), thereby producing the conditions of distributed practice and elaborative retrieval that are well established as drivers of long-term learning (Cepeda et al., 2006; Karpicke & Roediger, 2008). Third, peer-mediated meaning-making during collaborative game design required students to articulate, justify, and revise their understanding of Malaysian art movements in real time, which strengthened conceptual coherence and reduced reliance on rote memorisation. Together, these mechanisms explain how a single instructional intervention produced large effect sizes across multiple cognitive and affective dimensions, and they frame the more specific discussion of each outcome in the sub-sections that follow.

Enhancement of Cognitive Knowledge

The substantial improvement in cognitive knowledge (mean difference = 1.85, d = 1.97) indicates that the gamification approach was highly effective in promoting students' understanding and retention of Malaysian contemporary art content. This finding aligns with the work of Boyle et al. (2016) and Dicheva et al. (2015), who reported that gamification strategies significantly enhance knowledge acquisition in higher education settings. The result is reinforced by more recent empirical evidence demonstrating that well-designed gamified instructional interventions produce statistically significant gains in declarative and conceptual knowledge across diverse higher education contexts. Krath et al. (2021), drawing on a systematic review of 109 articles, concluded that gamification consistently supports knowledge acquisition when game elements are theoretically grounded rather than added as superficial reward layers. The meta-analysis by Sailer and Homner (2020) reported a positive overall effect on cognitive learning outcomes (g = 0.49), and Bai et al. (2020), in a meta-analysis of 30 empirical studies, similarly identified medium-to-large effects on knowledge gains in higher education, with stronger effects observed when gamification was combined with active learning rather than implemented in isolation. Manzano-León et al. (2021) further reported that creation-oriented gamification formats, in which learners produce game artefacts, were

associated with stronger and more durable knowledge outcomes than purely reward-based formats. Collectively, these recent findings situate the d = 1.97 effect observed for cognitive knowledge in this study within an established and growing international evidence base. The process of creating game boards required students to engage deeply with course material, as they needed to formulate trivia questions, design informational cards, and develop game narratives around specific topics such as the Batik Painting Movement, the Anak Alam philosophy, and the National Cultural Congress Policy.

Each of these activities maps onto a specific principle of the theoretical framework guiding this study. The act of formulating trivia questions operationalises the "understand" and "apply" tiers of Bloom's revised taxonomy (Anderson & Krathwohl, 2001), as students must reorganise factual information into testable propositions and distinguish essential from peripheral details. Designing informational cards exercises the "analyse" and "evaluate" tiers, requiring learners to compare competing accounts of art movements and to make principled decisions about which elements deserve emphasis in a learner-facing summary. Constructing game narratives around topics such as the Anak Alam philosophy and the National Cultural Congress Policy operates at the highest "create" tier, where multiple sources of knowledge are synthesised into an original, coherent product. At the same time, the production of a tangible, shareable artefact embodies Papert's (1991) constructionist principle that knowledge is most durably acquired when externalised in a public form, while the autonomy enjoyed in selecting visual style, narrative theme, and rule system reflects the autonomy-support component of Self-Determination Theory (Ryan & Deci, 2000). The activities embedded in the intervention were therefore not arbitrary game design tasks but deliberate enactments of the principles that the framework predicts will produce deep learning.

The Task Force structure, which assigned each group a specific research topic, further facilitated deep engagement with the content. When students transitioned from the Task Force research presentation (30% marks) to the game board creation (40% marks), they had already developed a thorough understanding of their assigned topic. The game board creation process then required them to extend this knowledge by integrating content from other groups' topics, thereby achieving a comprehensive understanding of the entire course syllabus. This cascading design reflects the principles of constructionist learning (Papert, 1991) and is consistent with the framework's theoretical positioning. In particular, the cascading sequence enacts three core constructionist propositions. First, knowledge construction was made externally visible through the production of a public artefact (the game board), which allowed students' mental models of Malaysian art history to become examinable, defensible, and revisable rather than remaining tacit. This visibility is, for Papert (1991), the defining condition that distinguishes constructionism from purely internal cognitive accounts of learning. Second, the staged progression from Task Force research to game board creation enabled iterative refinement: each phase produced an artefact (presentation, prototype, final board, video) that could be tested against the practical demands of designing playable, instructive content, generating natural feedback loops between conceptual understanding and design decisions. Third, the requirement that each group integrates other groups' topics into its own game positioned every student simultaneously as learner and as designer of learning experiences for peers, embodying what Papert (1991) identified as the most powerful constructionist condition, namely that students are entrusted with the responsibility of teaching through what they build. The cascading design is therefore not merely a sequencing convenience but a structural realisation of the constructionist commitments encoded in the conceptual framework.

Impact on Creative Thinking

The significant improvement in creative thinking (mean difference = 1.47, d = 1.79) demonstrates that the gamification approach effectively stimulated students' creative capacities. As art and design students, the participants were already predisposed towards creative expression; however, the game board project challenged them to apply their creative skills in a novel context. Designing game mechanics, visual aesthetics, reward systems, and narrative structures required a synthesis of artistic skills and strategic thinking that extended beyond traditional art and design assignments. This finding is consistent with Whitton's (2014) assertion that game design activities promote creative problem-solving and divergent thinking. More recent empirical work strengthens this position. Manzano-León et al. (2021), in their systematic review of gamification in education, identified creative thinking and creative self-efficacy as among the most consistently improved affective outcomes across studies, particularly in interventions that required learners to generate, rather than merely consume, game content. Krath et al. (2021), in a systematic theoretical review of 109 articles, similarly concluded that gamified pedagogies grounded in constructionist and self-determination principles produce measurable gains in creative engagement when learners hold genuine creative agency over the artefact being designed. Sailer and Homner (2020), in their meta-analysis

of gamification effects, reported significant positive effects on behavioural and cognitive learning outcomes, including those most closely associated with creative problem-solving. The d = 1.79 effect for creative thinking observed in the present study therefore aligns with, and contributes a further data point to, a converging international evidence base linking student-led game design to measurable creative growth.

The mandatory registration in innovation competitions (MIRCIC, ITEX, i-CREATE, MTE, or SIIDEX) further motivated students to develop original and commercially viable products, reinforcing the link between creative thinking and real-world application. The 80 suggested game board titles spanning six thematic categories provided students with a structured yet flexible framework for creative exploration, aligning with the principle of guided autonomy within Self-Determination Theory (Ryan & Deci, 2000). Self-Determination Theory holds that creative exploration is most likely to flourish when learners experience genuine volition over meaningful choices while operating within an environment that scaffolds, rather than constrains, their developing competence (Ryan & Deci, 2020). The 80 suggested game board titles fulfilled this dual requirement deliberately. By offering a curated set of conceptually rich starting points, the list reduced the cognitive load associated with generating ideas from scratch, thereby supporting students' sense of competence and shielding less experienced learners from the paralysis often produced by unstructured creative tasks. At the same time, the breadth and variety of the suggested titles preserved authentic autonomy, leaving topic selection, thematic interpretation, narrative framing, and visual treatment fully open to student decision. The mandatory registration of the final game board in an external innovation competition (MIRCIC, ITEX, i-CREATE, MTE, or SIIDEX) added a relatedness dimension by situating each group's creative output within a wider community of designers, judges, and audiences. According to recent SDT-based meta-analytic work (Howard et al., 2021), interventions that simultaneously satisfy autonomy, competence, and relatedness produce more substantial and durable creative engagement than those that address any single need in isolation. The convergence of these three psychological needs within the present intervention created the motivational conditions under which divergent thinking and original creative work were most likely to emerge, which helps to explain the magnitude of the observed creative thinking gains.

Improvement in Student Engagement

Student engagement recorded the second-highest mean improvement (+1.80) and a large effect size (d = 1.87), suggesting that the gamification approach was particularly effective in capturing and sustaining student interest throughout the semester. This result supports the theoretical framework of Self-Determination Theory (Ryan & Deci, 2000), as the game board project addressed all three basic psychological needs: autonomy (choice of game concept and design), competence (progressive skill development through consultations and iterations), and relatedness (collaborative group work). From an SDT perspective, the specific mechanisms by which the present approach generated and sustained engagement can be articulated more precisely. Autonomy support was operationalised through the wide latitude that students enjoyed in selecting their game concept, narrative theme, visual style, and rule system, which enabled the learning experience to feel personally meaningful and self-endorsed rather than externally imposed. Competence was supported through the progressive structure of the assessment, in which each milestone (Task Force research, mandatory consultation, prototype, final game board, explanatory video, and competition entry) functioned as an attainable yet challenging step that built systematically upon the previous one, providing what Ryan and Deci (2020) term "optimally challenging" conditions for mastery development. Relatedness was cultivated through continuous group collaboration and through public-facing outputs (presentation, video, competition submission) that connected students not only to peers and instructors but also to external evaluators, thereby embedding the learning activity within a wider community of practice. The contribution of this approach to the sustainability of engagement is particularly noteworthy: prior gamification studies have repeatedly observed an initial novelty-driven spike in engagement followed by decline once game elements lose their reward value (Hanus & Fox, 2015; Sailer & Homner, 2020). In contrast, the simultaneous and continuing satisfaction of all three SDT needs across the 14-week semester offered an internalised motivational foundation that did not depend on extrinsic novelty, which is consistent with the Howard et al. (2021) meta-analytic finding that interventions addressing all three psychological needs produce significantly more durable engagement than those targeting one or two needs. The gamification approach examined here therefore not only engaged students but, more importantly, sustained that engagement through the structural integration of autonomy, competence, and relatedness within a single coherent pedagogical design.

The multi-stage nature of the project, progressing from Task Force research to consultation to game board development to competition registration, maintained a sustained level of engagement that is often difficult to

achieve in purely lecture-based courses. The mandatory consultation session served as a critical checkpoint ensuring groups remained on track whilst providing formative feedback. The hands-on, product-oriented nature of the assessment was consistent with Csikszentmihalyi's (1990) flow state, where an appropriately challenging and intrinsically rewarding activity promotes optimal engagement.

Development of Collaborative Skills

The improvement in collaborative skills (mean difference = 1.44, d = 1.82) reflects the inherently social nature of the game board creation process. Working in groups of five, students were required to negotiate roles, divide responsibilities, resolve creative differences, and integrate individual contributions into a cohesive final product. These ongoing negotiations created a sustained, problem-rich social context in which peers with stronger conceptual or technical skills continuously scaffold less experienced group members. Meanwhile, stronger group members deepened their own understanding by explaining and justifying design decisions. This collaborative experience aligns with Vygotsky's (1978) Zone of Proximal Development, where peer interaction facilitates learning beyond what individuals could achieve independently. The pattern observed in this study is, moreover, consistent with current empirical evidence on collaborative game-based learning in higher education. Manzano-León et al. (2021) identified collaboration and teamwork as among the most consistently improved soft-skills outcomes across gamification studies in higher education, particularly in interventions in which the assessment culminated in the public presentation of a shared artefact. Krath et al. (2021) similarly highlighted that collaborative gamification produces additive effects on engagement, learning, and social bonding when group goals are made interdependent, and outputs are shared with audiences beyond the classroom. Bai et al. (2020), in their meta-analysis, reported that group-based gamified interventions produced stronger effects on collaborative learning outcomes than individual gamified tasks. The present study extends this evidence base by demonstrating that comparable collaborative gains are achievable in a Malaysian art and design education context, where peer-based knowledge construction has not previously been documented at this scale within art history pedagogy and where traditionally hierarchical studio cultures sometimes constrain collaborative outputs.

The continuity of group membership from the Task Force assignment to the game board project allowed for the development of deeper collaborative relationships over the semester. Groups that established effective communication and task allocation strategies during the Task Force phase were able to build upon these foundations during the more complex game board creation process. The video production component further required collaborative planning, scripting, filming, and editing, thereby reinforcing teamwork competencies essential for art and design professionals in industry settings.

Limitations and Future Directions

Several limitations warrant acknowledgement. First, the quasi-experimental design without a control group limits the ability to establish causal relationships definitively. Future research should employ a true experimental design comparing gamification-based and traditional approaches. Second, the relatively small sample size (N = 40) from a single campus constrains generalisability; multi-campus and multi-institutional studies would strengthen the evidence base. Third, the reliance on self-report questionnaire data may be subject to social desirability bias; incorporating objective assessments such as quiz scores and rubric-based evaluations of game board quality would provide complementary evidence.

Future research should also employ longitudinal designs to examine the sustainability of learning gains beyond the semester, qualitative methods such as interviews and focus groups to explore students' lived experiences during the intervention, and comparative studies across different art and design courses to assess the transferability of the gamification approach.

CONCLUSION

This study provides empirical evidence supporting the effectiveness of a gamification-based pedagogical approach in the teaching of Contemporary Art and Design in Malaysia (VCS265) at Universiti Teknologi MARA Sarawak Campus. Grounded in a conceptual framework integrating Self-Determination Theory, Constructionism, Flow Theory, and Bloom's Revised Taxonomy, the study demonstrated that the integration of tabletop game board creation as a major assessment component resulted in statistically significant improvements across all four measured dimensions: cognitive knowledge (d = 1.97), student engagement (d = 1.87), collaborative skills (d =

1.82), and creative thinking (d = 1.79). The large effect sizes observed across all dimensions underscore the practical significance of these improvements.

Unlike previous gamification studies, which primarily focus on digital or reward-based systems, this study introduces a constructionist gamification model through student-generated physical tabletop game design within the Malaysian art education context. The gamification approach transforms students from passive recipients of art historical knowledge into active creators of educational experiences. By designing game boards that encapsulate the richness of Malaysian contemporary art from the pioneering watercolourists of Penang to the philosophical depths of Anak Alam and the cultural diversity of the Pluralist Era, students develop a profound and meaningful connection with their artistic heritage.

This pedagogical innovation demonstrates that the teaching of art history need not be confined to conventional methods, and that creative assessment strategies can significantly enhance the quality of learning in higher education. The findings align with the aspirations of the Malaysian Education Blueprint 2013–2025 and contribute to the growing body of knowledge on curriculum innovation in art and design education across the Asia Pacific region.

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