

**Enhancing Occupational Safety Teaching Through OSHE Quest Analogue Gamification:
A Cross-Sectional Perception Study**

*Shariff Harun¹, Azhan Rashid Senawi¹, Azilah Anis¹, Muhammad Nur Haziq Shariff², Ibrahim Ahmad³

¹Safety Culture at Workplace RIG, Faculty of Business and Management, Universiti Teknologi MARA,
Puncak Alam, Selangor, Malaysia

²Sustainable Future Sdn. Bhd., Shah Alam, Selangor, Malaysia

³Royal College of Medicine Perak, Universiti Kuala Lumpur, Ipoh, Perak, Malaysia

Email: *shariffharun@uitm.edu.my, azhanrashid@uitm.edu.my, azilahanis@uitm.edu.my,

haziq@sustainablefuture.my, ibrahima@unikl.edu.my

Corresponding Author: Dr Shariff Harun

Abstract: Knowledge of occupational safety is essential to ensure the well-being of the entire workforce. Hence, imparting occupational safety knowledge, especially to business and management students, is crucial, as it will prepare the students early before joining the industry. However, the needs of the present generation of higher-learning students transcend the current conventional teaching pedagogy. Therefore, higher learning institutions need to be creative in their teaching and learning approach. In line with this development, gamification has received recognition as a transformative approach in higher education, especially in enhancing learners' participation and inclusiveness towards complex fields like occupational safety, health and environmental (OSHE) management courses. This study examines the pedagogical effectiveness of OSHE Quest gamification, a safety-aligned board game designed to simulate real-world industrial safety scenarios. Sixty-three undergraduate students from one public higher learning institution in Klang Valley, Malaysia, participated to provide insights into their perspectives on the OSHE gamification board game. The study found that factors like personal traits, enjoyment, ease of use, usefulness, and acceptance play an integral part in influencing students' acquiescence to use gamified educational resources. The study also found that well-designed board games like OSHE Quest can serve as innovative tools for transforming OSHE teaching, bridging the gap between conventional classroom learning and interactive professional learning and practices.

Keywords: *Business and Management, Higher Learning Institutions, Occupational Safety, Health and Environment, Gamification Educational Resources, Teaching and Learning*

1. Introduction and Background

Exposure to occupational safety and health (OSH) knowledge is compulsory for business and management students, especially in today's dynamic and ever-changing sphere of the business and technology era. This knowledge is vital to ensure everyone's safety, particularly for those who are in the service, industrial, construction, and retail sectors, the top industries with occupational injury and fatality rates in Malaysia (Department of Statistics Malaysia, 2023). As such, OSH knowledge needs to be embedded in their studies because understanding the essential elements of safe job practices will prepare the students with the mandatory knowledge and skills (Boucaut & Cusack, 2016; Harun et al., 2024). This approach will provide students with both a theoretical and practical foundation in the aspects of Occupational Safety, Health and Environmental (OSHE) management.

Efficient OSHE management teaching is profoundly dependent on an experience-based education methodology supplemented by traditional and modern learning approaches to address the intricacy of OSHE learning needs that require swift decision-making in crises (Ba et al., 2024). In addressing this issue, the gamification teaching approach has evolved as a transformational instructional method in higher education, particularly in disciplines that demand sophisticated decision-making and analytical skills, such as OSHE management (Kapp, 2012; Shahid et al., 2020). Conventional teaching approaches commonly do not succeed in engaging students in practical learning, which limits their capacity to apply theoretical knowledge in real-world industry settings (Deterding et al., 2011). Consequently, the use of modern gamification learning tools can enhance mission judgement and decision-making capabilities in various contexts, allowing for an enhanced learning experience (Sudan et al., 2024).

In line with this development, the OSHE Quest game board, an analogue gamification tool, is designed to simulate occupational safety and health management teaching. The game board transforms theoretical textbook concepts into interactive, problem-solving tasks that are engaging and exciting. The players progress through the board by answering challenge questions and making choices that simulate real-life consequences in the workplace, reinforcing essential OSHE principles such as hazard identification, safe behaviour, and accident prevention. The game board is designed to be highly versatile, allowing adaptation across different industries, age groups, and literacy levels.

Therefore, to evaluate the educational efficacy of the OSHE Quest game board, this study utilises the extended Technology Acceptance Model (Davis, 1989) to assess its pedagogical effectiveness. The conventional model is supplemented with intrinsic motivation (Venkatesh, 2000) and receptiveness to experience (Costa & McCrae, 1992). Thus, the study assesses user acceptance through five core determinants, which are perceived usefulness, perceived ease of use, perceived enjoyment, acceptance and personal traits. This cross-sectional perception study empirically assesses the multidimensional feasibility and student receptiveness of analogue gamification in OSHE education.

2. Literature Review

Education is undoubtedly an essential component in developing, nurturing, and crafting the future workforce in progressing Malaysia as a sustainable high-income nation. It has also been acknowledged as one of the primary forces behind societal development and a key component in educating young talent to address present and future economic challenges (Bikfalvi et al., 2024). This finding is in line with the World Bank trajectory statistics that Malaysia is on the right path to surpassing the high-income level threshold of US\$14,005 gross national income (GNI) per capita (Malaysian Investment Development Authority, 2024). This achievement is strongly supported by Malaysia's National Industrial Master Plan 2030 and the New Semiconductor Strategy (NSS), which firmly back the government's efforts in strengthening technical and vocational education and training (TVET) in producing high-skilled workforces (Malaysian Investment Development Authority, 2024).

In line with this progress, the development of a safety mindset and a preventive culture among the younger generations before joining the workforce has been among the objectives of successive iterations of Malaysia's strategies on health and safety at work (International Labour Organization, 2026). Unfortunately, despite considerable efforts and initiatives in the areas of research and training, the integration of Occupational Safety, Health and Environmental (OSHE) education is currently limited and dispersed. This limitation is due to the unappealing conventional learning approach for learners, which hinders its successful delivery (Bikfalvi et al., 2024). In resolving this issue, integrating gamification in learning is one of the recommended learning strategies that has garnered positive feedback and has shown enhanced learning results, motivation and engagement (Sundram et al., 2025).

Unfortunately, although gamification has gained popularity in higher education, there is still a lack of understanding regarding its usefulness in Occupational Safety, Health and Environmental (OSHE) education at Malaysian universities. Conventional lecture-based methodologies still dominate present teaching and learning strategies, despite studies indicating their limitations in developing practical competence and engaging students (Kasdi et al., 2025). Subsequently, although gamification has been widely explored in science, technology and mathematics education, its applicability to OSHE teaching is still lacking, especially in the Asian educational context. Therefore, in light of this pedagogical gap and the growing complexity of industries, a strategic approach that can accommodate graduates with the right OSHE analytical and decision-making skills is required (Kamal et al., 2021).

To overcome this gap, an innovative and interactive board game called OSHE Quest was introduced as a learning solution designed to transform conventional OSHE management education into an engaging, interactive experience. The board game promotes strategic thinking and problem-solving abilities, which are highly appreciated when tackling safety issues in business operations. OSHE Quest serves as an ideal platform for organisational OSHE development, advancing its potential to become a transformative force in safety education. Therefore, this study aims to assess students' perceptions of the OSHE Quest board game's usability, gameplay, and outcome as an innovative OSHE learning tool.

Henceforth, to assess the pedagogical effectiveness and student acceptance of the OSHE Quest board game, this study utilises the extended Technology Acceptance Model (TAM) introduced by Davis (1989). To address the unique aspects of gamified learning, the conventional TAM framework is enhanced with elements that assess intrinsic motivation, particularly perceived enjoyment. (Venkatesh, 2000) and psychological readiness, defined as openness to experience (Costa & McCrae, 1992). Using these multifaceted perspectives, the study examines five fundamental factors: perceived usefulness to assess academic productivity, perceived ease of use to evaluate operational intuitiveness, perceived enjoyment to capture hedonic engagement, acceptance to assess the perceived advantage of the interactive game board compared to conventional teaching approaches, and personal traits to determine baseline learner receptiveness. This cross-sectional study seeks to determine the empirical feasibility and multifaceted user acceptance of analogue gamification in workplace safety and health education by examining these parameters in conjunction with demographic factors like gender.

3. Research Methodology

This study adopted a quantitative research design, specifically the cross-sectional procedure, to gauge the effectiveness and user perception of the OSHE Quest game that uses gamification. The target population comprised undergraduate students enrolled in the Occupational Safety, Health and Environmental Management course at one public higher education institution in Klang Valley, Malaysia. The non-probability purposive sampling technique was used because the respondents were specifically chosen due to their direct exposure to the subject syllabus and the game board tool. The students were immediately invited to complete a digital questionnaire right after finishing a standardised session of the OSHE Quest gameplay, ensuring that the recorded perceptions accurately reflected their immediate experiential feedback. The digital questionnaire was used to ensure standardised administration and reduce data entry errors.

A 5-point Likert scale recommended by Zikmund et al. (2000) was adopted because the Likert scale is a good measuring instrument that can be used to gauge the respondent's level of acceptance pertaining to the subject under study. The scale used was 1 - *strongly disagree*, 2 - *disagree*, 3 - *neutral*, 4 - *agree*, and 5 - *strongly agree*. The instrument was adapted from a validated framework to ensure construct validity. Items measuring perceived usefulness and ease of use were adapted from the Technology Acceptance Model (Davis, 1989). Intrinsic motivation, operationalised as perceived enjoyment, was adapted from Venkatesh (2000) and items assessing the students' acceptance of the board game were adapted from the Big Five personality framework (Costa & McCrae, 1992). The collected data were subsequently analysed using SPSS statistical software to determine the board game's educational impact, ease of use and overall students' enjoyment. The 18 questionnaire items were grouped into five thematic constructs as listed in Table 1.

Table 1: The thematic constructs analysis

Constructs	Items	Measure
Personal Traits	3	Openness to adventure and new experiences
Acceptance	4	Perceived advantages of the interactive game board vs. conventional teaching
Usefulness	5	Impact of the game board on OSHE pedagogical effectiveness and efficiency
Enjoyment	3	Entertainment and fun aspects of the game board
Ease of Use	3	Interface, rules and usability

4. Results

The analysis of data from 63 undergraduate students who participated in the OSHE Quest intervention revealed significant positive inferences across all measured constructs. The demographic data of the students are tabulated in Table 2 below.

Table 2: The respondents' demographic profiles.

No.	Categories of Demographic Variables	Frequencies	%
1.	Gender		
	Male	21	33.3
	Female	42	66.7
2.	Age		
	20 – 22	36	57.2
	23 – 25	21	33.3
	26 – 28	6	9.5

To ensure the credibility of the constructs, the variables underwent a reliability test to determine their internal consistency. To measure the reliability, this study adopted Zikmund et al. (2000) measurement scale, whereby when a Cronbach's alpha measure is between $0.90 < \alpha < 1.0$, it indicates an *Excellent* reliability; if the Cronbach's alpha is between $0.80 < \alpha < 0.89$, it indicates a *Very Good* reliability; the reliability is *Good* when the value is between $0.70 < \alpha < 0.79$; it is having a *Fair* reliability when the measure is between $0.60 < \alpha < 0.69$; and the reliability is *Poor* when the Cronbach's alpha is < 0.60 . Table 3 below explains the Cronbach's alpha measure of each construct.

Table 3: Cronbach's alpha measure

Variables	Items	Cronbach's Alpha	Indicator
Personal Traits	3	.88	Very Good Reliability
Acceptance	4	.92	Excellent Reliability
Usefulness	5	.96	Excellent Reliability
Enjoyment	3	.98	Excellent Reliability
Ease of Use	3	.92	Excellent Reliability

The reliability analyses indicate that the Cronbach's Alpha for all the variables ranges from .98 (excellent reliability) to 0.88 (very good reliability), signifying that the measures exhibited significant internal consistency and stability. It can be concluded that the measurements used in this study are very dependable and suitable for subsequent investigations. The mean averages and standard deviations of each construct are tabulated in Table 4 below.

Table 4: Mean averages and standard deviations

Variables	Mean	Standard Deviation
Enjoyment	4.49	0.68
Ease of Use	4.41	0.68
Usefulness	4.37	0.69
Personal Traits	4.26	0.65
Acceptance	4.26	0.71

The descriptive analyses showed that all mean values were above 4.00, indicating the students' overwhelmingly positive general perceptions of the OSHE Quest game board. The highest-rated aspect of the OSHE board game is enjoyment ($M=4.49$), indicating that the board game successfully made OSHE learning highly entertaining and fun. The second highest aspect is the ease of use ($M=4.41$), highlighting the user-friendliness of the board game interface, allowing users to be engaged in OSHE learning.

To evaluate any significant perception differences, as well as to ensure that the OSHE Quest game board is universally effective, engaging and accessible across diverse student demographics and genders, the independent-samples t-test for each construct was also analysed. The results showed no statistically significant differences between male and female students across all constructs ($p > .05$). The reported findings for each construct are enjoyment ($t(61) = .523$, $p = .603$), personal traits ($t(61) = .090$, $p = .928$), usefulness ($t(61) = .000$, $p = 1.000$), ease of use ($t(61) = .653$, $p = .516$), and acceptance ($t(61) = -.093$, $p = .926$). It can be clearly concluded that students, regardless of gender, found that the board game is equally enjoyable, useful and

simple to use. The study verifies that the OSHE board game is inclusive and that its design mechanics do not inadvertently favour or eliminate a particular gender.

5. Discussion and Recommendations

The need to impart Occupational Safety, Health and Environmental (OSHE) knowledge among Malaysian higher learning students is not an effortless task. The current generation of higher learning students is technology-savvy; therefore, using conventional teaching methods alone is no longer practical in today's modern era. Therefore, it is essential to equip the students with an interactive and innovative learning environment. New innovative learning pedagogies and resources, such as analogue or digital gamification, are needed to ensure the successful delivery of OSHE knowledge to today's higher learning student generations. Therefore, the integration of the OSHE Quest gamification game board in OSHE learning is practical and timely. The analyses and findings of this study indicated that OSHE Quest has managed to achieve its pedagogical effectiveness objectives and is useful for students undertaking the OSHE course. The findings of this study corroborate the results of Sundram et al. (2025), who found that game-based techniques significantly enhance student engagement and academic outcomes.

Subsequently, this study significantly enhances the understanding of the acceptability and adoption of the OSHE Quest gamification board game among higher learning institution students, particularly given the scarcity of research in the Malaysian education sector. The findings have significant consequences, enhancing the discourse on imparting gamification learning resources as important instructional tools in OSH management education in Malaysia. This research aimed to clarify how factors such as personal traits, enjoyment, ease of use, usefulness, and acceptance significantly influence students' willingness to use gamification educational resources. This study's findings provide an insightful understanding of the elements affecting Malaysian students' intention to embrace gamification educational resources. This is consistent with Kasdi et al. (2025) study, which found that analogue gamification effectively elevated pedagogical effectiveness and conceptual understanding in university settings.

This study faced several limitations that must be considered when determining the direction of future research. Among others, the study focuses on a single university with a public higher education status; thus, it may limit generalisability, as private higher education institutions may face different sets of students and different educational environments. Future research could address these limitations by integrating the same study with a different scope of higher education institutions and sets of students. Nevertheless, the current findings strongly suggest that well-designed board games like OSHE Quest can serve as innovative tools for transforming OSHE education, bridging the gap between conventional classroom learning and interactive professional learning and practices.

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