

Usability Assessment of the Patient Safety EduGame in Nursing Education

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ABSTRACT

Background: Patient safety is a critical component of nursing education, essential for equipping students with the skills to minimise errors and enhance healthcare outcomes. Traditional teaching methods often struggle to effectively engage students and connect theoretical knowledge with practical application. Educational games (EduGames) have emerged as promising tools to address these gaps by fostering interactive, engaging, and practical learning experiences. **Objective:** This study evaluates the usability of the Patient Safety EduGame as a tool to enhance patient safety education among nursing students. **Methods:** A descriptive cross-sectional study was conducted among 120 undergraduate nursing students at a university in Indonesia. After playing the Patient Safety EduGame, participants fill out the System Usability Scale (SUS) and the Usability Metric for User Experience (UMUX-LITE), two usability metrics for user experience. Descriptive statistics, one-way analysis of variance (ANOVA), Pearson correlation, and independent t-tests were used to examine the data in order to assess usability metrics and find differences among subgroups. **Results:** The mean SUS score was 78.5 (SD = 9.2) and the mean UMUX-LITE score was 73.4 (SD = 10.1). Gender differences were significant for SUS scores ($p = 0.04$), with female participants reporting higher usability. Technological proficiency significantly influenced usability scores, with higher proficiency correlating with better scores ($p < 0.05$). A strong positive correlation ($r = 0.78$, $p < 0.001$) between SUS and UMUX-LITE scores confirmed convergent validity. **Conclusion:** The Patient Safety EduGame demonstrates high usability, making it a promising tool for integrating patient safety education into nursing curricula. Future research should explore the long-term educational impact and extend usability testing to broader populations.

Keywords: *EduGames; Gamified Learning; Patient Safety; SUS; Usability Assessment; UMUX-LITE*

INTRODUCTION

Patient safety is a cornerstone of nursing education, aimed at equipping future nurses with the skills and competencies necessary to minimise errors and enhance healthcare outcomes. However, traditional teaching approaches often fail to engage students or effectively link theoretical knowledge with practical application (Wang *et al.*, 2024a). This gap highlights the need for innovative strategies to integrate patient safety principles more effectively into nursing curricula. One promising method is the incorporation of educational games (EduGames), which combine interactive gameplay with targeted learning objectives to improve student engagement and knowledge retention.

Technological advancements in nursing education have increasingly emphasised the potential of innovative tools to enhance learning experiences. Among these tools, EduGames have gained recognition as an effective way to bridge the gap between theory and practice, particularly in patient safety education. EduGames are interactive games designed for educational purposes, providing nursing students with a dynamic platform to learn and apply critical concepts in safe and controlled settings. For example, Wang *et al.* (2024b) developed a serious game focused on improving patient safety competencies among nursing students, which significantly

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enhanced knowledge retention and attitudes toward patient safety. Similarly, Daniel *et al.* (2025) introduced a virtual reality-based simulation game to train students in managing patient deterioration, leading to improved clinical performance and greater confidence in real-world scenarios. Antikchi, Heydari and Bakhshi (2025) further emphasised the benefits of game-based learning environments, noting that they allow students to practise clinical skills without the risks associated with actual clinical settings. These environments also support the development of essential soft skills, such as teamwork and communication, which are crucial for delivering high-quality patient care.

The integration of EduGames into nursing education has shown substantial promise in enhancing learning outcomes. Game-based learning fosters critical thinking, decision-making, and motivation, encouraging students to immerse themselves in the educational material (Baah, Govender & Rontala Subramaniam, 2023). A recent meta-analysis by Nylén-Eriksen *et al.* (2025) highlighted the effectiveness of gamified methods in nursing education, demonstrating a marked improvement in students' ability to apply theoretical knowledge in simulated clinical contexts. Similarly, Kim, Park and Shin, (2020) found that high-fidelity simulations, including EduGames, significantly enhanced knowledge application and clinical decision-making. Zhang (2025) also emphasised the motivational benefits of EduGames, noting that their interactive nature promotes intrinsic motivation and sustained engagement. Additionally, the adaptability of EduGames to diverse learning needs makes them an invaluable tool for fostering inclusivity and personalised education in nursing programmes.

Beyond their educational benefits, EduGames offer practical advantages such as scalability and cost-effectiveness. Unlike traditional simulation labs, which require substantial resources and infrastructure, visual media learning using games can be implemented on a wide range of digital platforms, making them accessible to a broader audience (Suhaemi, Nursanti & Irawati, 2025). Advances in gamification have also facilitated the integration of real-time feedback and adaptive learning pathways, further enhancing their educational value. For instance, Kimm, Oh and Lee (2025) demonstrated that gamified learning environments with real-time feedback significantly improved nursing students' clinical reasoning skills.

Despite the growing body of evidence supporting the effectiveness of EduGames, limited research has explored their usability and overall impact in nursing education, particularly in the context of patient safety. Usability evaluation is critical to determine whether EduGames are user-friendly, engaging, and capable of meeting educational objectives (Berglund *et al.*, 2024). Lu, Schmidt and Shin (2025) underscored the importance of usability in e-learning applications, arguing that well-designed interfaces and intuitive navigation are essential for a positive learning experience. While prior studies have demonstrated the general benefits of gamified learning, few have examined the specific design and usability aspects of EduGames tailored for patient safety education in nursing.

The lack of emphasis on usability is concerning, given its significant implications for learning outcomes. Poorly designed EduGames can lead to frustration and diminished learning effectiveness among students. Furthermore, the absence of standardised frameworks for evaluating the usability of EduGames in nursing education hinders systematic assessment and improvement. This study seeks to address these gaps by evaluating the usability of the Patient Safety EduGame, offering insights into its design, user experience, and potential to enhance nursing education outcomes.

METHODOLOGY

Study design

The research employed a descriptive cross-sectional approach to assess the usability of the Patient Safety EduGame in nursing education. The main goal was to evaluate user impressions, pinpoint possible usability issues, and gather input to improve the game's functioning and instructional efficacy. This design was chosen because it enables the collection of data at a specific moment, offering insights into user interactions and perceptions of the game in its present condition.

Sample

The study's participants were undergraduate nursing students in their second and third years at an Indonesian university. Students who qualified for participation had to meet three criteria: they had to have completed at least one patient safety course, exhibit fluency in Bahasa Indonesia, and offer informed consent to participate in the

study. Exclusion criteria were also used to ensure the data's integrity. Students who had previously played the EduGame, or who were unable to complete the usability assessment owing to technical difficulties or personal situations were excluded from the study.

G*Power, a program with a stellar reputation for statistical power analysis, was used to determine the study's sample size (version 3.1.9.7). An expected medium effect size (Cohen's $f=0.25$), a 5% margin of error, and a 95% confidence level were all factors in the computation. Based on these assumptions, a sample size of 120 participants was needed to guarantee a power of 0.8. The participants were recruited using a purposive sampling strategy. The goal in going this route was to get a cross-section of nursing students' technical competence levels.

Instrument

The usability of the Patient Safety EduGame was evaluated with the use of the System Usability Scale (SUS) and the Usability Metric for User Experience (UMUX-LITE). A well-known and widely used standardised instrument for assessing usability, the SUS was initially designed by John Brooke in the year 1986. A Likert scale with five points is used to assign grades to ten different issues, with one representing "Strongly Disagree" and five representing "Strongly Agree". A higher composite score, which the SUS generates, and which can vary anywhere from 0 to 100, is indicative of an increased usefulness.

The UMUX-LITE was used as an additional instrument to evaluate usability in addition to the SUS, which was used as the primary instrument. This tool provides a concise yet robust option for evaluating user experience. It features two items that are in close alignment with the concept of usability that is provided by ISO 9241-11. The UMUX-LITE is assessed using a Likert scale with seven points, and its total score is standardised to exist within a range of 0 to 100 with the purpose of making interpretation easier.

For the purpose of this study, the SUS and UMUX-LITE were translated into Bahasa Indonesia in accordance with the principles for cross-cultural adaptation that were given by the World Health Organization (WHO, 2019). SUS and UMUX-LITE both had Cronbach's alpha values of 0.85 and 0.89, respectively, during the pilot testing of the translated version with thirty nursing students. This indicated that the dependability of the translated version was adequate.

Procedure

The method for the study was carried out in a number of structured phases to guarantee that it complied with ethical standards and collected ample amounts of data. For the purpose of recruitment, eligible students were invited to participate through the use of email communication and announcements made in the classroom. A written informed consent form was required to be submitted by participants prior to enrolment completion. An orientation session was arranged for the purpose of acquainting the participants with the intervention. During this session, the participants were provided with comprehensive instructions on how to access and utilise the Patient Safety EduGame. The participants conducted their own independent engagement with the EduGame over the course of a period of two weeks, during which they explored its features and completed interactive patient safety scenarios. Immediately following the conclusion of the game, the players were requested to complete the System Usability Scale (SUS) questionnaire as well as the UMUX-LITE.

Data Analysis

After analysis, examined the usability of the Patient Safety EduGame as well as the user experience that it offered by analysing quantitative data with IBM SPSS Statistics (version 28.0). This was done in order to compare and contrast the two aspects. Means, standard deviations, and frequency distributions of demographic characteristics of the participants are examples of descriptive statistics. These statistics are used to describe the features of the population. In order to obtain the mean scores and standard deviations for SUS and UMUX-LITE, descriptive analyses were carried out via the procedure. Through participation in these studies, participants were able to gain knowledge of their general perceptions associated with usability. To analyse the differences that exist between subgroups, such as gender, study year, or technical proficiency, independent t-tests and one-way analysis of variance were carried out. These tests were used to identify the disparities that exist. The results of these tests were determined to be statistically significant ($p < 0.05$), and subsequent post-hoc tests, notably Tukey's, were conducted to further analyse the results. Evaluating the connection between SUS and UMUX-LITE scores was accomplished by employing Pearson correlation coefficients as the method of analysis. Both the existence of convergent validity and patterns in user experience metrics were brought to light as a result of this

procedure.

Ethical Consideration

The researchers obtained ethical approval from the Institutional Review Board (IRB) of STIKep PPNI Jawa Barat, Indonesia with reference no III/098/KEPK/STIKep/PPNI/Jabar/III/2024 on 12th March 2024.

RESULTS

Table 1 presents the demographic characteristics of the participants. The study included 120 participants, with a relatively balanced gender distribution (56.7% female). Most participants were undergraduate students (65.0%) and reported moderate technological proficiency (43.3%).

Table 1: Demographic Characteristics of Participants

	Frequency (n)	Percentage (%)
Gender		
Male	52	43.3
Female	68	56.7
Study Year		
Second Year	68	37.5
Third Year	52	25.0
Technological Proficiency		
Low	24	20.0
Moderate	52	43.3
High	44	36.7

Descriptive statistics for System Usability Scale (SUS) and UMUX-LITE scores are summarized in Table 2. The mean SUS score was 78.5 (SD = 9.2), indicating good usability, while the mean UMUX-LITE score was 73.4 (SD = 10.1).

Table 2: Descriptive Statistics for SUS and UMUX-LITE Scores

Metric	Mean	SD
SUS Score	78.5	9.2
UMUX-LITE Score	73.4	10.1

Gender differences were significant for SUS scores ($p = 0.04$) but not for UMUX-LITE scores ($p = 0.08$). No significant differences were observed between second- and third-year students for either measure ($p > 0.05$) (Table 3).

Table 3: Independent t-Test Results for SUS and UMUX-LITE

Subgroup	Measure	Mean (Male)	Mean (Female)	t-value	p-value
Gender	SUS	75.2	79.8	2.12	0.04
	UMUX-LITE	73.1	76.5	1.76	0.08
Study Year	SUS	77.9	79.1	0.68	0.50
	UMUX-LITE	74.6	75.8	0.89	0.38

A one-way ANOVA was performed to examine the effect of technological proficiency on SUS and UMUX-LITE scores. Significant differences were found ($p < 0.05$). Tukey's post-hoc tests indicated that students with high technological proficiency had significantly higher scores on both measures compared to those with low or moderate proficiency (Table 4).

Table 4: One-Way ANOVA Results and Tukey's Post-Hoc Tests

Proficiency Level	Measure	Mean	F-value	p-value	Significant Pairwise Comparisons
Low	SUS	72.4	8.76	0.001	High > Low, High > Moderate
Moderate		76.2			
High		81.3			
Low	UMUX-LITE	70.8	7.45	0.002	High > Low, High > Moderate
Moderate		74.5			
High		78.6			

Pearson correlation coefficients were calculated to assess the relationship between SUS and UMUX-LITE scores. A strong positive correlation was observed ($r = 0.78, p < 0.001$), confirming convergent validity (Table 5).

Table 5: Pearson Correlation Coefficient

Measure	Correlation (r)	p -value
SUS and UMUX-LITE	0.78	<0.001

DISCUSSION

The results of this investigation reveal that the Patient Safety EduGame demonstrates high usability, as evidenced by a mean SUS score of 78.5 (SD = 9.2) and a mean UMUX-LITE score of 73.4 (SD = 10.1). These findings align with previous studies emphasising the critical role of user-centered design in developing educational tools for healthcare professionals (Murmanto *et al.*, 2023). The SUS score, exceeding the benchmark value of 68, indicates above-average usability (Sakdiah *et al.*, 2025). Similarly, the UMUX-LITE score corroborates this assessment, reflecting favourable usability and overall user experience.

These findings are consistent with prior research exploring the usability of gamified learning tools within nursing education. For example, Kalyuga and Singh, (2020) reported comparable SUS scores for a gamified learning tool designed to enhance clinical skills. However, this study uniquely identifies significant gender differences in usability perceptions, with female participants reporting higher SUS scores (mean = 79.8) than their male counterparts (mean = 75.2, $p = 0.04$). This outcome contrasts with findings from Alshabib, Alakkas and Hassine, (2025), which reported no significant gender-based disparities in usability ratings. Additionally, the absence of significant differences in usability scores between second- and third-year nursing students mirrors the findings of Zhang (2025), who concluded that academic year has minimal impact on perceived usability.

Technological proficiency emerged as a pivotal factor influencing usability outcomes, as evidenced by the System Usability Scale (SUS) and Usability Metric for User Experience LITE (UMUX-LITE) scores. This aligns with Korobkov and Collins, (2019), who emphasised the role of technological literacy in shaping user experience. Results from Tukey's post-hoc tests demonstrate that students with high technological proficiency achieved markedly higher usability scores than those with moderate or low proficiency. Recent studies have highlighted the significant impact of technological proficiency on students' interaction with digital tools. For instance, a systematic review by Vlachogianni and Tselios (2023) found that mobile applications with high usability scores were associated with improved student engagement and satisfaction. Similarly, the study demonstrated that students with higher technological proficiency achieved better performance in virtual reality-based listening tests, underscoring the importance of digital competency in educational settings (Lai & Lin, 2025). These findings underscore the importance of technological competency in enhancing user interaction, engagement, and satisfaction with digital tools.

The strong usability performance of the Patient Safety EduGame has significant implications for nursing education. The high SUS and UMUX-LITE scores validate its potential for seamless integration into nursing curricula to strengthen patient safety competencies. Moreover, the correlation between SUS and UMUX-LITE scores supports the tool's validity as an effective educational resource (Aktaş, Şişman & Borsci, 2025). The gamified approach employed by the EduGame fosters active learning, a pedagogical strategy shown to improve knowledge retention and practical skill application in clinical settings (McLaughlin *et al.*, 2024). By promoting engagement and interactivity, the EduGame enriches the learning experience and prepares nursing students to prioritise patient safety in their professional practice.

The influence of technological proficiency on usability underscores the necessity of pre-training initiatives aimed at enhancing users' digital skills (Jayadi *et al.*, 2025). Foundational workshops designed to improve digital literacy could help bridge gaps between students with varying levels of technical expertise (Hussain & Phulpoto, 2024). These training programmes are crucial to ensuring equitable access to and engagement with educational technologies, regardless of prior proficiency. Research indicates that digital literacy not only enhances usability but also increases user satisfaction and engagement, particularly in

educational environments (Naamati-Schneider & Alt, 2024). By fostering baseline technological competence, such initiatives contribute to more consistent usability experiences and support inclusive access to the advantages of digital learning platforms.

Limitation

However, there are a number of constraints that must be taken into consideration. Initially, the study sample was restricted to a singular institution, which may restrict the generalisability of the results to other contexts. Secondly, the SUS and UMUX-LITE scores' self-reported nature may induce response bias. Lastly, the study did not investigate the EduGame's long-term impact on knowledge retention or clinical skill application, which limits the ability to draw conclusions about its efficacy beyond usability metrics.

CONCLUSION

The Patient Safety EduGame demonstrates good usability, with strong SUS and UMUX-LITE scores, making it a promising tool for nursing education. Significant gender differences and the influence of technological proficiency on usability scores highlight important considerations for tool design and implementation. Future research should explore the long-term educational outcomes associated with this EduGame and extend usability testing to diverse student populations. Expanding studies to include students with varying cultural and educational backgrounds could provide deeper insights into its adaptability and effectiveness. Additionally, investigating the integration of advanced technologies, such as artificial intelligence and virtual reality, into the EduGame may further enhance its educational value. These efforts could support the development of more personalised, engaging, and impactful gamified learning experiences for nursing students. Overall, integrating gamified learning tools into nursing education has the potential to enhance patient safety competencies, fostering better outcomes in clinical practice.

Conflict of Interest

The authors declare that they have no competing interests. .

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