



EXPERIENTIAL SCENARIO-BASED ROLE-PLAYING GAME DESIGN FOR ENHANCING DIGITAL WELL-BEING LITERACY AMONG HIGHER EDUCATION STUDENTS

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ABSTRACT

Aim/Purpose	Digital Well-Being Literacy is increasingly important in higher education, yet structured approaches that combine experiential, scenario-based, and role-playing learning remain limited. This study investigated the design and educational outcomes of an Experiential Scenario-Based Role-Playing Game (ES-RPG) framework addressing digital health, digital safety, digital literacy, and digital citizenship.
Background	The framework integrates students' identified learning needs with Experiential Learning Theory, Scenario-Based Learning, and role-playing activities. Authentic digital situations require learners to assume roles, make decisions, consider consequences, and reflect on their choices.
Methodology	A three-phase design was used. Phase 1 identified Digital Well-Being Literacy needs among 598 undergraduates using the Priority Needs Index Modified. Phase 2 developed the ES-RPG framework and evaluated it with five experts. Phase 3 involved 70 undergraduates from two intact classes in a quasi-experimental pretest-posttest control-group design ($n = 35$ per group). Digital Well-Being Literacy was assessed using a validated 30-item test, and learning engagement was measured across behavioral, emotional, and cognitive dimensions.

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Contribution	The framework integrates needs assessment, experiential learning, scenario-based learning, and role-playing into a single instructional design. It translates identified learning priorities into authentic scenarios structured around role adoption, decision-making, and consequences, incorporating reflection throughout the experiential learning process.
Findings	The highest-priority needs were mental and emotional well-being, healthy technology use, privacy management, digital stress awareness, and online responsibility. Expert evaluation indicated high suitability for both the framework ($M = 4.56$) and its learning activities ($M = 4.52$). After controlling for pretest scores, the experimental group had higher posttest Digital Well-Being Literacy than the control group, with a robust $F(1, 67) = 13.93, p < .001$, partial $\eta^2 = .180$, with an adjusted mean difference of 2.61 points (95% CI [1.21, 4.01]). The experimental group also reported higher learning engagement, with effect sizes ranging from $d = 0.66$ to 1.65 .
Recommendations for Practitioners	The ES-RPG framework provides a structured way to translate Digital Well-Being Literacy content into authentic activities involving decision-making, consequences, and reflection.
Recommendations for Researchers	Further research should examine the contribution of individual framework components and replicate the intervention across multiple classes and institutional settings.
Impact on Society	Digital Well-Being Literacy encompasses health, safety, critical use of digital information, and responsible participation in digital environments. Contextualized learning experiences may help higher education address these areas more systematically.
Future Research	Longer interventions, delayed posttests, active comparison conditions, and behavioral measures of engagement are needed to examine the durability and generalizability of the findings.
Keywords	digital well-being literacy, experiential learning, scenario-based learning, needs assessment, role-playing game, learning engagement, higher education

INTRODUCTION

University students engage extensively with digital technologies for learning, communication, and everyday activities. Alongside these opportunities, concerns have emerged regarding digital stress, privacy, information overload, and unhealthy patterns of technology use (Bahar et al., 2024; Büchi, 2024; Thianthai & Tamdee, 2024; Vanden Abeele, 2021). These concerns point to the importance of Digital Well-Being Literacy, defined in this study as students' knowledge and understanding of digital health, digital safety, digital literacy, and digital citizenship.

Supporting Digital Well-Being Literacy requires more than awareness of digital risks. Students need opportunities to evaluate information, manage digital pressures, make informed privacy decisions, and consider responsible participation in online communities (Görög & Udvari, 2023). Conventional content-focused approaches may provide essential information, but they offer fewer opportunities for learners to apply that knowledge within realistic digital situations (Choi & Park, 2024; Ferreira et al., 2020).

Game-based learning offers one way to place learners in contextualized situations where knowledge must be applied rather than simply recalled. Role-playing games are particularly relevant because they place learners in situations that require them to consider alternative responses, make decisions, and

face the consequences of their choices (Dewi & Sujana, 2021; Winardy & Septiana, 2023; Yuditseva, 2023). Previous studies have also associated role-playing and game-based learning with positive outcomes in engagement, motivation, and learning (Wulan et al., 2024; Zhong, 2022). These features are well aligned with Digital Well-Being Literacy, in which issues such as privacy, technology use, and online responsibility often involve judgments that depend on context rather than the recall of isolated information.

Despite this potential, relatively little attention has been given to the use of game-based and role-playing approaches specifically for Digital Well-Being Literacy. A further issue concerns how the content of such interventions is selected. Instructional designs may not always be informed by empirical evidence of the digital well-being areas that students themselves identify as priorities. Bringing learner-identified needs into the design process may therefore provide a stronger basis for determining what students encounter in the learning activities and how those experiences are structured.

To address this gap, this study proposes an Experiential Scenario-Based Role-Playing Game (ES-RPG) framework that integrates learner-identified needs with Experiential Learning Theory (D. A. Kolb, 1984) and Scenario-Based Learning (Clark & Mayer, 2012). Identified learning priorities were used to inform the development of authentic scenarios in which students assume roles, make decisions, and consider the consequences of their choices. The study, therefore, focused on identifying students' Digital Well-Being Literacy needs, developing and validating the framework, and examining its implementation in relation to Digital Well-Being Literacy and learning engagement. The following research questions guided the study:

- RQ1:** What Digital Well-Being needs should inform the design of the experiential scenario-based role-playing game?
- RQ2:** To what extent does the experiential scenario-based role-playing game improve students' Digital Well-Being Literacy?
- RQ3:** To what extent does the experiential scenario-based role-playing game promote students' learning engagement?

LITERATURE REVIEW

STUDENTS' NEEDS ASSESSMENT

Needs assessment is an important step in instructional design because it provides evidence for identifying learners' priorities before learning interventions are developed. Students enter learning environments with different levels of prior knowledge, skills, and experience, and these differences may not be adequately addressed through generic instructional approaches. This is particularly relevant in digitally mediated learning environments, where patterns of technology use and digital engagement continue to evolve (Choi & Park, 2024; Ferreira et al., 2020).

A needs assessment examines the discrepancy between current and desired conditions to identify areas requiring greater instructional attention. The Priority Needs Index Modified (PNI Modified) provides a systematic means of quantifying these discrepancies and ranking needs according to their relative priority (Wongwanich et al., 2014). Such information can help align instructional content and learning activities with empirically identified learner needs rather than relying solely on predetermined priorities.

For Digital Well-Being Literacy, this alignment is particularly relevant because students' experiences are shaped by changing digital platforms, online interactions, and individual patterns of technology use. In the present study, needs-assessment findings provided the empirical basis for selecting learning content and for identifying priorities, which were subsequently translated into authentic scenarios and learning activities within the proposed framework.

EXPERIENTIAL LEARNING THEORY

Experiential Learning Theory (ELT) provides a theoretical basis for understanding how knowledge develops through experience and reflection. This perspective is relevant to Digital Well-Being Literacy because understanding principles related to privacy, online risks, or responsible digital behavior does not necessarily mean that learners can apply this knowledge in contextualized digital situations. Learning activities can therefore provide opportunities to interpret situations, consider alternatives, make decisions, and reflect on their consequences (D. A. Kolb, 1984).

D. A. Kolb (1984) conceptualized experiential learning as a four-stage cycle comprising Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. Learners engage in an experience, reflect on what occurred, develop or refine their conceptual understanding, and subsequently apply that understanding in new situations. Learning is thus viewed as an iterative process in which experience, reflection, conceptualization, and application are interconnected (Chan, 2022; A. Y. Kolb & Kolb, 2022).

This experiential process is particularly suited to digital situations in which learners must evaluate possible actions and consider their consequences. Research on simulation-based learning suggests that environments involving decision-making, consequences, and reconsideration of responses can support active and reflective learning (De Jong & Dexter, 2025). In the proposed framework, ELT provides the theoretical structure for organizing learning through experience, reflection, conceptualization, and subsequent application.

SCENARIO-BASED LEARNING

Scenario-Based Learning (SBL) places learners in authentic, contextually meaningful situations that require them to apply knowledge rather than recall isolated information. Scenarios typically present a problem or decision within a defined context, requiring learners to interpret available information and determine an appropriate response (Clark & Mayer, 2012). This approach is particularly relevant when decisions depend on contextual factors and more than one course of action may be plausible. The quality of SBL depends substantially on how scenarios are designed. Authenticity, complexity, sequencing, feedback, and the representation of consequences can shape how learners engage with a situation and reconsider their initial judgments (Errington, 2010; Norris et al., 2022). Well-designed scenarios can therefore provide a structured setting in which knowledge is applied to situations that resemble those learners may encounter beyond the classroom (Sadeghi et al., 2023). These characteristics are relevant to Digital Well-Being Literacy, in which students encounter context-dependent issues involving privacy and personal data, online interactions, technology use habits, and responsible participation in digital communities. Within the proposed framework, SBL provides the contextual structure through which identified Digital Well-Being Literacy needs are translated into authentic situations. ELT, in turn, guides learners through experience, reflection, conceptualization, and subsequent application in those situations.

ROLE-PLAYING GAMES

Role-playing games (RPGs) provide an interactive learning environment in which learners assume roles and respond to situations from the perspectives of the characters they represent. Rather than observing a problem from an external position, learners participate directly through role-based interaction and decision-making. The combination of narrative, role adoption, and consequential choices can create opportunities for active and situated learning (Dewi & Sujana, 2021; Rahman & Angraeni, 2020).

In educational settings, role-playing allows learners to examine situations from different perspectives and consider the implications of their choices (Winardy & Septiana, 2023). Digital environments extend these opportunities by allowing learners to interact with virtual characters or peers and experience simulated outcomes that may be difficult to reproduce in conventional classrooms (Yudintseva,

2023). In this way, role-playing provides an interactive setting in which learners can engage personally with contextualized problems rather than encounter them only through explanation or discussion.

The application of RPGs to Digital Well-Being Literacy remains relatively limited. This is a relevant area for investigation because university students regularly encounter issues involving privacy, personal data, online interactions, technology-use habits, and responsible participation in digital communities. Frequent use of digital technologies does not necessarily correspond to competence in evaluating online information or making informed decisions in digital environments (Georgopoulou et al., 2025). Role-playing provides a way to bring such issues into structured learning situations where students can consider them from different roles and perspectives.

DIGITAL WELL-BEING LITERACY

Higher education students use digital technologies extensively for learning, communication, and social participation. Frequent use, however, does not necessarily mean that students have the knowledge needed to navigate digital environments in healthy, safe, and responsible ways. Such knowledge is not always addressed explicitly within formal education, despite its increasing relevance to students' everyday digital experiences (Büchi, 2024; Vanden Abeele, 2021). This distinction between digital participation and informed digital participation provides an important basis for considering Digital Well-Being Literacy as an educational outcome.

In this study, Digital Well-Being Literacy is conceptualized as a knowledge-based construct rather than as a measure of psychological well-being or actual digital behavior. It refers to students' knowledge and understanding of four related dimensions: Digital Health, Digital Safety, Digital Literacy, and Digital Citizenship. The construct, therefore, focuses on students' ability to understand relevant principles and risks and to apply that understanding when interpreting digital situations, rather than on changes in well-being or behavior themselves.

The four dimensions address complementary aspects of digital life. Digital Health concerns the physical and emotional implications of technology use; Digital Safety addresses privacy, online risks, and protective practices; Digital Literacy concerns the critical evaluation of digital information and informed use of digital tools; and Digital Citizenship addresses ethical and socially responsible participation in digital environments (Görög & Udvari, 2023). Together, these dimensions define the Digital Well-Being Literacy outcome examined in this study.

Developing this knowledge requires more than exposure to information about appropriate digital practices. Students also need opportunities to consider how such knowledge applies to situations they may encounter in everyday digital life. The proposed framework, therefore, places Digital Well-Being Literacy in authentic situations that require students to interpret information, consider alternative responses, make decisions, and reflect on the consequences of those decisions. In this way, the intended learning outcome is aligned with the experiential, scenario-based, and role-playing processes incorporated into the framework.

LEARNING ENGAGEMENT

Learning engagement is commonly conceptualized as a multidimensional construct reflecting how students participate in and respond to learning experiences. Fredricks et al. (2004) distinguished three dimensions: behavioral engagement, referring to participation and involvement in learning activities; emotional engagement, referring to learners' affective responses to those activities; and cognitive engagement, referring to the mental effort and investment involved in understanding and completing learning tasks.

Research in technology-enhanced learning has associated active participation, authentic tasks, collaboration, and opportunities for reflection with behavioral, emotional, and cognitive engagement (Bond et al., 2020; Redmond et al., 2018). These dimensions are relevant to experiential and scenario-based learning because learners are expected not only to participate in activities but also to respond to the

learning experience and invest cognitive effort in interpreting situations and considering possible responses.

In the proposed framework, authentic scenarios, role participation, decision-making, and reflection provide opportunities for behavioral, emotional, and cognitive engagement. Accordingly, learning engagement was included as a learning outcome for examining students' involvement in the ES-RPG learning experience.

PROPOSED CONCEPTUAL FRAMEWORK

The proposed framework draws on four complementary foundations: Students' Needs Assessment, Experiential Learning Theory (ELT), Scenario-Based Learning (SBL), and Role-Playing Games (RPGs). Each serves a distinct function. Needs assessment identifies the Digital Well-Being Literacy areas requiring instructional attention; ELT provides the theoretical basis for learning through experience and reflection; SBL structures learning around authentic and contextually meaningful situations; and RPGs provide the interactive setting in which learners assume roles and respond to those situations.

The contribution of the framework lies in how these elements are combined within a needs-informed design, rather than in any single instructional approach. Empirically identified learner priorities are translated into authentic scenarios involving role participation, decision-making, consequences, and reflection. This creates a direct link between identified learning needs and the experiential, scenario-based role-playing activities designed to support Digital Well-Being Literacy. The overall structure of the framework is presented in Figure 1.

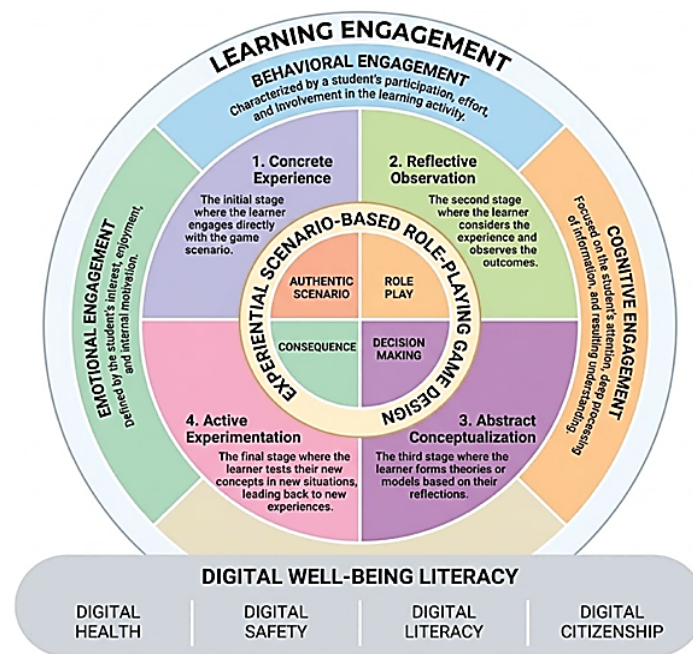


Figure 1. Proposed experiential scenario-based role-playing game framework for enhancing digital well-being literacy among higher education students

The instructional design comprises four components: authentic scenarios, role-playing, decision-making, and consequences. These components are aligned with Kolb's experiential learning cycle, encompassing Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. Reflection is embedded within this experiential process rather than treated as a separate design component. The relationship between the four instructional components and Kolb's four

stages is summarized in Table 2. Digital Well-Being Literacy is the primary learning outcome and comprises four dimensions: digital health, digital safety, digital literacy, and digital citizenship. Learning engagement is examined separately across behavioral, emotional, and cognitive dimensions. Figure 1 summarizes how the theoretical foundations, instructional components, and study outcomes are positioned within the proposed framework.

METHODS

This study employed a three-phase research design: (1) identifying students' Digital Well-Being Literacy needs, (2) developing and validating the Experiential Scenario-Based Role-Playing Game (ES-RPG) framework, and (3) evaluating the framework through a quasi-experimental implementation examining Digital Well-Being Literacy and learning engagement. The procedures for each phase are described below.

PHASE 1: IDENTIFYING STUDENTS' DIGITAL WELL-BEING LITERACY NEEDS

Participants

The target population comprised 752,659 undergraduate students enrolled in higher education institutions in Bangkok (National Statistical Office, 2023). Participants were recruited through a multi-stage sampling procedure. Three universities were selected at the first stage, followed by cluster sampling within each institution. The final sample comprised 598 undergraduate students who completed the needs-assessment survey.

Ethical approval was obtained from the Human Research Ethics Committee of King Mongkut's Institute of Technology, Ladkrabang (Certification No. EC-KMITL_67_091; approved September 6, 2024). Participation was voluntary, and participants were informed of the study's purpose and procedures before data collection.

Instrument and data analysis

A needs-assessment questionnaire was developed to examine students' Digital Well-Being Literacy across four dimensions: digital health, digital safety, digital literacy, and digital citizenship. Items were derived from the conceptual definitions and content areas associated with these dimensions and were reviewed for their relevance and alignment with the intended constructs.

The questionnaire comprised 12 items: digital health (3 items), digital literacy (3 items), digital safety (3 items), and digital citizenship (3 items) (see Appendix A). Each item was rated twice on a five-point Likert scale to assess students' current and desired levels.

Content validity was evaluated by five domain experts using the Index of Item–Objective Congruence (IOC; Rovinelli & Hambleton, 1977). Experts rated each item as +1 (clearly congruent), 0 (uncertain), or –1 (clearly incongruent). The IOC for each item was calculated as:

$$IOC = \Sigma R / N$$

where R represents the rating assigned by each expert, and N represents the number of experts. Items with IOC values below .50 were revised and re-evaluated. Following revision, IOC values for the final questionnaire ranged from .80 to 1.00.

Discrepancies between current and desired conditions were analyzed using the Priority Needs Index Modified (PNI Modified; Wongwanich et al., 2014):

$$PNI \text{ Modified} = (I - D) / D$$

where I denotes the mean desired-condition score, and D denotes the mean current-condition score. Higher PNI Modified values indicate larger discrepancies between current and desired conditions

and, consequently, higher relative instructional priorities. The resulting priorities informed the selection of learning content and the development of authentic scenarios in Phase 2.

PHASE 2: FRAMEWORK DEVELOPMENT AND VALIDATION

The ES-RPG framework was developed by combining the needs-assessment findings from Phase 1 with the theoretical and instructional foundations established in the literature review. The needs assessment identified the Digital Well-Being Literacy areas requiring instructional attention, while Experiential Learning Theory (ELT), Scenario-Based Learning (SBL), and Role-Playing Games (RPGs) informed the structure and design of the learning activities.

The priority needs were situated within the four Digital Well-Being Literacy dimensions and subsequently translated into learning content and scenarios. Mental and emotional well-being was identified within digital health; healthy technology use within digital literacy; privacy management and digital stress awareness within digital safety; and online responsibility within digital citizenship. Thus, the priority needs represent specific instructional areas within the broader Digital Well-Being Literacy dimensions rather than additional dimensions of the construct. Their alignment with the corresponding dimensions and learning scenarios is presented in Table 1.

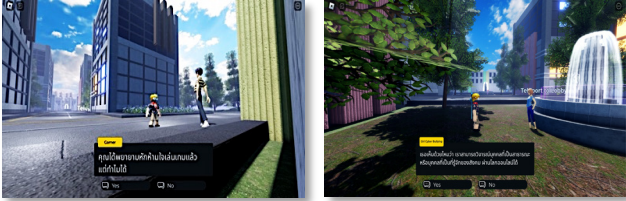
Table 1. Learning content design based on needs assessment findings

Priority need	Digital well-being domain	Example scenario design
Mental and emotional well-being	Digital health	Students respond to social media pressure, online comparison, and negative feedback.
Healthy technology use	Digital literacy	Students make decisions about screen-time management and digital-life balance.
Privacy management	Digital safety	Students evaluate data-sharing requests and adjust privacy settings.
Digital stress awareness	Digital safety	Students identify digital stressors and consider appropriate coping strategies.
Online responsibility	Digital citizenship	Students respond to cyberbullying, misinformation, and ethical dilemmas in online communities.

Building on ELT and SBL, the ES-RPG framework was organized around four design components: authentic scenarios, role-playing, decision-making, and consequences. These components were aligned with the four stages of Kolb's (1984) experiential learning cycle: Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. This alignment guided the structure of the learning activities, as presented in Table 2.

Table 2. Experiential scenario-based role-playing game design framework

Design component	Experiential learning stage	Description
Authentic scenario	Concrete experience	Learners encounter realistic digital situations derived from the priority needs identified in Phase 1, providing the initial learning experience.
Role-playing	Concrete experience/ reflective observation	Learners assume avatar-based roles and interact with non-player characters (NPCs), allowing them to experience digital situations from different perspectives and consider their responses within the scenario (Figure 2).

Design component	Experiential learning stage	Description
		 Figure 2. Avatar-based role-playing and interaction with non-player characters
Decision-making	Abstract conceptualization/ active experimentation	Learners interpret the situation, connect it with relevant Digital Well-Being Literacy concepts, evaluate possible responses, and apply their understanding through a selected course of action (Figure 3).  Figure 3. Decision-making, consequences, and reflection within an ES-RPG scenario
Consequence	Reflective observation/active experimentation	Learners observe the outcomes of their decisions, consider their implications, and use this experience to inform subsequent choices in later scenarios.

Expert validation

The proposed framework and learning activities were evaluated by five experts: two specialists in educational technology, two in curriculum and instruction, and one in digital well-being. All experts had more than 10 years of professional experience in their respective fields.

Using a five-point rating scale, the experts evaluated the appropriateness of the framework and learning activities, including their alignment with the theoretical foundations, identified student needs, and intended learning outcomes. The framework received an overall mean rating of 4.56 (SD = 0.47), while the learning activities received an overall mean rating of 4.52 (SD = 0.47). Expert feedback was used to refine the framework, scenarios, and learning activities before implementation.

PHASE 3: FRAMEWORK IMPLEMENTATION AND EVALUATION

Research design and participants

Phase 3 employed a quasi-experimental pretest–posttest control-group design. The population comprised 270 undergraduate students from eight intact classes. Two classes were selected through cluster sampling, yielding 70 participants; one class formed the experimental group ($n = 35$) and the other the control group ($n = 35$). The experimental group received the ES-RPG intervention, while the control group received conventional instruction covering the same Digital Well-Being Literacy

content over three weeks. Because the intervention was implemented at the class rather than the individual level, potential class-level influences could not be fully separated from differences between the instructional conditions.

Instruments

Digital Well-Being Literacy was assessed using a 30-item, four-option multiple-choice test covering digital health, digital safety, digital literacy, and digital citizenship (see Appendix B). Items were developed from the conceptual definitions of these dimensions and reviewed for content validity using the Index of Item–Objective Congruence (IOC). A sample item assessing digital literacy asked, “When you encounter news online from an unfamiliar source, what is the most appropriate action before sharing it?” A pilot study with 30 students yielded Cronbach’s $\alpha = .80$, an average difficulty index of .61, and an average discrimination index of .58. Reliability in the main study was $\alpha = .817$ for the pretest and $\alpha = .722$ for the posttest.

Learning engagement was assessed using a 30-item, five-point Likert-scale questionnaire covering behavioral, emotional, and cognitive engagement (see Appendix C). A sample item assessing cognitive engagement was, “I carefully analyzed the situations before making decisions.” Content validity was established through IOC review. Cronbach’s alpha coefficients were .868 for behavioral engagement, .777 for emotional engagement, and .707 for cognitive engagement, with an overall $\alpha = .780$.

Procedure

Both groups completed the Digital Well-Being Literacy pretest before the intervention. The experimental group then participated in ES-RPG activities structured around authentic scenarios, role-playing, decision-making, and consequences, whereas the control group received conventional instruction covering the same Digital Well-Being Literacy content. The experiential learning process also provided opportunities for students to reflect on the consequences of their decisions and apply their understanding to subsequent situations. After the three-week intervention, both groups completed the Digital Well-Being Literacy posttest and the learning engagement questionnaire. Weekly activities are summarized in Table 3.

Table 3. Summary of intervention activities by week

Week	Experimental group (ES-RPG)	Control group (conventional)
1	Authentic scenarios addressing digital health and digital safety; role-playing with NPCs; decision-making and immediate consequences.	Lectures, teacher explanations, and discussions addressing digital health and digital safety.
2	Digital literacy scenarios involving information evaluation, role-based decision-making, and consequences, followed by opportunities to reflect on the outcomes of decisions.	Lectures, assigned readings, and teacher-guided discussions addressing digital literacy.
3	Digital citizenship scenarios involving ethical participation and responsible online behavior, role-based decision-making, and consequences, with opportunities to apply understanding to subsequent situations.	Lectures, teacher explanations, and discussions addressing digital citizenship.

Data analysis

Means and standard deviations were calculated for Digital Well-Being Literacy and learning engagement scores. Learning engagement scores were interpreted using the following predefined ranges:

4.50–5.00 = very high, 3.50–4.49 = high, 2.50–3.49 = moderate, 1.50–2.49 = low, and 1.00–1.49 = very low.

For Digital Well-Being Literacy, ANCOVA was used to compare posttest scores between groups while controlling for pretest scores. Normality, homogeneity of variance, and homogeneity of regression slopes were examined before the analysis. Because the homogeneity-of-variance assumption was not satisfied, HC3 heteroscedasticity-robust standard errors were used for statistical inference. Effect size was reported as partial η^2 , and a 95% confidence interval was provided for the adjusted between-group difference. Learning engagement was compared between groups using independent-samples *t* tests, with Cohen's *d* and 95% confidence intervals reported for the between-group differences. No missing data were identified; therefore, no imputation was required.

RESULTS

DIGITAL WELL-BEING LITERACY NEEDS ASSESSMENT

The results are presented according to the three research questions: students' Digital Well-Being Literacy needs, Digital Well-Being Literacy following the ES-RPG intervention, and learning engagement. A total of 598 undergraduate students participated in the needs assessment. Their demographic characteristics are summarized in Table 4.

Table 4. Demographic information of the participants (n=598)

Aspects	Number	Percentage
Gender		
Male	252	42.14
Female	346	57.86
Age		
21 years and above	281	46.99
19 – 20 years	253	42.31
18 years and below	64	10.70
University		
Public	373	62.37
Private	177	29.60
Other	48	8.03
Device ownership		
Smartphone	598	100
Tablet	376	62.88
Laptop	356	59.53
Desktop computer	115	19.20

Participants were predominantly female (57.86%) and aged 21 years or above (46.99%), with the majority enrolled in public universities (62.37%). All participants owned smartphones, while laptop and tablet ownership were also common (59.53% and 62.88%, respectively).

To identify priority areas for framework development, students' current and desired levels of digital well-being literacy were compared using the Priority Needs Index Modified (PNI Modified). The results are summarized in Table 5.

Table 5. PNI modified values and priority rankings (n=598)

Assessment items	Current level		Desired level		Results	
	Mean	SD	Mean	SD	PNI modified	Priority
Digital health						
Physical health	3.71	0.78	3.96	0.81	0.07	2
Mental and emotional well-being	3.77	0.84	4.09	0.91	0.09	1
Digital detox	3.62	0.90	3.82	0.97	0.06	3
Digital literacy						
Critical evaluation	3.68	0.89	3.82	0.94	0.04	3
Healthy technology use	3.61	0.89	3.89	0.89	0.08	1
Self-awareness in the digital space	3.85	0.78	4.04	0.83	0.05	2
Digital safety						
Protecting mental health online	4.07	0.78	4.28	0.77	0.05	2
Privacy management	3.92	0.78	4.22	0.76	0.08	1
Digital stress awareness	3.71	0.84	4.02	0.78	0.08	1
Digital citizenship						
Kindness and respect online	3.90	0.83	4.14	0.81	0.06	3
Online responsibility	3.80	0.82	4.10	0.81	0.08	1
Ethical behavior and social responsibility	3.87	0.80	4.12	0.82	0.07	2
Average	3.79	0.83	4.04	0.84	0.07	

Note. Priority 1 indicates the highest need within each Digital Well-Being Literacy dimension, followed by Priorities 2 and 3. Equal PNI Modified values were assigned the same priority rank.

As shown in Table 5, the average PNI Modified value was approximately 0.07, indicating a discrepancy between students' current and desired levels of Digital Well-Being Literacy. The highest-priority needs were mental and emotional well-being within digital health (PNI = 0.09), healthy technology use within digital literacy (PNI = 0.08), privacy management and digital stress awareness within digital safety (both PNI = 0.08), and online responsibility within digital citizenship (PNI = 0.08). These five priority areas were used to guide the learning content and scenario design of the ES-RPG framework.

DIGITAL WELL-BEING LITERACY

The groups did not differ significantly in baseline Digital Well-Being Literacy. The control group had a pretest mean of 14.97 (SD = 1.79), compared with 14.83 (SD = 2.75) for the experimental group, Welch's $t(58.44) = 0.26$, $p = .798$ (Table 6).

ANCOVA assumptions were examined before the main analysis. Residuals showed no significant departure from normality (Shapiro–Wilk $W = .976$, $p = .210$). The group $\times$ pretest interaction was not significant, $F(1, 66) = 0.54$, $p = .465$, indicating no evidence of a violation of the assumption of homogeneity of regression slopes. Levene's test was significant, $F(1, 68) = 11.12$, $p = .001$, indicating unequal error variances. HC3 heteroscedasticity-robust standard errors were therefore used for statistical inference.

Table 6. Baseline comparison of digital well-being literacy scores

Group	N	M	SD	<i>t</i>	df	<i>p</i>
Control	35	14.97	1.79	0.26	58.44	.798
Experimental	35	14.83	2.75			

As shown in Table 6, the groups had comparable Digital Well-Being Literacy scores at baseline. No significant difference was found between the control and experimental groups, Welch's $t(58.44) = 0.26$, $p = .798$. ANCOVA was then used to compare posttest scores while controlling for pretest performance. Descriptive and adjusted posttest means are presented in Table 7.

Table 7. Descriptive statistics, adjusted means, and ANCOVA results for digital well-being literacy

Group	Pretest M (SD)	Posttest M (SD)	Adjusted mean	95% CI
Control	14.97 (1.79)	23.57 (3.40)	23.57	[22.40, 24.73]
Experimental	14.83 (2.75)	26.17 (2.11)	26.18	[25.42, 26.93]

As shown in Table 7, the adjusted posttest mean was higher for the experimental group than for the control group (26.18 vs. 23.57). The adjusted between-group difference was 2.61 points (95% CI [1.21, 4.01]), robust $F(1, 67) = 13.93$, $p < .001$, partial $\eta^2 = .180$.

To provide a more detailed view of students' performance across the four dimensions of digital well-being literacy, descriptive statistics were examined for digital health, digital safety, digital literacy, and digital citizenship. As shown in Table 8, the experimental group had higher mean posttest scores than the control group across all four dimensions, with the largest descriptive difference observed in Digital Literacy (7.54 vs. 6.31). These dimension-level results are descriptive and were not subjected to separate inferential analyses.

Table 8. Descriptive statistics of digital well-being literacy by dimension

Dimension	Control M (SD)	Experimental M (SD)
Digital health	5.51 (1.04)	6.17 (0.86)
Digital safety	5.71 (0.99)	6.14 (0.81)
Digital literacy	6.31 (1.30)	7.54 (0.74)
Digital citizenship	6.03 (1.07)	6.31 (1.02)
Overall	23.57 (3.40)	26.17 (2.11)

STUDENTS' ENGAGEMENT

Learning engagement was compared between the experimental and control groups across behavioral, emotional, cognitive, and overall engagement. Descriptive statistics, between-group comparisons, effect sizes, and 95% confidence intervals are presented in Table 9.

Table 9. Comparison of learning engagement between the experimental and control groups

Dimension	Control group (n = 35) M (SD)	Experimental group (n = 35) M (SD)	<i>t</i>	<i>p</i>	Cohen's <i>d</i>	95% CI for <i>d</i>
Behavioral Engagement	3.68 (0.44)	4.18 (0.78)	-3.31	.001	0.79	[0.30, 1.28]
Emotional Engagement	3.85 (0.39)	4.20 (0.65)	-2.76	.007	0.66	[0.18, 1.14]
Cognitive Engagement	3.70 (0.37)	4.18 (0.42)	-5.14	< .001	1.23	[0.71, 1.74]
Overall Engagement	3.74 (0.22)	4.19 (0.31)	-6.89	< .001	1.65	[1.10, 2.19]

Note. df = 68 for all independent-samples *t* tests; *n* = 35 per group.

As shown in Table 9, the experimental group reported higher scores than the control group across behavioral, emotional, cognitive, and overall learning engagement (all $p \leq .007$). Effect sizes ranged from $d = 0.66$ to 1.65 , with the largest between-group difference observed for overall engagement.

DISCUSSION

RQ1: WHAT DIGITAL WELL-BEING NEEDS SHOULD INFORM THE DESIGN OF THE EXPERIENTIAL SCENARIO-BASED ROLE-PLAYING GAME?

The needs assessment identified five priority areas for Digital Well-Being Literacy: mental and emotional well-being, healthy technology use, privacy management, digital stress awareness, and online responsibility. Together, these priorities suggest that students' needs extend beyond technical knowledge to include health, informed technology use, safety, and responsible participation in digital environments. Mental and emotional well-being emerged as the highest priority within digital health (PNI = 0.09), while healthy technology use, privacy management, digital stress awareness, and online responsibility were also prioritized (PNI = 0.08).

These findings are consistent with research highlighting the psychological demands associated with intensive digital use, the importance of managing online experiences and privacy, and responsible participation in digital communities (Büchi, 2024; Churchman et al., 2024; Görög & Udvari, 2023; Satyaninrum et al., 2023; Sriwisathiyakun, 2024; Vanden Abeele, 2021). The pattern of identified needs also supports the broader view of Digital Well-Being Literacy adopted in this study, which encompasses not only safe technology use but also health, critical engagement with digital environments, and responsible digital participation.

Importantly, the needs assessment findings were carried forward into the instructional design. Rather than relying solely on predetermined digital well-being content, the identified priorities were translated into authentic scenarios structured around role-playing, decision-making, and consequences. In this way, the needs assessment served not only to identify areas requiring instructional attention but also to provide an empirical basis for the content and situations incorporated into the ES-RPG activities (Choi & Park, 2024; Ferreira et al., 2020; Wongwanich et al., 2014).

RQ2: TO WHAT EXTENT DOES THE EXPERIENTIAL SCENARIO-BASED ROLE-PLAYING GAME IMPROVE STUDENTS' DIGITAL WELL-BEING LITERACY?

Students in the ES-RPG group had higher posttest Digital Well-Being Literacy than those receiving conventional instruction after controlling for pretest scores (adjusted means: 26.18 and 23.57, respectively). The adjusted between-group difference was 2.61 points (95% CI [1.21, 4.01]), with a partial η^2 of .180. This finding suggests that the ES-RPG approach may support students' knowledge and understanding of digital well-being.

One possible explanation lies in the experiential and scenario-based structure of the framework. Students engaged with contextualized digital situations in which they adopted roles, considered alternative responses, made decisions, and examined the consequences of their choices. These experiences also provided opportunities for reflection, consistent with D. A. Kolb's (1984) experiential learning cycle. The application of knowledge and judgment within meaningful contexts similarly reflects the principles of Scenario-Based Learning (Clark & Mayer, 2012; Errington, 2010). Through this process, digital well-being concepts were not presented solely as abstract information but were situated within situations requiring students to interpret problems and apply their understanding when making decisions. The present design, however, does not allow the contribution of individual instructional components to be isolated.

At the dimension level, the experimental group had higher descriptive posttest means for digital health, digital safety, digital literacy, and digital citizenship, with the largest difference observed in digital literacy. Because no separate inferential tests were conducted for these dimensions, these patterns should be interpreted descriptively rather than as evidence of differential effects across the four dimensions.

The overall finding is consistent with previous studies showing that game-based and role-playing environments can support digital literacy and the contextualized application of knowledge (Abou Hashish et al., 2024; Chen & Wu, 2021; Wang et al., 2023; Zhou, 2024). Building on prior game-based and role-playing research, the present framework connects empirically identified learner needs to authentic scenarios that involve role-based participation, decision-making, consequences, and reflection. This needs-informed integration provides a structured connection between the learning priorities identified in Phase 1 and the experiential activities implemented in Phase 3. Digital Well-Being Literacy was measured as knowledge and understanding rather than as behavioral or psychological change; therefore, the findings should be interpreted specifically in relation to students' knowledge-based Digital Well-Being Literacy.

RQ3: TO WHAT EXTENT DOES THE EXPERIENTIAL SCENARIO-BASED ROLE-PLAYING GAME PROMOTE STUDENTS' LEARNING ENGAGEMENT?

Students in the ES-RPG group reported higher behavioral, emotional, cognitive, and overall learning engagement than those receiving conventional instruction, with effect sizes ranging from $d = 0.66$ to 1.65 . Cognitive engagement also showed a substantial between-group difference ($d = 1.23$), suggesting greater cognitive involvement in the learning activities among students in the ES-RPG condition.

This pattern is consistent with Fredricks et al.'s (2004) multidimensional conceptualization of engagement and with research linking active participation and technology-enhanced learning environments with greater learner engagement (Bond et al., 2020; Redmond et al., 2018). Similar patterns have been reported in game-based and immersive learning contexts (Baah et al., 2024; Ruiz et al., 2024; Videnovik et al., 2023). Within the ES-RPG activities, students participated in role-based scenarios that required them to interpret digital problems, consider alternative responses, make decisions, and examine the consequences of those decisions. Such active and contextually meaningful participation may help explain the higher behavioral and emotional engagement reported by the experimental group,

consistent with research emphasizing active participation and interaction in technology-supported learning environments (Bond et al., 2020; Redmond et al., 2018).

The relatively large difference in cognitive engagement may be particularly relevant to the framework's experiential design. Rather than simply receiving information about digital well-being, students were required to evaluate situations and apply their understanding when making decisions within the role-playing environment. Opportunities for reflection further encouraged students to reconsider their choices and connect their experiences with relevant digital well-being concepts. These processes are consistent with D. A. Kolb's (1984) experiential learning cycle, in which concrete experience is followed by reflection and conceptualization, and with research suggesting that game-based learning can promote cognitive engagement through active involvement in learning tasks (Baah et al., 2024).

Learning engagement, however, was examined as a separate learning outcome rather than as a mechanism explaining differences in Digital Well-Being Literacy. No mediation or causal analysis between engagement and Digital Well-Being Literacy was conducted. Accordingly, the higher engagement reported by the ES-RPG group should be interpreted as an additional learning outcome associated with the instructional experience rather than as evidence that engagement accounted for the observed differences in Digital Well-Being Literacy.

CONCLUSIONS

Addressing Digital Well-Being Literacy in higher education requires more than providing information about safe or responsible technology use. The ES-RPG framework used students' identified needs to inform the design of authentic digital scenarios centered on role-playing, decision-making, and consequences. The needs assessment highlighted mental and emotional well-being, healthy technology use, privacy management, digital stress awareness, and online responsibility as priority areas for instructional attention.

Following the three-week intervention, students in the ES-RPG group had higher Digital Well-Being Literacy than those receiving conventional instruction after controlling for pretest scores. They also reported higher behavioral, emotional, cognitive, and overall learning engagement. These findings suggest that connecting learner-identified needs with contextualized experiential learning may provide a useful approach to Digital Well-Being Literacy education. Learning engagement was examined as a separate outcome and should not be interpreted as the mechanism underlying differences in Digital Well-Being Literacy.

The contribution of the ES-RPG framework lies in linking empirically identified learner needs with experiential, scenario-based, and role-playing learning within a coherent instructional design. The findings provide an initial empirical basis for further examination and refinement of the framework across broader educational contexts.

LIMITATIONS

The findings should be interpreted with consideration of the study design and context. The study was conducted with 70 students drawn from two intact classes at a single institution. With only one class per instructional condition, differences between the groups may partly reflect class-level characteristics rather than the instructional conditions themselves. This limits the extent to which the findings can be generalized beyond the present setting. Replication involving multiple classes, instructors, and institutions would help establish whether similar findings emerge across different educational contexts.

The three-week intervention also limits conclusions about the durability of the observed differences. Although the ES-RPG group achieved higher posttest Digital Well-Being Literacy, no delayed post-test was administered; therefore, it remains unclear whether the knowledge gains endure over time. Novelty associated with the role-playing environment may also have contributed to the observed outcomes. Longer interventions and follow-up assessments would help distinguish sustained learning from effects associated with initial exposure to a new instructional environment.

Finally, learning engagement was assessed through self-report only after the intervention, without a pretest baseline, which may not fully represent students' actual participation, and means that pre-existing differences in engagement between the two classes cannot be ruled out. Behavioral indicators such as interaction logs or observational data could provide complementary evidence. In addition, the use of a conventional, rather than an active, comparison condition limits the extent to which the observed differences can be attributed specifically to the ES-RPG design, rather than to the broader effects of receiving a more interactive learning experience. Future studies incorporating active comparison conditions, baseline engagement measures, and multiple engagement measures would provide a stronger basis for evaluating the framework.

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APPENDIX A: NEEDS-ASSESSMENT QUESTIONNAIRE

The questionnaire consisted of 12 items across four dimensions of Digital Well-Being Literacy: digital health, digital literacy, digital safety, and digital citizenship. Each item was rated twice using a five-point Likert scale to assess students' current and desired levels.

No.	Items
Digital Health	
1	I can maintain my physical health while using digital devices, including managing screen-related discomfort and maintaining appropriate posture.
2	I can manage my mental and emotional well-being when using digital media and interacting in online environments.
3	I can take regular breaks from digital devices and disconnect from digital activities when necessary.
Digital Literacy	
4	I can critically evaluate the credibility, accuracy, and reliability of information encountered in digital environments.
5	I can manage my use of digital technology to maintain a healthy balance between online activities and daily life.
6	I can recognize and reflect on my own behavior, habits, and identity in digital environments.
Digital Safety	
7	I can protect my mental well-being when encountering harmful content or negative interactions online.
8	I can manage my personal information and privacy settings to protect my data in digital environments.
9	I can recognize sources of digital stress and take appropriate actions to prevent or reduce their negative effects.
Digital Citizenship	
10	I can communicate and interact with others online with kindness, courtesy, and respect.
11	I can take responsibility for my actions, decisions, and communication in digital environments.
12	I can act ethically in digital environments and consider the potential consequences of my actions for others and society.

APPENDIX B: DIGITAL WELL-BEING LITERACY TEST

The test comprises 30 four-option multiple-choice items covering four dimensions of Digital Well-Being Literacy: digital health, digital safety, digital literacy, and digital citizenship. Respondents are instructed to select the single best answer for each question.

1. Which statement best describes screen time management?
 - A. Using digital devices only during free time
 - B. Balancing time spent on digital devices with other daily activities
 - C. Avoiding all forms of digital technology
 - D. Using digital devices continuously to improve productivity
2. What should students do when working at a computer for extended periods?
 - A. Always set screen brightness to its lowest level
 - B. Continue working without interruption until the task is finished
 - C. Take regular eye breaks and maintain appropriate posture
 - D. Remain in the same position to sustain concentration
3. Which situation suggests that gaming behavior may need to be adjusted?
 - A. Playing games occasionally to relax
 - B. Playing games with friends during leisure time
 - C. Playing games after completing important tasks
 - D. Being unable to control gaming time, resulting in disrupted studies and sleep
4. What should students do if comparing themselves with others on social media causes stress?
 - A. Reduce exposure to distressing content and reflect on their usage habits
 - B. Follow more accounts to make additional comparisons
 - C. Post personal information to attract attention
 - D. Permanently stop communicating with everyone
5. Which physical effects may be associated with prolonged use of digital devices?
 - A. Improved hearing
 - B. Eye strain and musculoskeletal discomfort
 - C. Increased muscle strength
 - D. Consistently improved long-term memory
6. How should students respond if using their phones before bedtime leads to insufficient sleep?
 - A. Increase screen brightness to stay alert
 - B. Continue using the phone until they feel sleepy
 - C. Establish a period without digital devices before bedtime
 - D. Consume caffeinated beverages to compensate for lost sleep

7. Which behavior reflects care for emotional well-being in digital environments?
 - A. Responding to every negative comment
 - B. Constantly checking follower counts
 - C. Always keeping online-related stress to oneself
 - D. Recognizing personal emotions and seeking support when needed
8. Which approach reflects healthy gaming habits?
 - A. Setting gaming limits so that gaming does not interfere with studies, health, or relationships
 - B. Playing until winning every time
 - C. Replacing all social activities with gaming
 - D. Playing continuously without breaks to improve skills
9. What is web phishing?
 - A. Posting opinions on websites
 - B. Creating fraudulent websites or webpages to trick users into disclosing information
 - C. Storing information in cloud services
 - D. Publishing articles on social media
10. Which password management practice is the most secure?
 - A. Using the same password for every account
 - B. Using a date of birth as a password
 - C. Using long, unique passwords and storing them securely
 - D. Sharing passwords with a trusted friend in case they are forgotten
11. What is the primary benefit of multifactor authentication (MFA)?
 - A. Eliminating the need to recognize fraudulent websites
 - B. Preventing every type of online threat
 - C. Eliminating passwords in all circumstances
 - D. Providing additional protection against unauthorized account access
12. Which practice is appropriate for managing personal information on social media?
 - A. Reviewing privacy settings before sharing information
 - B. Publishing a national identification number to establish credibility
 - C. Accepting friend requests from every account
 - D. Continuously sharing real-time location information

13. What should a student do after receiving an urgent message containing a link to verify a bank account?
 - A. Open the link immediately to prevent account suspension
 - B. Verify the request directly through the bank's official app or communication channels
 - C. Provide the sender with a one-time password (OTP)
 - D. Forward the message to friends and ask them to test the link
14. Which practice is appropriate when using mobile banking?
 - A. Disclosing an OTP to someone claiming to be a bank employee by telephone
 - B. Installing banking apps from links received in messages
 - C. Checking the recipient's name and the amount before confirming a transaction
 - D. Posting a banking password publicly for convenience
15. What should a person do promptly if a phone with a mobile banking app is lost?
 - A. Wait for someone to return the phone
 - B. Publish the banking password on social media
 - C. Purchase a replacement phone without taking other action
 - D. Contact the bank to block or protect access to the account
16. Which approach is most appropriate when evaluating information about an online seller?
 - A. Trusting the seller based on the number of likes and followers.
 - B. Relying primarily on product descriptions provided by the seller.
 - C. Comparing information from multiple sources and checking the credibility of customer reviews.
 - D. Assuming that highly advertised products are reliable.
17. Which set of activities represents core components of digital media literacy?
 - A. Viewing, memorizing, distributing, and following
 - B. Accessing, analyzing, evaluating, and creating media
 - C. Searching, copying, storing, and forwarding
 - D. Reading, typing, downloading, and saving
18. When you encounter news online from an unfamiliar source, what is the most appropriate action before sharing it?
 - A. Share it immediately if it has many likes.
 - B. Consider only the accompanying image.
 - C. Check its source, publication date, and supporting evidence against reliable sources.
 - D. Assume it is credible if the publisher has many followers.

19. Which feature may indicate that an online news story is unreliable?
 - A. It cites original sources
 - B. It clearly identifies the publication date
 - C. It provides information that can be verified through multiple sources
 - D. It uses an emotionally sensational headline without supporting evidence
20. Which statement best describes critical thinking in digital environments?
 - A. Analyzing evidence and comparing information before forming conclusions
 - B. Always believing information that agrees with one's views
 - C. Accepting widely shared information without verification
 - D. Judging credibility solely by the number of followers
21. What should a student do if a news image may have been taken from an older event?
 - A. Share it because it appeared in a real news report previously
 - B. Verify the image's original source and context before using it
 - C. Accept its caption without checking
 - D. Remove the image date to avoid confusion
22. Which practice demonstrates responsible digital content creation?
 - A. Copying others' work without attribution
 - B. Publishing information without verification
 - C. Checking accuracy and crediting sources when creating content
 - D. Using only information that supports one's own opinion
23. What should students do when two sources present conflicting conclusions?
 - A. Choose the source with more attractive illustrations
 - B. Always choose the source published first
 - C. Believe the source favored by their friends
 - D. Compare the evidence, presentation methods, and credibility of both sources
24. What does digital citizen identity refer to?
 - A. Managing and expressing one's identity appropriately in online and offline environments
 - B. Creating as many online accounts as possible
 - C. Disclosing all personal information to establish an identity
 - D. Changing online identities to avoid accountability
25. Which behavior is an example of cyberbullying?
 - A. Providing constructive feedback respectfully
 - B. Creating an online group to repeatedly ridicule and harass a person
 - C. Giving a friend advice in a private message
 - D. Exchanging academic opinions

26. What should a student do upon witnessing a friend being cyberbullied?
- A. Reshare the abusive content to increase its visibility
 - B. Join the harassment to avoid becoming a target
 - C. Offer support, preserve evidence, and help report the incident to appropriate people or the platform
 - D. Publish the perpetrator's personal information in retaliation
27. Which behavior demonstrates digital empathy?
- A. Commenting without considering others' feelings
 - B. Using aggressive language to win an argument
 - C. Sharing another person's private experiences for entertainment
 - D. Considering others' feelings and the potential consequences before communicating online
28. Which behavior demonstrates responsible freedom of expression online?
- A. Expressing opinions respectfully while recognizing others' rights and dignity
 - B. Publishing allegations without supporting evidence
 - C. Using insulting language to attract attention
 - D. Revealing personal information about people with opposing views
29. What is a digital footprint?
- A. The number of digital devices a person owns
 - B. The traces of data generated by activities and interactions in digital environments
 - C. The speed at which a website can be accessed
 - D. The number of hours spent online each day
30. Which behavior reflects ethical digital citizenship?
- A. Using others' work without permission or attribution
 - B. Sharing a friend's personal information without consent
 - C. Respecting others' rights, communicating responsibly, and considering societal impacts
 - D. Using anonymous accounts to harass others

APPENDIX C: LEARNING ENGAGEMENT QUESTIONNAIRE

The Learning Engagement Questionnaire consisted of 30 items designed to assess students' engagement in the learning activities across three dimensions: behavioral engagement (10 items), emotional engagement (10 items), and cognitive engagement (10 items). All items were rated on a five-point Likert scale, with higher scores indicating greater levels of learning engagement.

No.	Items
Behavioral Engagement	
1	I participated regularly in all learning activities.
2	I followed the instructions and rules of the learning activities.
3	I participated in discussions and exchanged ideas during the learning activities.
4	I made an effort to complete the assigned tasks.
5	I devoted sufficient time and effort to the assigned learning activities.
6	I actively participated in solving problems or situations presented during the learning activities.
7	I collaborated with my peers during the learning activities.
8	I monitored my own progress throughout the learning process.
9	I took responsibility for the roles or tasks assigned to me.
10	I made an effort to participate as fully as possible in the learning activities.
Emotional Engagement	
11	I enjoyed participating in the learning activities.
12	I was interested in the content presented during the learning activities.
13	I felt excited when encountering new situations or challenges.
14	I felt motivated to continue learning throughout the activities.
15	I felt that the learning activities were meaningful to my life.
16	I felt connected to the roles or situations presented in the learning activities.
17	I was satisfied with the learning experience.
18	I felt enthusiastic about participating in the learning activities.
19	I found this learning experience different from and more interesting than conventional learning.
20	I would like to participate in similar learning activities in the future.
Cognitive Engagement	
21	I carefully analyzed the situations before making decisions.
22	I connected what I learned with my real-life experiences.
23	I considered the possible consequences of my decisions.
24	I considered multiple alternatives when solving problems.
25	I reflected on what I had learned after completing the activities.
26	I tried to understand the reasons underlying the situations presented.
27	I used critical judgment to evaluate information before making decisions.
28	I thought deeply about the issues presented in the learning activities.
29	I was able to apply what I learned to other situations.
30	I tried to develop my understanding beyond simply remembering the content.

AUTHORS



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