A Game-Based Home Visit Training for Long-Term Care Personnel Integrating SVVR Scenario Exploration and Generative AI Interaction

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Abstract

This study simulates the real process of conducting home visits and creates an educational game that combines SVVR (situational virtual reality exploration) with generative AI. The game integrates environmental observation with communication during interviews with elderly people. The goal of the game is for participants to role-play as newly hired LTC staff, assigned by a supervisor to carry out their first home visit. During the visit, participants must explore the environment, gather information from the elder, and then summarize and analyze what they find. In the end, they need to use observation, communication, and information integration skills to report back to the supervisor on whether the elder's condition matches their actual situation. The game involves participants moving through various SVVR rooms, clicking objects to access text/images, and utilizing visitation skill-improvement tips. A Generative AI simulates the elder, imposing a time limit for interaction, information collection, and confirmation. Google Docs functions as the simulated record forms typically completed by LTC staff during visits. The preliminary study involved 20 professional LTC workers in Taiwan (aged 28 to 39). Results showed that participants had significantly higher flow experience scores compared to the median (3 points). Their anxiety scores were also above the median. For cognitive load, extraneous load was significantly lower than the median, while germane load was significantly higher. Overall, the game design fostered a positive flow experience for participants without inducing excessive learning anxiety. Its ease of use and effectiveness in skill practice were highlighted.

Keywords: aging population, long-term care, virtual reality, generative AI, gamified interaction

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Introduction

The current global reality of aging is reflected in a population of approximately 857 million people aged 65 and above. This number is projected to nearly double to 1.58 billion by 2050, with the proportion of the global population increasing from the current 10% to 16%. These figures highlight that aging is an irreversible trend, particularly evident in Asia. Notably, Taiwan has been identified as the fastest-aging nation in the world (United Nations, 2023). The demand for long-term care (LTC) resources and professional personnel is rising rapidly. Consequently, cultivating an adequate supply of well-trained and high-quality LTC staff has become a major challenge for societal development.

Newbould et al. (2022) emphasized that effective educational and training programs can enhance the professional competence of long-term care (LTC) personnel and improve the overall quality of LTC services. In addition, such programs contribute to staff recruitment and retention while fostering a stronger sense of professional identity (Clarke & Ravenswood, 2019). Well-designed training initiatives can also increase LTC workers' confidence and help reduce the occurrence of adverse events and occupational burnout (Harrad & Sulla, 2018).

At the international level, there is broad consensus on the importance of strengthening training for LTC staff to address skill gaps and raise the quality of care (OECD, 2020). Nevertheless, implementation often encounters practical challenges, including insufficient staffing, time limitations, restricted resources, and a persistent gap between training content and real-world application.Chang and Hwang (2023) demonstrated that the use of virtual environments allows students to engage directly with simulated scenarios, practicing observation, exploration, and decision-making. Their findings revealed that participants in VR experiential courses performed significantly better in observation, exploratory skills, and problem-solving compared to those who received traditional training.

On the other hand, employing Generative Artificial Intelligence (Generative AI) to role-play the interviewee offers students a safe and repeatable practice environment. Research has shown that giving medical and nursing students the opportunity to engage in dialogue with simulated patients and receive immediate feedback significantly enhances their clinical communication skills, builds confidence, and strengthens their ability to manage challenging conversations (Thesen et al., 2025). Immersion in realistic and contextually relevant environments further supports learning by improving comprehension and retention. Evidence suggests that immersive learning enables students to develop practical skills that can be directly applied to their future professional practice and everyday life experiences (Goh et al., 2021).

Gamified interactive learning offers personalized and immersive educational experiences. Research by Shukla and Merikapudi (2024) demonstrated that combining Generative AI with gamified interaction can strengthen learners' observation, exploration, and problem-solving skills, while also increasing engagement. In addition, Chien et al. (2025) found that incorporating Non-Player Characters (NPCs) into role-playing activities can function as a scaffolding mechanism, guiding learners toward deeper reflection.

Despite its relevance, gamified learning within immersive interactive scenarios remains underexplored in the context of long-term care (LTC) education and training. To address this gap, the present study designs an educational game that integrates Scenario-based Virtual Reality (SVVR) exploration with Generative AI. The game enables students to simulate home visits conducted by LTC personnel with elderly individuals. Through this process, learners

practice essential exploration and interaction skills, collect and organize data, and ultimately verify the elder's condition with a supervisor to complete the task.

Methods

The objective of the game *"Chen A-Cheng's Visitation Time"* is to simulate a home visit to an elderly individual. Participants are required to synthesize, analyze, and organize information gathered through exploration, observation, and communication. At the conclusion of the visit, a supervisor evaluates whether the participant's understanding of the elder's multifaceted condition aligns with reality. The effectiveness of the game is assessed through participants' demonstration of observation, communication, and information integration skills.

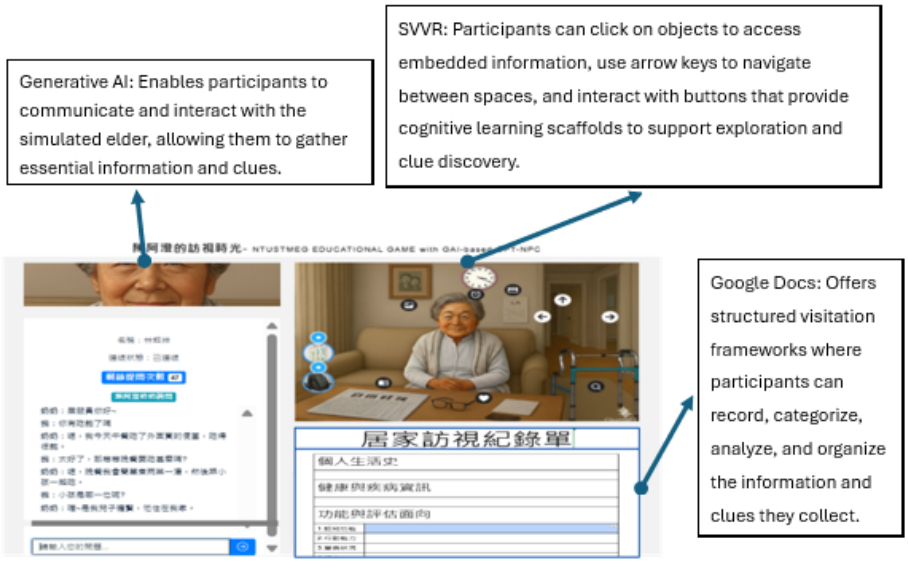
The game interface is hosted on Google Sites and integrates three platform tools—SVVR, Generative AI, and Google Docs (see Figure 1). Participants are free to explore and utilize these tools:

- SVVR: Enables participants to navigate the environment, read information embedded in objects, switch between scenes, and access the "backpack" for visitation skills and functional assessment guidelines. This process allows them to gradually collect clues about the elder's daily life.
- Generative AI: Provides interactive dialogue with the elder. Through communication, participants obtain information about the elder's personal history, health status, and functional domains.
- Google Docs: Offers structured form templates for categorizing, analyzing, and organizing the collected data.

Throughout the game, participants adopt different strategies and approaches, with the flexibility to prioritize scenario exploration, interactive communication, or documentation and organization.

Figure 1

The Game Interface Is Set Up Within a Google Sites Web Page, Detailing the Operational Methods for Each Component



The preliminary study recruited 20 LTC service personnel in Taiwan, aged between 28 and 39. Each participant was provided with a computer device equipped with internet access. The experiment lasted approximately 60 minutes and was divided into three phases:

- **10 minutes:** Explanation of the testing procedure and game instructions
- **30 minutes:** Game-based learning activity (simulation task)
- **20 minutes:** Completion of post-test questionnaires

The post-test included the Game Effectiveness Test, the Flow State Scale, the Activity Anxiety Scale, and the Cognitive Load Scale. In addition, five semi-structured questions on game practicality were administered to further explore participants' experiences with the game mechanism.

The Game Effectiveness Test was designed based on three sources: (1) content observed in the SVVR environment, (2) communication with the elder via Generative AI (GAI), and (3) a synthesis of both. The test comprised ten multiple-choice questions, each worth ten points, for a total possible score of 100. Each question included five options, and participants were required to select all correct answers to receive full credit.

To assess learners' flow performance during learning activities, Kiili's (2006) Flow Questionnaire was utilized. This instrument, which was translated into Chinese by Taiwanese scholars Hou & Li (2014), comprises 22 items across two major dimensions: Flow Antecedents and Flow Experience. A five-point Likert scale was employed for all responses.

Learners' anxiety levels during participation were investigated using Krashen's (1987) Affective Filter Hypothesis Scale, which was adapted by Hung Mei-Hsueh (2001) into the "Learning Experience Scale." This scale contains 8 items, all rated on a five-point Likert scale.

To examine learners' cognitive load, the Cognitive Load Scale developed by Klepsch et al. (2017) was applied. This 8-item scale distinguishes among three load types: intrinsic load, extraneous load, and germane load. Like the other instruments, it also utilizes a five-point Likert scale.

Results and Discussion

The data from Chen A-Cheng's Visiting Time were analyzed using Wilcoxon Signed-Rank tests. As shown in Table 1, participants' game performance ($M = 74.90$, $SD = 7.58$) was significantly higher than the passing score of 70 on the scale. Table 2 indicates that the overall flow experience ($M = 3.93$, $SD = 0.45$) was significantly higher than the scale's median value (i.e., 3). Table 3 shows that activity-related anxiety ($M = 2.1$, $SD = 0.8$) was significantly lower than the scale's median value (i.e., 3). Table 4 reveals that extraneous cognitive load ($M = 2.18$, $SD = 0.63$) was significantly lower than the scale's median value (i.e., 3), while germane cognitive load ($M = 3.62$, $SD = 0.66$) was significantly higher than the scale's median value (i.e., 3).

In the qualitative feedback, participants provided insightful comments such as: "*I can understand the life trajectory of the elderly, and the environmental setup allows me to infer their abilities*" (P8); "*It reminds me of the elders I once cared for or visited*" (P5); and "*Because it is AI simulation, the pressure is lighter, and I can focus on collecting questions*" (P10). Overall, the qualitative data demonstrate that the mechanism realistically presents the living situations of the elderly (100%), aids participants in understanding their conditions and difficulties (95%), fosters emotional connection with the elderly (70%), mitigates

communication pressure compared to interacting with real people (65%), and enables participants to concentrate more on assessment aspects (85%).

Collectively, these findings indicate that this game mechanism effectively facilitates participants' acquisition of information about the elderly. Throughout the process, participants report experiencing a sense of control, enjoyment, focus, and immersion (Flow), all without inducing excessive learning anxiety. Crucially, the learning operation does not impose unnecessary extraneous cognitive load while effectively facilitating germane cognitive load.

Table 1
The Mean and Standard Deviation of Learners' Game Performance

				(N = 20)
	M	*SD*	*Z*	*Sig.*
game performance	74.90	7.58	2.487*	0.013

Note. $^{*}p < 0.05$

Table 2
The Mean and Standard Deviation of Learners' Flow

				(N = 20)
	M	*SD*	*Z*	*Sig.*
Overall Flow	3.93	0.45	3.83***	< .001
Flow antecedents	3.97	0.57	3.81***	< .001
Challenge-skill balance	3.88	0.56	3.74***	< .001
Goals of an activity	3.95	0.94	3.14**	0.002
Unambiguous Feedback	3.55	0.84	2.47*	0.014
Control	4.10	0.90	3.40***	< .001
Playability	4.38	0.69	3.79***	< .001
Flow experience	3.79	0.47	3.83***	< .001
Concentration	4.18	0.67	3.60***	< .001
Time distortion	4.03	0.66	3.67***	< .001
Autotelic experience	3.95	0.70	3.58***	< .001
Loss of self-consciousness	3.00	0.69	−.135	0.893

Note. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table 3
The Mean and Standard Deviation of Learners' Anxiety

				(N = 20)
	M	*SD*	*Z*	*Sig.*
Game Anxiety	2.10	0.80	−3.16**	0.002

Note. $^{**}p < 0.01$

Table 4
The Mean and Standard Deviation of Learners' Cognitive Load

(N = 20)

	M	*SD*	*Z*	*Sig.*
Intrinsic cognitive load	3.10	0.98	0.373	0.709
Extraneous cognitive load	2.18	0.63	−3.57***	< .001
Germane cognitive load	3.62	0.66	3.12**	0.002

Note. $^{**}p < 0.01$, $^{***}p < 0.001$

Conclusions and Limitations

Chen A-Cheng's Visiting Time is a simulation-based serious game developed for this study, targeting the home-visiting skills of long-term care personnel. The primary aim of the game is to enhance participants' proficiency in exploration, observation, and communication. It particularly underscores the importance of cross-checking, synthesizing, and analyzing information and cues derived from both the environment and the elderly resident.

Based on the data analysis, the game demonstrated significant positive effects on learning outcomes and flow experience, coupled with low levels of game-related anxiety, minimal extraneous cognitive load, and high germane cognitive load. Preliminary findings suggest that this experiential learning approach—integrating role-playing, environmental simulation, and GAI-based interactive simulation—effectively facilitates a high degree of learning flow, mitigates learning anxiety, minimizes unnecessary extraneous cognitive load, and successfully provides the essential germane cognitive load required for deep learning.

Initial results indicate that this mechanism of situational exploration and interaction successfully cultivates participants' observational skills, communication abilities, and information integration competence. Future research should prioritize expanding the sample size, conducting comparative studies against traditional long-term care training, and further investigating the influence of simulation fidelity and technology acceptance on learners' perceptions and outcomes.

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