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A Community-Based Infectious Disease Board Game to Enhance Intergenerational Learning in Gerontological Nursing Education

Chun-Chin Tsai PhD ^a and Mei-Fang Chen PhD ^b

^aDepartment of Semiconductor and Electro-Optical Engineering, Southern Taiwan University of Science and Technology, Tainan, Taiwan; ^bDepartment of Nursing, National Tainan Junior College of Nursing, Tainan, Taiwan

ABSTRACT

Purpose: To develop and evaluate a community-based infectious disease board game intervention aimed at enhancing intergenerational learning between nursing students and older adults, and improving competencies related to dengue fever, scabies, SARS, and HIV/AIDS.

Design: This quasi-experimental study used an independent, non-matched, two-group pretest – posttest design.

Methods: Third-year nursing students in southern Taiwan were recruited and assigned to either an intervention or a control group. The intervention group participated in a five-week program consisting of three weeks of classroom instruction followed by two weeks of board game – based learning sessions conducted with older adults. The control group received traditional lecture-based instruction. Outcomes measured included students' communication, teamwork, and social responsibility, as well as older adults' knowledge, attitudes, and preventive behaviors regarding infectious diseases.

Findings: Students in the intervention group demonstrated significantly greater improvements than the control group in health communication ($t = 2.82, p = .006$), team collaboration ($t = 5.33, p < .001$), and social responsibility ($t = 4.07, p < .001$). Older adults also showed significant improvements in infectious disease knowledge, attitudes, and preventive behaviors, all $p < .001$.

Conclusions: The integration of educational board games into nursing curricula is an effective and scalable strategy for enhancing intergenerational learning, fostering key professional competencies among students, and improving health literacy among older adults.

Clinical Relevance: This approach provides practical implications for gerontological nursing education by promoting intergenerational collaboration, strengthening community engagement, and supporting the development of preventive health behaviors among older populations.

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Introduction

In alignment with the United Nations Sustainable Development Goals, and particularly Goal 4 of ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all, higher education institutions are increasingly encouraged to implement meaningful community-based initiatives, known as community-based higher education (CBHE) (Zeydani et al., 2021). Within this framework, intergenerational learning (IGL) has emerged as a promising pedagogical approach that bridges younger and older generations through structured reciprocal activities fostering communication, empathy, and mutual development (Mahinay et al., 2025). Jarrott et al. (2021) identified 15 evidence-based practices contributing to positive IGL outcomes, emphasizing

purposeful roles, supportive environments, and friendship-building. These principles align with the broader mission of nursing education, namely to develop students' professional competence while fostering social responsibility and civic engagement.

In nursing curricula, particularly in medical-surgical nursing education, integrating intergenerational and community-based learning can enhance students' understanding of holistic and person-centered care. It provides opportunities to cultivate essential competencies such as communication, empathy, critical thinking, and teamwork – skills mandated by the Nursing Personnel Act in Taiwan as professional responsibilities (Ministry of Health and Welfare, 2023). However, despite the recognition of experiential learning, traditional lecture-based pedagogies remain dominant. In infectious disease education, clinical engagement is further constrained by strict infection-control protocols, leaving students with limited opportunities for real-world interaction (Kim et al., 2020). This gap between theoretical learning and clinical practice underscores the need for innovative, preventive, and community-engaged strategies that connect knowledge with authentic social application (Zeydani et al., 2021).

From a community health perspective, older adults in local communities often face knowledge and behavioral gaps related to infection prevention, including misconceptions about vaccine safety, inadequate hand hygiene practices, and limited understanding of emerging infectious diseases such as dengue and influenza (Chng et al., 2022; Zhang et al., 2025). Previous studies have indicated that this population frequently exhibits low awareness of infection-transmission routes and suboptimal preventive behaviors, contributing to higher rates of preventable infections (Huang & Chang, 2016; Lee, 2023). Addressing these gaps is essential for strengthening community resilience and health literacy, particularly in aging societies where older adults represent a high-risk group for infectious disease complications (Lee, 2023).

Educational board games have been increasingly recognized as effective, interactive tools. When infused with the principles of experiential learning theory and the Attention, Relevance, Confidence, and Satisfaction (ARCS) model, educational board games offer an interactive and impactful approach that can promote knowledge acquisition and behavioral change in both academic and community settings (Kolb, 1984; Li & Keller, 2018). In psychiatric nursing education, board games have been shown to significantly enhance students' knowledge, attitudes, and learning satisfaction by fostering empathy and promoting active participation within a learner-centered environment (Wu et al., 2023). Similarly, community-based health education programs using board games have been shown to improve older adults' knowledge, attitudes, and preventive behaviors regarding conditions such as osteoporosis. By incorporating real-life scenarios, interactive tasks, and reward mechanisms, these games can enhance engagement, reinforce memory retention, and support sustainable behavioral change (Tsai et al., 2024). Moreover, intergenerational board game activities have been shown to strengthen communication, empathy and inclusion, reduce social isolation, and promote healthier lifestyles among participants (Cès et al., 2024).

Building upon these insights, our research team developed the GAME framework – Goal setting and content development (G), Activity design and game creation (A), Mechanics and dynamics implementation (M), and Evaluation of outcomes (E) – to guide the systematic and replicable design of educational board games for health promotion (Wu et al., 2024). This study extends the application of the GAME framework by integrating the principles of CBHE and IGL into a medical – surgical nursing course. The intervention simultaneously addresses two needs: enhancing nursing students' experiential learning and improving older adults' infectious disease literacy, attitudes, and preventive behaviors. Implemented across both academic and community older-care settings, this study aimed to establish a sustainable, inclusive, and competency-based approach of nursing education to foster mutual growth across generations.

Method

Design

This study used a quasi-experimental, two-group pretest – posttest design with independent intervention and control groups that were not individually matched.

Setting and Sample

This quasi-experimental study was conducted at a junior nursing college in Taiwan. The young adult participants were third-year students enrolled in a five-year nursing program and currently taking the Medical-Surgical Nursing course. Two classes were selected and randomly assigned to either the experimental or control group using a simple drawing method. The experimental group received a five-week intervention involving the Older Adult-Young Adult Epidemic Board Game, while the control group received traditional PowerPoint-based instruction. The first three weeks of the intervention were implemented in a medical-surgical nursing classroom equipped with large tables conducive to group-based board game activities. The remaining two weeks were conducted in four local community care centers to facilitate the IGL component of the program. Pre- and post-intervention assessments were conducted to evaluate the outcomes. The older adult participants joined the IGL activities during the final two weeks of the program, and they were also assessed before and after the intervention to examine changes in their learning engagement and health-related knowledge.

Data Collection

Data were collected from September 2024 to January 2025 over an 18-week semester. For student participants, the pretest (T0) was administered in the first week of the semester, and the posttest (T1) was administered in the 18th week. At T0, before the intergenerational board game activities, student participants completed a personal information form to provide demographic and background data. Their responses to the communication, teamwork, and social responsibility scales were collected at both T0 and T1 by a part-time research assistant who was blinded to group assignment. Students in both the intervention and control groups were unaware of their group assignment throughout the study period to allow for a more objective evaluation of the intervention effects. Each test required approximately 20 minutes to complete. The student data were collected in the classroom. To prevent experimenter effects, the corresponding author was not present in the classroom when the students completed the questionnaires.

For older adult participants, a personal information form was completed before the intergenerational board game activities. Their infectious disease prevention knowledge, attitudes, and preventive behaviors were assessed before and after the two-week community-based intervention. Data were collected at the community care centers by a part-time research assistant who was not involved in delivering the intervention. The older adult participants were regular attendees of the community care centers but had not previously interacted with the students before the intervention. This arrangement ensured that all intergenerational interactions occurred exclusively within the study activities. Older adult participants received a lunch box as a token of appreciation for their participation. No transportation allowance was provided because all participants were local residents of the communities served by the centers.

Incorporating the Board Game into the Nursing Course as the Intervention

The first author of this study has over 15 years of teaching and clinical experience in medical-surgical nursing. Drawing on prior research and extensive teaching expertise, the author developed an infectious disease educational board game titled Pandemic Secrets. For the purposes of this study

and the game scenario, a pandemic was operationally defined as a communicable disease event with the potential for sustained spread across communities that requires coordinated prevention, risk communication, and infection-control responses. The title *Pandemic Secrets* was selected to frame infection prevention as a collaborative discovery process. Specifically, the word “Secrets” refers to the hidden transmission routes, prevention clues, and public health responses that participants uncover through gameplay.

The game was not designed to simulate a specific historical pandemic, but rather to provide an educational scenario for learning about communicable disease prevention and response. The game content addresses four major infection categories: vector-borne diseases, represented by dengue fever; skin-related diseases, represented by scabies; respiratory diseases, represented by SARS; and blood-borne diseases, represented by HIV/AIDS. COVID-19 was not included as a separate disease topic in this study because it is no longer classified as a notifiable communicable disease in Taiwan, and widespread vaccination has contributed to effective disease control, with most cases now presenting as mild illness. In addition, respiratory infection-control principles relevant to COVID-19, including mask wearing, hand hygiene, environmental cleaning, and transmission prevention, were addressed through the SARS-related cards and scenarios.

The intervention was integrated into a five-week segment of a compulsory third-year medical-surgical nursing course (5 credits, 90 hours, offered over an 18-week semester). The game-based learning component included a game board, a set of disease-specific game cards, and a user guide (Figure 1). Each set of cards targeted the following ten core infection control concepts: (1) pathogen identification, (2) diagnostic methods, (3) modes of transmission, (4) environmental disinfection, (5) infection surveillance and reporting, (6) treatment and disease management, (7) protective measures, (8) vaccination, (9) hand hygiene, and (10) health education. These elements were designed to deepen the students’ conceptual understanding of infectious disease nursing through multiple gameplay modes. To ensure the accuracy, engagement, and pedagogical value of the content, a panel of five experts including two nursing educators, two infectious disease specialists, and a researcher with expertise in board game design reviewed the game. Revisions were made based on their feedback before finalizing the game.

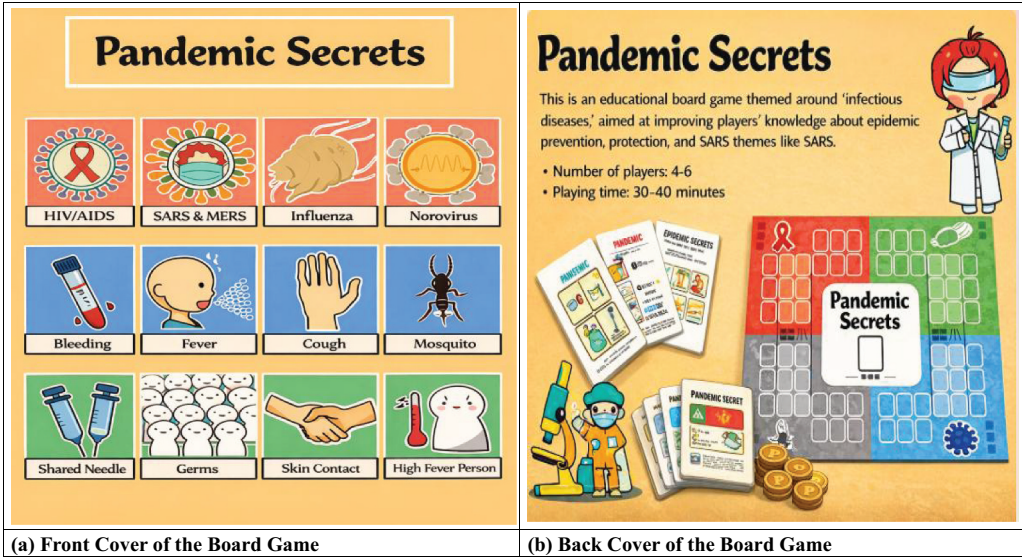


Figure 1. Contents of the older adult-young adult epidemic board game. (a) Front cover of the board game. (b) Back cover of the board game. (c) the game board. (d) Game counters. (e) The front and back of the Cards.



Figure 1. (Continued.).



(e) The Front and Back of the Cards

Figure 1. (Continued.).

Prior to the intervention, the participating nursing students had no previous contact or caregiving experience with the older adults. The intervention emphasized educational interaction rather than direct patient care, providing opportunities for the students to apply medical – surgical nursing concepts in a safe, community-based environment. The students were divided into four groups, each assigned to one of four community care centers, with eight to nine members per group. During the first three weeks, the students practiced gameplay with their peers to familiarize themselves with the rules and content. In the final two weeks, they visited their designated community care centers to interact with older adults, fostering IGL and promoting health education. At each site, the students were further divided into smaller subgroups of two to three members, each engaging six to seven older adults.

The intervention was facilitated by the first author and a research assistant. The first author introduced the game contents and rules, and the students were trained to take turns hosting and guiding the sessions. Each gameplay session lasted approximately 50 to 60 minutes (see Table 1). During the sessions, the students and older adults engaged in interactive communication and demonstrated preventive health behaviors such as proper hand hygiene, correct mask-wearing, and discussions on infection control practices, thereby reinforcing both knowledge and behavioral competencies in a supportive, non-clinical context. In the final activity, the students used the game cards to concisely review and explain key concepts related to the infectious diseases AIDS, scabies, SARS, and dengue fever to consolidate their learning outcomes. In contrast, the control group received traditional instruction consisting of lectures, video-assisted learning, and in-class discussions, as part of the standard curriculum.

Measures

Personal information form

A personal information form was used to collect demographic and background characteristics from both student participants and older adult participants to describe the sample and compare baseline characteristics.

Table 1. Weekly curriculum design: educational objectives, game-based learning activities, and Evaluation strategies.

Week	Theme	G – Goal (Learning Objectives)	A – activity design and game content creation	M – Mechanics (Game Implementation)	E – Evaluation (Debriefing & Outcome Assessment)
12	Scabies SARS & Dengue Fever HIV/AIDS	In Weeks 12 to 14, scabies, SARS, dengue fever, and AIDS were reviewed through ten key infection control concepts, including pathogen identification, diagnosis, transmission, disinfection, surveillance, treatment, protection, vaccination, hand hygiene, and health education.	1. game counters 2. game board 3. game cards (Scabies, SARS, Dengue Fever, HIV/AIDS)	1. Players bet coins on the correct infectious disease category based on the card shown. After all bets are placed, the dealer reveals the answer. Correct guesses earn additional coins. 2. Students rotate as dealers and players. The dealer explains the rules, reads the card, and reveals the correct answer. If any player chooses incorrectly, the dealer must explain the reasoning behind the correct answer.	In Weeks 12 to 14, students used Scabies, SARS, Dengue fever, and AIDS cards to review the 10 key infection control concepts with the older adults. Taiwanese language practice was incorporated to support understanding and cultural relevance. Each participant had a clearly defined role and task during the game.
13					
14					
15	Intergenerational Learning (1)	1. Build the foundation for intergenerational interaction and mutual trust 2. Familiar with the game rules and role assignments 3. Introduce basic health knowledge and concepts	Students and older adults participated together in the infection control board game described above.	Each group consisted of 2–3 students and 6–7 older adults. Students took turns serving as dealers, while the older adults acted as players, placing coin bets on the appropriate categories. Older adults are guided to explain their reasons for choosing a particular disease. If an incorrect choice is made, students are expected to provide an explanation.	In one week, students used Scabies and SARS cards; in another week, they used Dengue fever and HIV/AIDS cards to review the 10 key infection control concepts with older adults, facilitating discussions and encouraging experience sharing. In addition, please check whether the older adults are wearing their masks properly and assist with preparing diluted bleach solution for disinfection.
16	Intergenerational Learning (2)	1. Integration of four disease topics 2. Deepen subject knowledge and practical application 3. Conduct comprehensive discussions and experience sharing to enhance reflective learning			

Measures for students

Health communication skill scale

Health communication ability was assessed using a 17-item Health Communication Scale (HCS) adapted from the Oral Exchange Rating section of the Health Literacy Environment Review developed by Rudd and Anderson (2006). The scale was translated and adapted for use in Taiwanese health education settings (Chang, 2021). The instrument was administered in its original adapted form, and no items were added, deleted, or modified for the present study. Responses were rated on a 3-point Likert scale (0 = not achieved, 1 = partially achieved but needs improvement, and 2 = well achieved), with higher scores indicating better health communication ability. Previous research by Chang (2021) demonstrated satisfactory reliability and validity among nurses, with a Cronbach's α of .78. In the present study, Cronbach's α was .83, and the content validity index (CVI) was 1.00.

Teamwork scale

Teamwork ability was measured using a 9-item Teamwork Scale adapted from the teamwork dimensions proposed by Jeng and Tang (2004) and subsequently applied in educational research (Yang, 2019). The scale assesses team trust, communication, task allocation, and coordination abilities. The scale was administered in its original form because the intervention required students to work collaboratively in small teams to conduct game-based health education activities. Participants completed the self-report questionnaire before and after the intervention. Responses were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating stronger teamwork ability. The scale has shown good reliability and validity among university students, with Cronbach's α ranging from .89 to .95. In the present study, Cronbach's α was .87, and the content validity index (CVI) was 1.00.

Service-learning scale

Social responsibility was assessed using the 38-item Community-Based Learning (CBL) Scale developed by Ibrahim (2010). This scale was selected because it was designed to assess students' perceived learning outcomes in community-based learning contexts across multiple domains. The scale includes domains related to civic responsibility, community engagement, social awareness, and broader local/global citizenship perspectives, which closely correspond to the aims of the present service-learning intervention. Hsu (2022) translated the CBL Scale into Chinese and applied it to university social responsibility (USR) courses, supporting its applicability for assessing learning outcomes in this context. Previous validation in USR courses demonstrated sound construct validity and high internal consistency, with an overall Cronbach's α of .964 (Hsu, 2022). In the present study, the full validated Chinese version was administered without adding, deleting, or modifying any items. Responses were rated on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree, with higher scores indicating greater perceived social responsibility. The scale showed good reliability and content validity in the present sample, with a Cronbach's α of .91 and a content validity index (CVI) of 1.00.

Infectious disease knowledge test

Knowledge of infectious diseases was assessed using three parallel test banks developed by the research team based on educational materials published by the Taiwan Centers for Disease Control (Taiwan Centers for Disease Control, n.d.). Each test bank contained 10 multiple-choice questions addressing dengue fever and respiratory infectious diseases. Each correct response was awarded 5 points, yielding a total score ranging from 0 to 100. Parallel-form reliability was examined across the three versions to ensure measurement consistency and reduce testing effects.

Measures for older adults

Infectious Disease Prevention Knowledge, Attitude, and Preventive Behavior Questionnaire

A questionnaire on infectious disease prevention knowledge, attitudes, and preventive behaviors was developed based on promotional materials and manuals on the prevention of dengue fever, SARS, scabies and AIDS published by the Taiwan Centers for Disease Control (Taiwan Centers for Disease Control, n.d.), as well as relevant literature (Liu, 2022; Wei, 2024). The questionnaire consisted of five items for each dimension: knowledge, attitude, and preventive behavior. Knowledge items were multiple-choice questions, with one point awarded for each correct answer and zero points for incorrect responses. Attitude and preventive behavior items were rated on a 5-point Likert scale, with higher scores indicating more favorable knowledge, attitudes, and preventive behaviors. In the present study, Cronbach's α was .83–.89, and the content validity index (CVI) was 1.00.

Data Processing and Analysis

All data were coded, entered, and analyzed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including mean and standard deviation, were used to summarize the pretest and posttest outcome variables. Cronbach's α was used to examine internal consistency, and the content validity index (CVI) was used to evaluate content validity.

Paired-samples t-tests were used to examine within-group pretest – posttest changes. For students, paired-samples t-tests were conducted separately for the intervention and control groups to examine changes in health communication, teamwork, social responsibility, and infectious disease knowledge. For older adults, paired-samples t-tests were used to examine changes in infectious disease prevention knowledge, attitudes, and preventive behaviors from pretest to posttest.

Independent-samples t-tests were used to examine between-group differences among students at pretest, posttest, and in change scores from pretest to posttest. This approach was used to evaluate baseline comparability and to compare whether changes in the intervention group differed from those in the control group. A p -value of $<.05$ was considered statistically significant.

Research Ethics

Ethical approval for this study was obtained from the Human Research Ethics Committee at National Cheng Kung University (NCKU HREC; Approval No. NCKU HREC-E-113–545-2). Before the intervention, the study purpose was explained, and informed consent was obtained from both the student and older adult participants. Confidentiality and anonymity were ensured. All participants were informed that their participation was voluntary and that withdrawal at any time would not affect their academic grades or access to services.

Results

Demographic characteristics

A total of 80 third-year students enrolled in a five-year junior college nursing program in Taiwan were recruited, including 33 in the intervention group and 47 in the control group. In Taiwan, students typically enter this junior college system after junior high school; therefore, third-year students are usually around 17 years old. The mean ages were 17.09 ± 0.29 years and 17.06 ± 0.25 years in the intervention and control groups, respectively. The participation retention rate was 100% in both groups. Most participants were female (90.9% in the intervention group and 95.7% in the control group), and 72.7% of the intervention group and 68.1% of the control group reported having part-time jobs. Students' baseline knowledge regarding the four infectious diseases was assessed before the intervention, and no significant difference was found between the two groups. No significant

differences were found in demographic characteristics between the two groups, indicating baseline comparability.

Ninety-two older adult participants completed the study, with a mean age of 70.9 ± 4.2 years. Most were female (88.0%) and married (70.7%). Regarding educational attainment, 9 participants (9.8%) had elementary school education or no formal education, 42 (45.7%) had junior high school education, and 41 (44.6%) had senior high school education or higher. Regarding the four infectious diseases, most older adults reported no history of these diseases (82.6%), while 14 (15.2%) reported a history of dengue fever and 2 (2.2%) reported a history of scabies.

Differences in outcome variables before and after the intervention among students and older adults

Outcome variables were analyzed using both within-group pre-post changes and between-group comparisons (Table 2). The mean difference refers to the change score from baseline to posttest ($T1 - T0$). Among students, the intervention group showed significant within-group improvements in health communication, team collaboration, social responsibility, and infectious disease knowledge from $T0$ to $T1$ (all $p < .001$). In contrast, the control group showed a significant improvement only in infectious disease knowledge ($p < .001$), while changes in health communication, team collaboration, and social responsibility were not significant.

Between-group comparisons of the change scores showed that the intervention group had significantly greater improvements than the control group in health communication ($t = 2.82, p = .006$), team collaboration ($t = 5.33, p < .001$), and social responsibility ($t = 4.07, p < .001$). However, there was no significant between-group difference in the change score for infectious disease knowledge ($t = 0.27$,

Table 2. Differences in outcome variables within and between the intervention and control groups and older adult group.

Variables	T1-T0	T0		T1	
	Mean (p)	Mean	SD	Mean	SD
Students					
Health communication					
Intervention group	2.42(<.001***)	29.36	3.10	31.79	3.01
Control group	0.68(.101)	28.87	3.87	29.55	3.65
t -value (p)	2.82(.006**)	0.63(.547)		2.90(.005**)	
Team collaboration					
Intervention group	3.76(<.001***)	36.73	4.40	40.48	2.75
Control group	0.06(.875)	35.96	5.38	36.02	
t -value (p)	5.33(<.001***)	0.68(.500)		5.07(<.001***)	
Social responsibility					
Intervention group	14.27(<.001***)	125.18	9.53	139.45	14.96
Control group	1.47(.431)	129.00	18.31	130.47	
t -value (p)	4.07(<.001***)	−1.21(.229)		2.24(.03*)	
Infectious Disease Knowledge					
Intervention group	6.67(<.001***)	2.09	3.03	8.76	2.48
Control group	6.45(<.001***)	1.68	2.24	8.13	
t-value (p)	0.27(.787)	0.70(.488)		3.52 0.940(.350)	
Older adults					
Infectious disease Knowledge	2.40(<.001***)	2.38	0.74	4.78	1.03
Infectious disease Attitude	6.20(<.001***)	14.20	1.55	20.39	
Infectious disease Behavior	5.04(<.001***)	14.46	2.15	19.50	
					2.64

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

$p = .787$), indicating that both groups improved similarly in factual knowledge. These findings suggest that the board game intervention had stronger effects on interactive and civic learning outcomes than on knowledge acquisition alone.

For older adults, paired comparisons showed significant improvements from T0 to T1 in infectious disease knowledge, attitudes, and preventive behaviors (all $p < .001$), suggesting positive changes after participating in the intergenerational board game activities.

Discussion

The findings of this study support the theoretical value of integrating intergenerational learning (IGL), community-based health education (CBHE), and game-based learning in gerontological nursing education. The infectious disease-themed board game did not function merely as a knowledge-delivery tool; rather, it created a structured contact zone in which students and older adults interacted through shared tasks, guided discussion, and collaborative problem solving. This mechanism is consistent with IGL perspectives that emphasize purposeful roles, reciprocal interaction, supportive environments, and relationship building across generations (Jarrott et al., 2021; Kaplan & Thang, 2020; Tuohy et al., 2023).

Within the CBHE context, the activity connected classroom learning with community health needs, allowing students to apply public health concepts in authentic interpersonal situations while older adults contributed experiential knowledge. This approach aligns with community-based education literature, which highlights reciprocal partnerships between academic institutions and local communities and supports students' development of practical skills, civic responsibility, and engagement with real-world health issues (Ibrahim, 2010; Mahinay et al., 2025; Zeydani et al., 2021). The board game further transformed abstract infectious disease concepts into concrete scenarios, visual prompts, and immediate feedback, consistent with prior studies showing that game-based learning can enhance health-related knowledge, attitudes, engagement, and preventive behaviors (Chen & Tsai, 2022; Hsieh et al., 2023; Tsai et al., 2024; Wu et al., 2023).

For the student outcomes, the intervention group showed significantly greater improvements than the control group in health communication, team collaboration, and social responsibility, whereas no significant between-group difference was observed in infectious disease knowledge. This suggests that factual knowledge about infectious disease transmission and prevention may be improved through both traditional instruction and board game-based learning, while the added value of the IGL board game lies in interactive, experiential, and civic learning outcomes. During the activity, students explained health information, listened to older adults' experiences, adapted their language, negotiated shared understanding, and worked collaboratively to complete infection-control tasks. These processes provided situational opportunities for students to practice health communication and teamwork beyond the classroom. In addition, the service-oriented nature of the intervention positioned students as health facilitators in the community, which may have reinforced their emerging professional role identity and sense of social responsibility (Ibrahim, 2010; Kolb, 1984; Lee, 2023; Rudd & Anderson, 2006; Zeydani et al., 2021).

For the older adult participants, the intergenerational infectious disease-themed board game effectively enhanced knowledge, attitudes, and preventive behaviors related to infectious disease prevention. These improvements may be explained by the participatory and reciprocal nature of the activity. While students served as facilitators and co-players, older adults shared life experiences and practical insights during gameplay. Through scenario-based tasks and intergenerational dialogue, older adults were able to clarify misconceptions, acquire practical prevention knowledge, and reinforce behaviors such as mask-wearing, handwashing, and disinfectant use. This learning process is consistent with adult learning theory, which emphasizes relevance, participation, and autonomy as important elements for effective learning among older adults (Formosa, 2019). Moreover, being recognized as knowledge contributors may have strengthened older adults' motivation, sense of

value, and engagement in health-promoting behaviors, reflecting the importance of social role reinforcement in later life (Krzeczkowska et al., 2021; Tsai et al., 2024; Webster et al., 2024).

Limitations

Several limitations should be acknowledged. First, this was a quasi-experimental study design without random assignment at the individual level, which may limit the generalizability of the findings. Second, the relatively short duration of the intervention and follow-up period may not capture the long-term sustainability of the observed improvements. Third, all participants were recruited from a limited geographic area, potentially affecting the external validity of the results. Fourth, underlying cultural values in Taiwan, including respect for elders, filial norms, and the social expectation that younger adults show deference and care toward older adults, may have strengthened the observed empathy, communication, and mutual respect during intergenerational learning. These cultural factors should be considered when interpreting the findings and when adapting the intervention to other sociocultural settings. Future studies should consider randomized controlled trials with longer follow-up periods and more diverse populations to validate and extend these findings.

Practical implications

These findings have several implications for nursing education and community-based course design. First, traditional classroom instruction may be sufficient when the instructional goal is limited to factual knowledge acquisition; however, when course objectives include health communication, teamwork, civic responsibility, and intergenerational understanding, an IGL board game may provide additional educational value. Second, similar programs should intentionally assign reciprocal roles to students and community participants, rather than positioning students only as teachers and older adults only as passive learners. Third, board game-based activities should include realistic health scenarios, visual cues, guided discussion, and immediate feedback to support both student communication practice and older adults' application of health concepts to daily life. Fourth, such interventions should be embedded within structured course – community partnerships to ensure continuity, trust, participant engagement, and feasibility. Therefore, this model may be useful for gerontological nursing, public health nursing, service-learning, and other health-related courses that aim to integrate professional learning with community engagement.

Conclusion

The results of this study showed that our intergenerational, game-based educational intervention effectively enhanced health communication, team collaboration, social responsibility, and infectious disease knowledge among young nursing students, while simultaneously improving infectious disease knowledge, attitudes, and preventive behaviors among older adults. These findings highlight the potential of using IGL models combined with experiential strategies such as educational board games to promote mutual empowerment and health literacy across generations. Integrating such innovative approaches into health education curricula may help to build healthier, more connected communities.

Author contributions

CRedit: **Chun-Chin Tsai PhD:** Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing; **Mei-Fang Chen PhD:** Conceptualization, Formal analysis, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing.

Data availability statement

The datasets generated during the current study are available from the corresponding author, Dr. Mei-Fang Chen (e-mail: meifang0302@gmail.com).

Disclosure statement

No potential conflict of interest was reported by the author(s).

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ORCID

Chun-Chin Tsai PhD  <http://orcid.org/0009-0005-4809-9980>

Mei-Fang Chen PhD  <http://orcid.org/0000-0003-0071-5316>

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