

Integrating Technology-Enhanced and Traditional Pre-Service Learning: Preparing University Students for Service-Learning in Nursing Homes

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Abstract

Service-learning (SL) (Bringle & Hatcher, 1995) integrates credit-bearing coursework with community service addressing real-world needs. This study examines technology-enhanced pre-service learning—specifically the Hybrid Immersive Virtual Environment (HiVE), metaverse platforms, and virtual reality (VR)—compared with traditional approaches in preparing university students for nursing home service delivery. To our knowledge, this is the first study to examine the role of technology-enhanced pre-service learning in fostering student readiness and engagement, as well as its comparative effectiveness against traditional pre-learning approaches regarding SL outcomes. A pre/post-survey assessed four cohorts between 2023 and 2025. HiVE and mobile-based metaverse platforms provided high-quality learning experiences and effective familiarisation with nursing home settings, whereas VR caused discomfort. Technology-enhanced modes improved health-promoting behaviours (health responsibility, physical activity, nutrition, spiritual growth, and interpersonal relations), while traditional pre-learning excelled in intellectual, cognitive, and civic development. Integrating both approaches maximises outcomes; virtual tools should be used to deliver foundational knowledge and cultural context prior to fieldwork.

Keywords: HiVE, Metaverse, Service-Learning

1. Introduction

Service-learning (SL) (Bringle & Hatcher, 1995) is a credit-bearing, course-integrated educational approach in which students engage in structured service activities that address authentic community needs. The COVID-19 pandemic disrupted traditional in-person SL, particularly within health promotion contexts, due to social distancing requirements and institutional closures. This necessitated a rapid transition toward electronic and hybrid SL models. This shift underscored the importance of incorporating hybrid pre-service learning sessions alongside face-to-face service delivery.

Emerging technologies, such as the Hybrid Immersive Virtual Environment (HiVE) and gamified metaverse platforms, provide immersive and interactive pre-learning experiences by simulating real-world environments and practice scenarios. These tools support students in developing foundational knowledge, cultural competence, and needs assessment skills virtually, thereby overcoming access barriers while effectively preparing them for direct community engagement.

To our knowledge, this is the first study to examine the role of technology-enhanced pre-service learning in fostering student readiness and engagement, as well as its comparative effectiveness against traditional pre-learning approaches regarding SL outcomes.

2. Methodology

This study employed a quasi-experimental design. A pre- and post-survey was conducted with university students enrolled in the subject “Engaging in Workforce Health for Health Care Workers at Nursing Homes.” This course required 30 hours of group service within nursing homes in Hong Kong. Data were collected before (T0) and after (T1) the service-learning course from four cohorts between 2023 and 2025.

Students attended pre-service lectures, conducted needs assessments with nursing assistants, and designed two tailored health promotion activities. Among the 2024/25 cohorts, 82 students participated in technology-enhanced pre-service learning using HiVE and gamified metaverse platforms. These tools enabled students to virtually explore nursing home settings, understand on-site services, and practice needs assessment skills through filmed simulations prior to service delivery, followed by a post-experience evaluation of these technologies.

As the data were not normally distributed, the Kruskal-Wallis test was used to compare the Technology Acceptance Model across teaching modes. The Wilcoxon signed-rank test compared SL learning outcomes between pre- and post-SL delivery. The Mann-Whitney U test compared SL learning outcomes between groups with and without metaverse learning. The significance level was set at $p < 0.05$.

3. Results and Discussion

Table 1 presents the demographic characteristics of the participants. A total of 82 students (57.3% female, mean age 21.6 years) completed the post-experience questionnaire on technology-enhanced learning. Most lacked prior experience with HiVE (54.9%) or the metaverse (68.3%), although 54.9% had

previously used VR in an educational context.

Significant differences were observed across teaching modes regarding perceived learning productivity, intent to use, usability, and health impacts ($p < .05$). Mobile-based metaverse was preferred over other modalities ($p < .05$), aligning with previous research (Choi et al., 2025). HiVE and mobile metaverse scored higher on production quality and nursing home familiarisation ($p < .05$), whereas VR-based metaverse induced greater discomfort.

However, no prior studies have directly compared HiVE, metaverse across different devices, and VR in this specific context; previous studies have confirmed the environment familiarisation capabilities of the metaverse (Kye et al., 2021).

All students demonstrated improvement in all assessed aspects post-SL compared to pre-SL ($p < .01$), consistent with previous findings regarding improvements in civic and personal development following SL (Nuriyeva et al., 2025).

Among students who received technology-enhanced pre-service learning, significant improvements were observed in health responsibility ($p < .01$), physical activity ($p < .01$), nutrition ($p < .01$), spiritual growth ($p < .05$), and interpersonal relations ($p < .01$) of the Health-Promoting Lifestyle Profile II (HPLP-II) after service-learning delivery. In contrast, students in the traditional pre-service learning group showed significant improvements only in civic development ($p < .01$) and health responsibility ($p < .05$) among common learning outcomes.

There were no significant differences between groups in any variables prior to SL delivery. After SL delivery, students in the traditional pre-service learning group demonstrated greater improvements in intellectual and cognitive development ($p < .01$) and civic development ($p < .01$) compared to those in the technology-enhanced group. Conversely, students in the technology-enhanced group showed greater improvement in health responsibility ($p < .05$) than those in the traditional group.

The findings indicate that both technology-enhanced and traditional groups improved across all assessed aspects, with each approach offering distinct advantages in specific domains. Therefore, these results suggest the development of a new SL framework that strategically integrates both approaches to maximise student outcomes.

4. Implications

This study suggests that technology-enhanced pre-service learning modes, such as HiVE and mobile-based metaverse environments, effectively prepare university students for service delivery in nursing homes by offering high-quality learning experiences and familiarisation with the setting. However, VR-based metaverse teaching is associated with greater discomfort. Technology-enhanced pre-service learning significantly improved students' health-promoting behaviours. In contrast, traditional pre-service learning was more effective for intellectual, cognitive, and civic development.

These results suggest that integrating technology-enhanced and traditional approaches is essential for maximising student learning outcomes. A hybrid model can utilise HiVE and mobile-based metaverse technologies to deliver foundational knowledge and cultural context—such as for service locations in Thailand and mainland China—before students begin fieldwork. This virtual exposure can enhance cultural understanding and better prepare students for on-site service delivery.

Ethical Declaration Statement

The project has been approved by the Departmental Research Committee (on behalf of the PolyU Institutional Review Board) of The Hong Kong Polytechnic University (Reference Number: HSEARS20240906008).

Generative AI Policy Statement

The author(s) used PolyU Gen AI during the preparation of this work for grammar checking. After utilising the tool/service, the author(s) thoroughly reviewed and edited the content as necessary and assumed full responsibility for the publication's content.

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Table 1: Demographic Characteristics of Participants

Baseline characteristic	Technology-enhanced learning approaches		Traditional learning approaches		Full sample	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Gender						
Male	34	54.0	24	47.1	58	50.9
Female	29	46.0	27	52.9	56	49.1
Current year of study						
Year 1	0	0	0	0	0	0.0
Year 2	10	15.9	0	0	10	8.8
Year 3	7	11.1	4	7.8	11	9.6
Year 4	46	73.0	47	92.2	93	81.6
SYA Students	45	71.4	32	62.7	77	67.5
Program						
Health related	19	30.2	7	13.7	26	22.8
Engineering and Building	19	30.2	16	31.4	35	30.7
Business	12	19.0	8	15.7	20	17.5
Design	1	1.6	5	9.8	6	5.3
BA Art	7	11.1	4	7.8	11	9.6
Science	4	6.3	7	13.7	11	9.6
Hotel	1	1.6	4	7.8	5	4.4

Note: N = 114 (n = 63 for Technology-enhanced learning approaches and n = 51 for Traditional learning approaches). Participants were on average 21.2 years old (SD = 1.78), and all characteristics did not differ by condition.