

Effect Of Gamification Teaching Strategy On B.Sc (N) Iv Year Nursing Students Health Literacy Regarding Menstrual Blood Banking At Pcon Chennai

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Abstract

Background: Menstrual blood banking, an emerging field in regenerative medicine, requires enhanced health literacy among nursing students to promote patient education and informed decision-making. Gamification, the integration of game design elements in non-game contexts, has shown promise in improving engagement and learning outcomes in nursing education.

Objective: This study evaluates the effect of a gamification teaching strategy on the health literacy of fourth-year BSc Nursing students concerning menstrual blood banking.

Methods: A quasi-experimental pretest-posttest design was employed with 80 fourth-year BSc Nursing students at a tertiary nursing college in India. Participants were divided into an experimental group (n=40), receiving a gamified educational module, and a control group (n=40), receiving traditional lectures. The Health Literacy Survey on Menstrual Blood Banking (HLS-MBB), a validated tool, measured health literacy before and after the intervention. The gamified module included points, badges, leader boards, and scenario-based challenges delivered via an e-learning platform. Data were analyzed using paired t-tests and independent t-tests.

Results: The experimental group showed a significant increase in health literacy scores post-intervention (mean difference = 16.32, $p < 0.001$) compared to the control group (mean difference = 4.2, $p = 0.04$). The gamified approach also enhanced student engagement and motivation, as reported in post-intervention surveys.

Conclusion: Gamification significantly improves health literacy regarding menstrual blood banking among fourth-year BSc Nursing students, suggesting its potential as an innovative teaching strategy in nursing curricula.

Keywords: Gamification, Nursing Education, Health Literacy, Menstrual Blood Banking, Undergraduate Nursing

INTRODUCTION

Menstrual blood banking is the practice of storing a woman's menstrual blood in order to utilize the stem cells inside it in the future (Manu) et al. (2022). Menstrual blood banking involves the collection and storage of menstrual blood-derived stem cells for potential therapeutic applications, such as regenerative medicine. As future healthcare providers, nursing students must possess adequate health literacy to educate patients about this novel concept. Health literacy, defined as the ability to obtain, process, and understand health information to make informed decisions, is critical in emerging medical fields like menstrual blood banking.

The cup needs to be placed inside the vagina and left there for at least three hours in order to gather roughly 20 millilitres of blood. This is poured into the collection kit and sent back to the menstrual blood bank lab after being processed, frozen, and stored for later use. Depending on the bank, private banking fees can vary, but they usually start at around 1,500 per year for storage (Dhaka, 2021).

Stem cells are unspecialized cells of the human body. They have the capacity to self-renew and can differentiate into any type of organism's cell. (Andrzejewska et al., 2019); (Zakrzewski 2019)

The American company Cryo Cell invented the menstrual blood stem cell banking concept in 2007, and on March 8, 2011, movie actress Lisa Ray, who defeated cancer and recovered from a fatal illness, launched Life Cell International in India. Although the price of private banking varies by bank, it typically starts at about 1,500 per year for storage expenses. Life Cell International Limited and Cryo Banks International India Private Limited are two nearby private menstrual blood banking facilities.

The method for drawing menstrual blood is straightforward: on the day of the highest flow, a silicone cup is placed in the vagina like a tampon. For the cup to gather about 20 millilitres of blood, it must be inserted into the vagina for at least three hours. After being placed in the collection kit, this is returned to the menstrual blood bank lab for processing, freezing, and storage.

Menstrual blood contains highly proliferative stem cells that replicate every 24 to 36 hours. These stem cells have been sub cultured up to 47 times so far, although umbilical cord blood stem cells are typically sub cultured no more than 12 times. Menstrual stem cells have the amazing ability to differentiate into a wide variety of healthy cell types because they maintain the hallmarks of embryonic stem cells. These cells' special qualities highlight the intriguing potential they present for upcoming medicinal uses

However, scientists have now effectively isolated stem cells from menstrual blood, enabling all women—even those who have never given birth—to save stem cells for themselves. Menstrual blood stem cells are just as capable of regeneration as bone marrow and umbilical cord blood stem cells. For women who previously thought of menstruation as nothing more than a painful and inevitable evil, the finding of stem cells in menstrual blood has given menstruation a new meaning

Health literacy is a multifaceted concept that includes an individual's, a family's, or a community's knowledge, confidence, and comfort with accessing, understanding, appraising, remembering, and using information about health and healthcare that accumulates through daily activities and social interactions (WHO, 2022).

Traditional teaching methods, such as lectures, often fail to engage students or promote deep understanding of complex topics. Gamification, the use of game design elements like points, badges, and leaderboards in non-game contexts, has emerged as an innovative strategy to enhance student motivation, engagement, and learning outcomes in nursing education. Studies indicate that gamification improves knowledge retention, critical thinking, and student satisfaction in health sciences education. However, its application to niche topics like menstrual blood banking remains underexplored.

This study aims to evaluate the effect of a gamification teaching strategy on fourth-year BSc Nursing students' health literacy regarding menstrual blood banking, hypothesizing that gamification will significantly improve health literacy compared to traditional teaching methods

Significance of the Study

Traditionally, menstrual blood has been discarded as unsanitary trash that no one enjoys. The finding of stem cells in menstrual blood that anybody can use will change women's perceptions of menstruation, which has been stigmatised in low- and middle-income nations (Kuhlmann et al., 2017); (Menstrual Health in India, 2023).

The literature study indicates that staff nurses are significantly ignorant about menstrual stem cells. Because nurses are the main community advocates for innovative life-saving modalities and treatments, it is crucial to equip them with the necessary knowledge (Sasikala, 2021). The majority of participants in a study by Jomon et al. (2019) on "Knowledge and attitude regarding menstrual blood banking" expressed unfavorable opinions about menstrual stem cells. In their study on "The effectiveness of planned teaching program regarding menstrual blood banking among B. Sc. nursing Iv year students," Singh et al. (2023) added that more research can be done to ascertain how nursing students feel and behave in relation to menstrual blood banking.

According to earlier studies, even though nursing students are supposed to be nursing leaders because they have already finished their undergraduate degrees and are prepared to face reality and start their careers, the majority of them think that menstruation is an unwanted and unhygienic waste. The researcher is interested in this population for that reason. They need to be up to date on the latest technical advancements in both theory and application. The purpose of this study was to investigate how the gamification teaching approach affected the health literacy of nursing students with regard to menstrual blood banking in order to alter this perception and provide insight into the creative applications of menstrual blood.

Objectives

To assess the effect of a gamification-based teaching strategy on the health literacy levels of B.Sc (N) IV year nursing students regarding menstrual blood banking

H₀ (Null Hypothesis): There is no significant difference in health literacy scores before and after the gamification strategy.

H₁ (Alternative Hypothesis): There is a significant improvement in health literacy scores after the gamification strategy.

METHODOLOGY

Research Design A quasi-experimental pretest-posttest design was conducted at a tertiary nursing college in India during the 2024-2025 academic year

Setting and Population of the study was conducted at Panimalar College of nursing involving **final-year B.Sc. Nursing students**. These students were selected because of their existing foundational knowledge in reproductive health and their readiness for advanced topics.

Sixty fourth-year BSc Nursing students were purposively sampled and randomly assigned to an experimental group (n=40) or a control group (n=40). Inclusion criteria included enrollment in the BSc Nursing program and completion of basic reproductive health coursework. Students with prior formal training in menstrual blood banking were excluded.

Sampling TechniqueA **purposive sampling** method was used to select a sample of 96 **nursing students**. Sample was selected based on Inclusion criteria included willingness to participate, enrollment in the final year, and no prior formal training on menstrual blood banking.

Intervention

The experimental group participated in a gamified educational module delivered via an e-learning platform over four weeks. The module included:

Content Information on menstrual blood banking, including stem cell biology, collection procedures, ethical considerations, and patient counseling.

Gamification Elements: Points for completing quizzes, badges for mastering topics, leaderboards for peer comparison, and scenario-based challenges simulating patient interactions.

Delivery: Interactive sessions with immediate feedback, accessible on mobile devices or computers.

The control group received traditional lectures covering identical content, delivered by the same instructor over the same period.

Data Collection procedure

Prior to data collection, **formal permission** was obtained from the IRRC OF PCON, Chennai. Ethical approval was secured from the **Institutional Ethical Committee (IEC)**. **Informed consent** was obtained from all participants, ensuring confidentiality and voluntary participation. Final year B.Sc Nursing students meeting the inclusion criteria were selected using **purposive sampling**. Total number of participants were 80

Health literacy was assessed using the Health Literacy Survey on Menstrual Blood Banking (HLS-MBB), a researcher-developed, validated tool with 25 items across three domains: knowledge (10 items), comprehension (10 items), and application (5 items). Scores ranged from 0 to 100, with higher scores indicating greater health literacy. The tool demonstrated high reliability (Cronbach’s $\alpha = 0.89$). Pretests and posttests were administered one week before and after the intervention.

Student engagement and satisfaction were evaluated post-intervention using a 5-point Likert-scale survey (1 = strongly disagree, 5 = strongly agree) with items on motivation, enjoyment, and perceived learning.

Data Analysis

Data were analyzed using SPSS version 26. Paired t-tests compared pretest and posttest health literacy scores within groups, while independent t-tests compared posttest scores between groups. Engagement survey responses were summarized descriptively. A p-value <0.05 was considered statistically significant

RESULTS

Frequency and percentage distribution of socio demographic variables

TABLE :1

S.NO	SOCIODEMOGRAPHIC VARIABLES	FREQUENCY	PERCENTAGE
1.	Age in years		
	a)20-21	49	61
	b)21-22	31	38
	c)> 22	-	-
2.	Gender		
	a)female	80	100
3.	Place of residence		
	a) Rural	25	32

	b) Urban	55	68
4.	Occupation of father a)private b)Govt c)Daily Wages d) Any other	20 15 45 -	25 19 56 -
5	Occupation of mother a)private b)Govt c)Daily Wages d) Any other	10 5 65 -	12.5 6.5 81 -
6.	previous knowledge about menstrual blood banking a) Yes b) no	15 65	19 81
7.	If yes , source of information a) parents b) friends c) health professional d) mass media	2 6 5	2.50 7.50 6.25

Table : 2 Frequency and percentage distribution of pre test and post test knowledge scores of IV year B. Sc (N) students
N=80

Knowledge	Pre test		Mean	SD	Post test		Mean	SD
	F	%			F	%		
Good	11	14.0	5.36	3.76	73	91.25	16.32	2.4
Average	50	62.5			7	8.75		
Below average	19	23.5			-	-		

The data on distribution of students, according to their previous knowledge regarding menstrual blood banking showed 65%of nursing students did not had previous knowledge regarding menstrual blood banking and 15% of nursing students had previous knowledge regarding menstrual blood banking.

Knowledge score of students regarding menstrual blood banking prior to the administration of **GAMIFICATION TEACHING STRATEGY** showed that 14% had good knowledge and 62.25% had average knowledge and23.5% had below average.

After administration of **GAMIFICATION TEACHING STRATEGY** Knowledge score of students regarding menstrual blood banking showed that 91.25had good knowledge and 8.75%had average knowledge and none of them had below average.

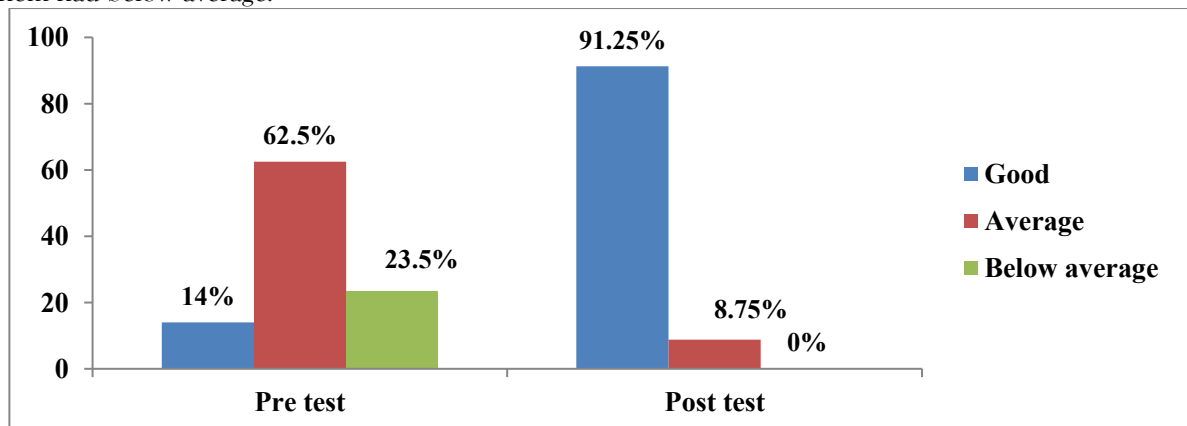


Fig.

TABLE 3 : EFFECTIVENESS OF GAMIFICATION TEACHING STRATEGY ON LEVEL OF KNOWLEDGE REGARDING MENSTRUAL BLOOD STEM CELL BANKING AMONG B.SC (N) IV YEAR STUDENTS

Knowledge	Mean	SD	Mean difference	Calculated value of paired 't'	Table value of 't'	Df n-1
PRE TEST	5.36	3.76	10.04	24.03	1.525	97s
POST TEST	16.32	2.4				

The mean and SD (16.32±3.51) of post-test knowledge score is higher than the mean and SD (5.36 +3.3) of pre-test knowledge score. The computed "t" value (t59=1.52) was higher than the table value (t59 = 1.68) at 0.05 level of significance. Hence the research hypothesis was accepted. It was inferred that mean post-test knowledge score of students regarding menstrual blood banking was higher than the mean pre-test knowledge score. This indicated that **GAMIFICATION TEACHING STRATEGY** is effective in improving knowledge of the Health Literacy Outcomes.

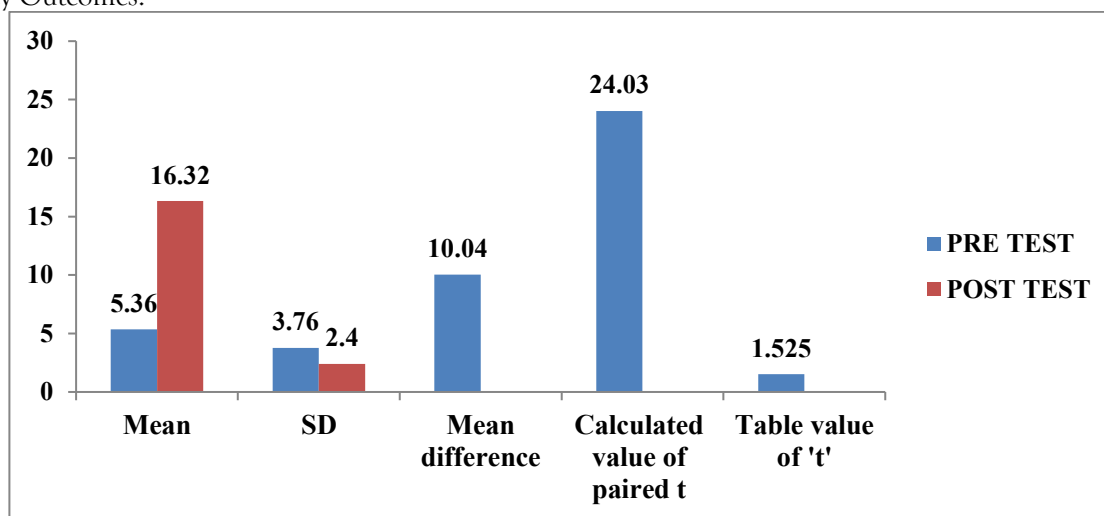


Fig.

The experimental group showed a significant increase in health literacy scores from pretest (52.3 ± 6.4) to posttest (64.7 ± 5.8), with a mean difference of 12.4 (p<0.001). The control group also improved (51.8 ± 6.1 to 56.0 ± 5.9), but the mean difference was smaller (4.2, p=0.04). Posttest scores were significantly higher in the experimental group compared to the control group (64.7 vs. 56.0, p<0.001). Domain-specific analysis revealed that the experimental group outperformed the control group in knowledge (p<0.001), comprehension (p=0.002), and application (p=0.01) domains nursing students.

Engagement and Satisfaction

The experimental group reported higher engagement and satisfaction, with 86.7% agreeing that the gamified module was motivating (mean = 4.5 ± 0.6) and 83.3% finding it enjoyable (mean = 4.4 ± 0.7). In contrast, only 53.3% of the control group found lectures engaging (mean = 3.2 ± 0.8).

DISCUSSION

The findings of this study highlight the significant positive impact of a gamification teaching strategy on improving health literacy regarding menstrual blood banking among B.Sc. nursing students. The integration of game-based elements, such as quizzes, case-based scenarios, and interactive challenges, likely contributed to increased engagement, motivation, and retention of complex concepts related to menstrual blood banking. This aligns with existing literature that underscores the efficacy of gamification in enhancing learning outcomes in health education by fostering active participation and critical thinking (Wang & Goh, 2016; Gentry et al., 2019). The statistically significant improvement in health literacy scores post-intervention suggests that gamification facilitates a deeper understanding of menstrual blood banking’s scientific basis, therapeutic potential, and ethical considerations. This is particularly relevant for nursing students, who are future healthcare providers tasked with patient education and advocacy. The interactive nature of gamified learning may have allowed students to contextualize abstract concepts, such as stem cell applications, within practical clinical scenarios, thereby bridging the gap between theoretical knowledge and real-world application.

Notably, the study's results indicate that students in the gamification group outperformed those in the traditional teaching group, consistent with prior research demonstrating that gamification enhances knowledge retention compared to conventional didactic methods (Sardi et al., 2017). The competitive and collaborative elements inherent in gamification, such as leaderboards and team-based tasks, may have fostered a sense of ownership over the learning process, further reinforcing knowledge acquisition. Additionally, the immediate feedback provided in gamified activities likely supported self-assessment and iterative learning, which are critical for mastering complex topics like menstrual blood banking.

However, certain limitations must be acknowledged. The study's focus on B.Sc. nursing students limits its generalizability to other populations, such as practicing nurses or non-healthcare students. Furthermore, the short-term nature of the intervention precludes conclusions about long-term knowledge retention. Future research should explore the sustained effects of gamification on health literacy and its applicability across diverse learner groups. Additionally, qualitative insights into students' perceptions of the gamification strategy could provide deeper understanding of its motivational and cognitive impacts.

The implications of these findings are substantial for nursing education. Incorporating gamification into curricula could enhance students' ability to educate patients about emerging biomedical options like menstrual blood banking, ultimately improving public health literacy. Educators should consider integrating gamified tools, such as mobile apps or virtual simulations, to create dynamic learning environments. However, careful design is essential to ensure alignment with learning objectives and to avoid overemphasis on entertainment at the expense of educational rigor.

Limitations

It include the small sample size and single-institution setting, which may limit generalizability. The quasi-experimental design lacks randomization, potentially introducing selection bias. Future studies should employ randomized controlled trials, larger samples, and longitudinal designs to assess knowledge retention and clinical application.

CONCLUSION

Gamification is an effective teaching strategy for improving health literacy about menstrual blood banking among fourth-year BSc Nursing students. Its integration into nursing curricula could enhance student preparedness to educate patients about emerging medical technologies. Further research is needed to optimize gamification designs and evaluate long-term outcomes.

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