Effectiveness of virtual reality Situation-Based Flipped Learning and Gamification on nursing students' learning attitudes, problem-solving abilities, and empathetic abilities.

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The integration of innovative educational approaches in nursing education has become increasingly crucial for enhancing learning outcomes. Among these approaches, virtual reality (VR), Situation-Based Flipped Learning, and Gamification have gained attention as promising tools to engage nursing students and promote a deeper understanding of complex concepts. This study aims to investigate the effectiveness of combining these strategies in a virtual reality Situation-Based Flipped Learning environment with elements of Gamification on nursing students' learning attitudes, problem-solving abilities, and empathetic skills. By leveraging these technologies, educators seek to create an immersive and interactive learning experience that not only aligns with the demands of modern education but also addresses the unique challenges faced by nursing students in developing critical competencies. This research explores the potential impact of this integrated approach on nursing education, contributing valuable insights to the ongoing efforts to optimize teaching methodologies for future healthcare professionals.

Aim of the Study

To explore the impact of educational program by using situation-based flipped learning and gamification on nursing students' learning attitudes, problem-solving abilities, and empathetic abilities at the Faculty of Nursing Zagazig University.

Research Hypotheses

1. The students' learning attitude will be improved after participating in situation-based FL with gamification classes.

2. The students' problem-solving abilities will show a significant change after situation based FL classes combined with gamification.

3. There is a significant increase in students' empathetic abilities after completing situation-based FL classes combined with gamification.

Research Design:

A quasi - experimental design was used.

Study Setting:

The study was carried out at the Faculty of Nursing, Zagazig University, Egypt, which includes seven scientific departments namely; Nursing Administration, Psychiatric and Mental Health Nursing, Pediatric Nursing, Community Health Nursing, Maternal and New Born Health Nursing, Medical Surgical Nursing, Community Health Nursing and Geriatric Nursing.

Subjects:

The subjects of the study included fourth year nursing students who enrolled in nursing administration course in the academic year 2022-2023.

Sample Size:

The sample was taken through a proportionate random sampling technique by using a simplified formula n= N/1+N (e) 2, provided by Yamane [1]. A 95% confidence level and P =0.05 are assumed for Equation. The ideal sample size was 70 students.

Field Work:

The study was carried out for three months from the beginning of January to the end of March 2023, as the following:

Preparatory phase:

It started with reviewing national and international resource of theoretical and empirical literature on the topic of the study using textbooks, articles, magazines, research, and internet search to get a clear image of all parts of the study. The instructional system was based on Dick and Carey's [27] analysis, design, development, implementation, and evaluation model. This model is a systematic approach that analyzes educational needs to find solutions; designs, develops, implements, and evaluates the results. A needs analysis was conducted via a pre-test questionnaire sheet of students' preferred teaching methods and learning activities. The estimated time each student needed to complete each sheet varied between 30-40 minutes. Accordingly, the educational program's objectives were set out and the content was designed.

The design phase: involved preparing the program, which included a weekly schedule and a list of learning activities divided into out-of-class and in-class activities. Students' performance goals were prepared based on a weekly schedule. Various videos and lecture materials for each class were prepared based on previous studies and the literature on FL. The researchers conducted lectures on FL teaching methods to develop instructional and teaching materials.

The development phase: involved developing educational materials on the selected nursing management skills for out- of-class activities by designing teaching objectives, providing prerecorded video lectures, which can be downloaded by mobile technology devices for preview, and design quizzes, questions, and set up scenarios for application exercise. For in-class activities, individual and group discussion regarding the topic ,collecting activity data {quizzes and answer to questions}, students were given Individual Readiness Assurance test, collaborative Readiness Assurance test , in addition, based on the role-play scenarios and demonstrations, the roles of the patient, patient family, head nurse, nurse leader, and the nurse were assigned to each, and nursing intervention was applied during the role-play. Students who participated in this study were provided immediate feedback on their progress, achievement or rewarded with a badge.

The developed situation-based FL combined with gamification were applied during twelve weeks of decision-making skills, problem solving skills, communication skills, motivation skills, and time management skills modules. In particular, the gamification elements of challenge, competition, scaffolding, achievement, and compensation were applied to all out-class, in-class, and deeper-class domains the students participated in.

For example, in the decision-making skills module, for the out of class activity, goal of decision-making was accurately presented, a prerecorded video lecture on decision making with quiz, questions and a situation problem with scenario as an application exercise pre settled up; the students were asked to watch videos, answer quizzes and

analyze the presented people appeared in the presented situational case scenario as patients, nurses and patient family.

for the in class activity, collecting activity data (answer of questions and quizze1), individual and group discussion , students were given Individual Readiness Assurance test, collaborative team Readiness Assurance test , based on the role-play scenarios and demonstrations, the roles of the patient, patient family, and the nurse were assigned to each, and nursing intervention was applied during the role-play. To ensure that the students who participated in this study were compensated, they were provided immediate feedback on their progress or achievement or rewarded with a badge.

Students were able to check their learning effects and progress, and the results were shared on the leader board to encourage users to learn voluntarily, moreover, stimulate student's competitive spirit, the leader board provided the ranking of each team and the records of the opponents.

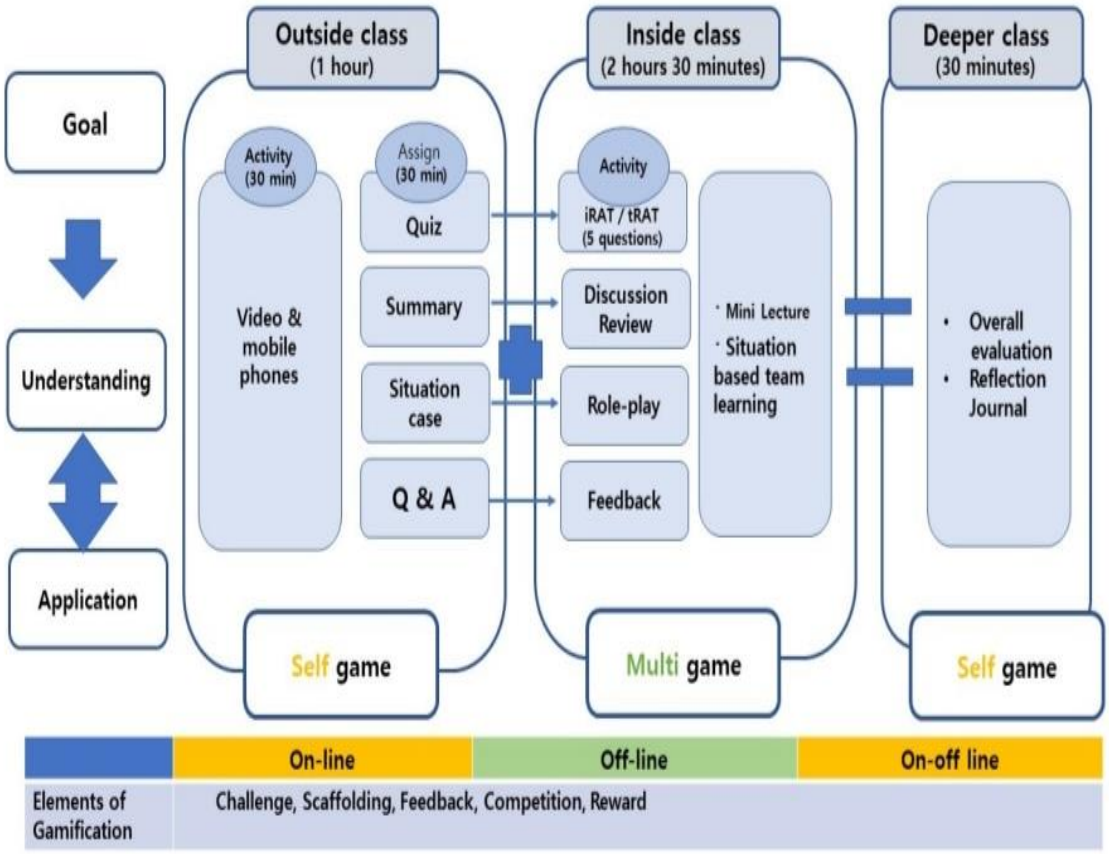
The implementation phase

The planned educational program was implemented across 12 class; these class lasted 20 hours; from which 6 theory (out-of-class activity: two hours for each module;75min MP4 video lectures and 15 min quiz questions, and 30 min situation case were uploaded to mobile phones); and 6 practical class (in-class activity: four hours for each module) were performed. Five modules comprising 75min MP4 video lectures and 15 min five quiz questions, and 30 min situation case were uploaded to mobile phones for the out-of-class activity.

The modules allowed the students to understand and apply communication skills, decision-making skills, problem solving skills, time management skills, and motivation skills in each class. For the out-of-class activity, students were asked to watch skills for each a video lecture and participate in the class. The video presented knowledge about each skill through videos, images, and sound. In-class activity was operated with mini-lectures and team-based learning. The students faced challenges, competition, self-expression, achievements, and rewards during the course, which are gamification elements. It was hard to take the entire number of students at the same time, so the students were distributed into five groups; every group comprised approximately 14 students. All sessions were repeated to the five main groups until the 70 students finished all 15 hours of instruction.

The evaluation phase, the students took the individual readiness assurance test (iRAT) before each class to review the content they had learned while preparing for each class. This was followed by the team readiness assurance test (tRAT), in which they formed teams to discuss, solve, and submit answers to a quiz composed of the same questions as those in the iRAT. After completing the tRAT, the instructor shared the correct answers and gave mini-lectures to explain what the students had not understood. The questions in these situational cases were to be solved through team based cooperative learning and competition. Additionally, after each class, the students wrote in reflection notes as a post-class activity.

Figure 1. Situation-based flipped learning and gamification as combined methodologies on nursing students'



learning attitudes, problem-solving abilities, and empathetic abilities.
Abbreviations: FL: Flipped Learning; iRAT: Individual Readiness Assurance Test.

Tools of data collection:

A questionnaire sheet including 4 parts:
Part (1): Personal characteristics of nursing students developed by the researchers: Age, gender, previous working, and previous training about flipped learning and gamification.
(2): Learning Attitude Scale
Developed by Hwang [28] to evaluate students' attitudes, habits, beliefs, and motivations toward class. The scale consisted of 40 items divided into four sub-sections; the first (9 items), dealt with the nature of learning, e.g. (the clever ones learn more easily); the second (11 items), with expectations from learning e.g. (learning new things makes me successful in what I do.); the third (10 items), with openness to learning e.g.(I want to develop my communication with people through learning new); and the fourth (10 items), with anxiety about learning, e.g. (I am anxious while being

introduced a new subject). This tool uses a five-point Likert scale (1 = not at all, 5 = very much), and the higher the score, the better the learning attitude. In Hwang's study [28], Cronbach's _ was 0.84.

Problem-Solving Ability

Developed by Lee et al. [29] to measure problem-solving ability. It consists of 45 items in five categories and six sub- categories (Clarifying problem, seeking a solution, decision making, applying the solution, and evaluation & reflection). The tool uses a five-point Likert scale (never, rarely, sometimes, often, always), and the higher the score, the higher the problem-solving ability. Cronbach's _ was0.94 while developing this instrument [29], and Cronbach's _ was 0.92 in this study.

Empathetic Ability

Empathetic ability was measured using a tool developed byWakabayashi et al. [30] and validated by Yeo [31] using the Korean version of the Empathy Quotient-Short form. It comprises 11 items on a two-point scale to measure empathy's cognitive, emotional, and social aspects e.g.(I can tune into how someone else feels rapidly and intuitively,& I can easily tell if someone else is interested in or bored by what I am saying). The higher the total score, the higher the empathetic ability. In a study by Yeo [31], Cronbach's _ was 0.88, and in this study, Cronbach's _ was 0.81.

Ethical Consideration

This study was conducted after obtaining ethical approval from the Faculty of nursing - Zagazig University. The students voluntarily participated in this study. They had opportunities to ask questions and were allowed to refuse to provide information. The researchers explained the purpose and method of the study and obtained written informed consent from the participants before conducting the surveys. The students were treated equally, regardless of whether they participated in the study. Furthermore, they were guaranteed anonymity, and their data were not shared with anyone other than the researchers.

Content Validity:

A self-administered questionnaire was used, after the translation of instrument to Arabic. The content and face validity were established by a jury of experts (5 professors & 4 assistant professors) from academic nursing staff, Zagazig and Cairo Universities. In addition, the content validity of the modules were also assessed by them.

Pilot Study:

To test the questionnaire accuracy and feasibility before using, a pilot study was conducted on 10 percent of the research sample (n=7). Those students who were included in the pilot study were removed from the sample analysis. Informed consent has been received from the entire study group for participation in the study, and they have been told that participation in the research is voluntary. And that every student can decide to stop completing the study and withdraw without consequences at any point.

Statistical Design:

Entering data and using statistical evaluation (SPSS), version 21.0. And checked to ensure no information was lost or inadequate. ANOVA F test and t-test were used to identify the relationship between the variables and the analysis of the association between total scores.

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