The Development and Evaluation of an Online Educational Game Integrated with Gather Town for Nursing Staff Learning

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Abstract
Many on-the-job training courses for nursing education have been converted to online courses due to the COVID-19 pandemic. However, emergency and intensive training courses emphasize the provision of real situations to promote learners' abilities in making accurate observations and instant judgments based on patients' situations. In this research, an online educational simulation game called *Emergency Room,* which uses the Gather Town platform and Google Jam board application to build virtual emergency room scenes and integrate patient complaints of differing severity, was developed. This game enables learners to establish how to evaluate the consciousness and muscle strength of critically ill patients and establish cognitive scaffolding and peer scaffolding to improve the consistency of evaluation, providing a contextual and real learning environment. By providing a description of the patient's condition in a simulated emergency room, the correctness and consistency of assessment of consciousness and muscle strength according to the patient's condition are expected to improve by playing the game. The trainees were also required to identify the principle of urgent admission based on the main complaint and clinical evaluation of each patient, especially with regards to their consciousness and muscle strength. After preliminary analysis of the empirical evidence, it was found that the learning effectiveness of the trainees was significantly improved. The flow state and technical acceptance of all learners were also analyzed, and the results showed that the overall flow and game acceptance were both higher than the median (median of the five-point scale = 3). Most of the learners also reported that using the game was more helpful for attaining problem-solving skills than not using the game.

Keywords: Simulated Learning, Online Educational Games, Level of Consciousness, Muscle Strength, Physical Assessment

Introduction

When the 2020 COVID-19 pandemic spread globally, more than 1.6 billion students were affected by the pandemic. Since the pandemic is a highly contagious virus, it is difficult to provide physical learning places due to the risk of infection and spreading the infection to faculty, staff, and students (Baran & Correia, 2014). Reducing clinical courses had a significant impact on medical education, especially for medical students who wish to acquire certain structured abilities and skills before starting their careers (Ferrel & Ryan, 2020). Educational structure changed in many educational institutions due to COVID-19 pandemic (Hussein et al., 2020). Medical students need to acquire certain abilities through learning and participating in clinical and non-clinical activities. By using different communication and education technologies, learners can learn with anyone anytime, anywhere, thereby expanding, and accelerating learning (McClure & Williams, 2021); however, compared with physical courses, an important problem is the lack of social interaction between learners on the online learning platforms.

Our game research aims to explore how the online educational game integrated with Gather Town promotes the effectiveness of remote simulation in clinical nursing education. The online educational game integrated with Gather Town used in this study emphasizes situated learning, cognitive scaffolding, peer scaffolding, and game design elements such as virtual peer interaction, medical scenarios, and clinical simulation in teaching activities. Situational learning refers to that learning should be carried out in the context of the application of the knowledge learned (Lave & Wenger, 1991). Scaffolding theory refers to providing support and guidance to improve students' learning ability when learning content or skills (Wood et al., 1976). Vygotsky (1978) pointed out that learners can expand their "independent processing capabilities" with the help of peers of capable people. Online games use medical scenarios may enhance peer collaboration to assess the patient's coma scale and muscle strength, and then simulate clinical handovers. The research purposes of this study are to develop an online educational game integrated with Gather Town as well as explore learners' learning performance, flow state, game acceptance, and game anxiety of online educational game integrated with Gather Town.

Figure. 1 The Game *Emergency Room*

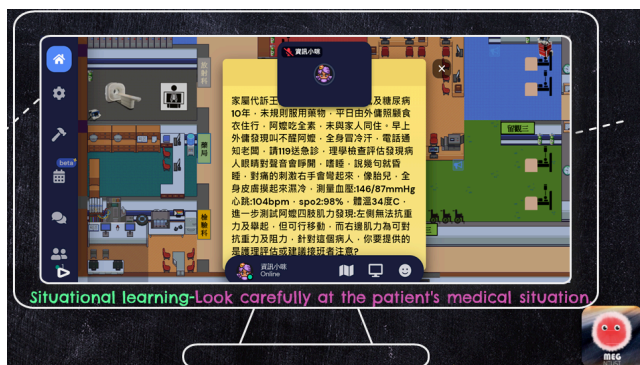Figure. 2 Peer Scaffolding of the Game
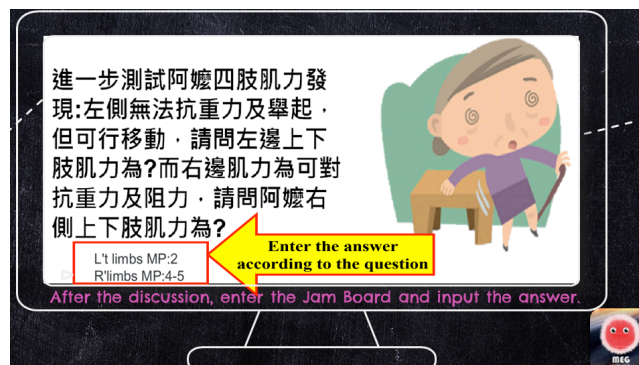
Figure. 3 Cognitive Scaffolding of the Game

Figure. 4 Learners Evaluate the Patients

Methods

The online educational game *Emergency Room* developed with Gather Town was designed based on situated learning (Figure 1). After completing the pre-test questions, the assistant will guide the nursing staff to play the game and enter the *Emergency Room*. Learners in this study consisted of 12 nurses, divided into four groups to play games at different times. Each participant uses a personal computer and microphone to communicate with others in Gather Town through completing the learning activity. They must find three patients in the *Emergency Room* who need to evaluate GCS and MP of the cases, and write down the scores in a Google Jam board. In this process, learners have to apply professional knowledge and clinical experience to discuss with each other to form a peer scaffolding (Figure 2), and also can read reference books in Gather town as cognitive scaffolding. Learners evaluate three patients' status to finish the tasks according to the patients' description (shown as Figure 3). Once learners complete the evaluation, they need to fill in the answers in a Jam board (Figure 4), and the head nurse would reveal if they provide the appropriate evaluation of three patients.

To be able to analyze academic performance, the content of the pre-test and post-test are the same. There are 4 questions in the exam. The four clinical head nurses of a medical center in Taipei reviewed the questions for expert validity.

This study used Kiili (2006)'s Flow Scale to assess the flow state of learners, which was translated and revised by Hou and Li (2014). The flow state includes two dimensions of flow antecedents and flow experience, and all scales are measured using the Likert five-point scale (1-5 points). The reliability measurement (Cronbach's alpha = 0.931) shows a high degree of internal consistency. Regarding the acceptance, the study adapted and revised Davis's (1989) The Technology Acceptance Model items. There are 8 items including usefulness, ease of use, and game elements. The program of learning activities includes pre-test (10 minutes), game (30 minutes), post-test (10 minutes), and finally the questionnaire (10 minutes).

Results and Discussion

In terms of academic performance, the Table 1 shows the result of the Wilcoxon signed rank test that students' performance has improved after playing online emergency room games (Z=-2.075, p<.001). By completing the game, the overall performance of the learner has been improved. In terms of flow, based on the result of one simple t test, the overall flow status (M = 3.73, t=7.205, p<0.001), the sub-dimension flow antecedent dimension (M = 3.54, t=3.57, p<0.01) and the sub-dimension flow experience (M = 3.93, t=5.49, p<0.001) are all significantly (p<0.05) higher than the median value (median fifth ratio = 3) (See Table 2). The

results show that learners are deeply involved in the game. In addition, and the result revealed that usefulness (M=4.15, t=5.55, p<0.001), ease of use (M=3.8, t=2.99, p<0.05), and game elements (M=4.02, t=4.79, p<0.01), were also significantly (p<0.05) higher than the median (the median in a five-point scale =3)**(see Table 3),** which indicates that the game operation process is simple, and easy for nursing staff to use.

Table 1 Mean and Standard Deviation of Learning Performance Pre- and Post-Test.

	M	SD	Z	Sig.
Pre-test	3.97	1.82		0.038**
Post-test	5.24	1.75		

**$P < 0.01$

Table 2 Means and Standard Deviations of Flow State Scores.

Dimensions	M	SD	t
Flow antecedents	3.54	0.53	3.57**
challenge	3.83	0.62	4.69**
goal	3.70	0.62	3.95*
feedback	3.25	0.54	1.59
self-control	3.54	0.94	1.99
playability	3.38	0.71	1.82
Flow experience	3.93	0.59	5.49***
concentration	4.27	0.63	-.24
time distortion	4.21	0.84	4.99***
Autotelic experience	4.31	0.67	6.81***
loss of self-consciousness	2.92	1.20	6.93***
Overall flow	3.73	0.49	5.21***

* p<.05 ** p<.01*** p<.001

Table 3 Means and Standard Deviations of Game Acceptance Scores.

Dimensions	M	SD	t
usefulness	4.15	0.72	5.55***
ease of use	3.8	0.90	2.99*
Game elements	4.02	0.74	4.79**

* p<.05 ** p<.01*** p<.001

Conclusions

In this research, an online educational game, *"Emergency Room"*, which combined the chief complaint of patients with simulation emergency 'Gather Town' environment was developed. The aim of this research enhanced the contextual learning experience of nurses considering the restrictions caused by the COVID-19 pandemic. The results showed that the game helped nurses to improve their evaluation skills, and increased their knowledge and ability to assess patient limb and muscle strength. These preliminary findings indicated that combined online educational games with a mechanism by simulate real situations can effectively improve the learning of nursing staff. The results of flow analysis also showed the high level of engagement with the game reported by all the nurses who participated in the study. Also, the game was easy for learners to play. Future research could conduct a quasi-experimental design to compare the

effectiveness of participants in the game with that a control group (who undertake, for example, general online courses), and to further explore the assessment capabilities, emergency response ability, and online learning motivation of nursing staff.

Acknowledgements

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