

Design and Evaluation of a Contextualized Mobile Educational Game for Learning Emergency Medical Care

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The Southeast Asian Conference on Education 2024
Official Conference Proceedings

Abstract

The emergency medical service is a complex and variable situation and the critical thinking ability of the medical staff is challenged. Compared with traditional education, the contextual simulation of mobile learning can improve the learners' critical thinking ability. This study 《119 Dispatch Center》 LINE@ and Google Form were combined to design a digital contextual role-playing mobile educational game to develop emergency care skills, with the learning objective of correctly performing the emergency care procedures for patients who have fainted. Learners are required to role-play as Emergency medical staff, performing the correct emergency procedures in complex situations, and calling out for non-player character (NPC) expert advice to assist the learner's decision-making at the right time. Participants were 11 nursing staff from Taiwan. Based on single-sample Wilcoxon Signed-Rank analyses, learners' scores on the flow, usefulness, ease of use, and game elements were significantly higher than the median of the 5-point scale (i.e., 3), and the mean score for activity anxiety was 2.30, which was lower than the median (i.e., 3) of the scale. The results of this study showed that the game design mechanism was easy to operate, which could effectively enhance the learners' flow and engagement, and did not cause too much anxiety about the activity. Through qualitative opinion analysis, learners indicated that the simulation situation was very realistic, just like the usual work experience of caring patients. In addition, the call out has a reminder function, which can help learners to think and make the correct decision in emergency medical care.

Keywords: Critical Thinking, Clinical Reasoning, Scaffolding, Digital Educational Game, Situated Learning

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Introduction

The Emergency Medicine Service System (EMSS) receives a public emergency notification, Emergency medical staff drives ambulances to the scene of the injury or illness to perform a first aid mission, until transit to the hospital, the medical staff will rely on personal experience to provide clinical reasoning and care to the injured patient in order to provide timely, accurate, appropriate and care (Andersson et al, 2022). Lee, D., & Park, J. (2019) stated that critical thinking is the basic foundation of clinical reasoning. Due to the complexity and variability of the patient's situation, the lack of critical thinking among medical staff may affect the patient's life safety and disability, therefore, it is necessary to improve the critical thinking skills of medical staff. Contextual simulation can enhance learners' clinical decision-making, clinical reasoning, and critical thinking skills more than traditional teaching (Macauley et al., 2017), and can promote learner motivation (Chen et al., 2017), further facilitating learning transfer (Catalano, 2015). Game-based learning allows learners to modify their learning strategies through self-directed learning and repetitive practice, develops learners' creativity, problem-solving ability and higher-level thinking (Hsieh et al., 2015), provides clues to problem solving, reduces learning anxiety, and increases engagement to achieve a state of flow (Hou et al., 2022). The study combines the instant messaging software *LINE@* and the *Google Form* digital platform to design 《119 Dispatch Center》 (as shown in Figure 1.), a digital contextual role-playing mobile educational game that develops emergency ambulance skills. The learning objective is to use critical thinking to perform proper emergency care procedures for a fainting patient.

Learners are required to play the role of an medical staff, receive a dispatch at *LINE@*, click on the map (red markers), link to the *Google Form* context to perform the proper emergency procedures, use the *LINE@* ambulance radio to call out when the scaffolding needs to be prompted, and request NPC experts consultation when appropriate to guide learners in critical thinking and clinical reasoning.

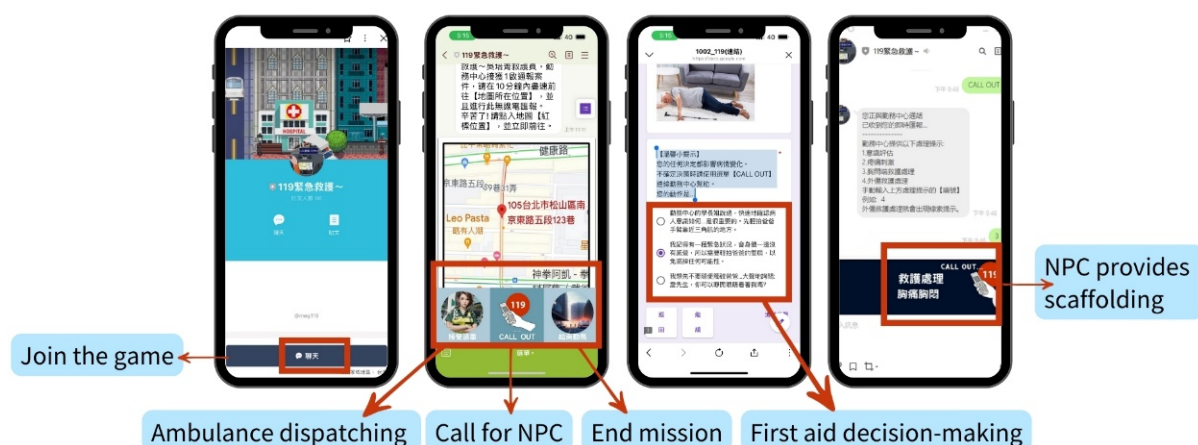


Figure 1: Combining the instant messaging software *Line@* and *Google form* as a role-playing ambulance paramedic guides critical thinking and clinical reasoning.

Methods

This study was a pilot study with 11 medical staff from Taiwan. Each session consisted of 30 minutes: 10 minutes for the introduction of the story, and rules of the game, 10 minutes for

the game activity, and 10 minutes for the questionnaire. The study investigated the game usefulness and game ease of use of the game mechanism for learning, the game elements that facilitate game motivation, and the learners' anxiety and flow during the learning activities. The other part of the questionnaire consisted of 4 semi-structured questions focusing on whether the game mechanics of this study could enhance learners' understanding of emergency care procedures.

Results and Discussions

According to the single-sample Wilcoxon Signed-Rank analyses (e.g., Table 1), on the game usefulness ($M = 3.93$, $SD = 0.92$), game ease of use ($M = 4.21$, $SD = 0.76$), game elements ($M = 4.4$, $SD = 0.75$), and flow ($M = 4.5$, $SD = 0.52$), learners' scores were all significantly higher than the median (i.e., 3) of the scale, and the mean activity anxiety score ($M = 2.3$, $SD = 0.89$) was lower than the median (i.e., 3) of the scale. Through qualitative feedback analysis, learners reported that the simulations were very realistic, like the experience of handling a patient at work, and that the call-outs had a reminder function to help learners consider and make the right first aid decisions.

Table1: The Results of single-sample Wilcoxon Signed-Rank analyses

Item	<i>M</i>	<i>SD</i>	<i>Z</i>	<i>Sig.</i>
Game usefulness	3.93	0.92	2.75**	0.006
Game ease of use	4.21	0.76	2.72**	0.007
Game elements	4.40	0.75	2.69**	0.007
Sense of control	4.27	0.79	2.74**	0.006
Uncertainty	4.36	0.81	2.76**	0.006
Achievement	4.18	0.87	2.60**	0.009
Think the game was fun	4.55	0.82	2.89**	0.004
Wish to play again	4.64	0.81	3.00**	0.003
Overall flow	4.50	0.52	2.937**	0.003
Flow antecedents	4.40	0.53	2.937**	0.003
Flow experience	4.58	0.55	2.941**	0.003
learning anxiety	2.30	0.89	-2.08*	0.038

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Conclusions and Limitations

In this study, we developed 《119 Dispatch Center》, a digital contextual role-playing mobile educational game that aims to develop emergency care skills. Through the process of individual play, the game can effectively enhance the learner's flow and engagement without high anxiety about the activity. The simulation context of the game and the call out scaffolding reminders can guide the learners to critical thinking and clinical reasoning. It is suggested that future research can design experimental and control groups, and increase the number of experimental participants to improve the reliability and validity, as well as to explore the learning effectiveness.

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