Design and Evaluation of a Contextual Distance Management Training Game With a Real-Person Non-player Character Mechanism

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Abstract
As the COVID-19 epidemic continues, teleconferencing has become an important mode of company operation, and many professional training courses are also taught online. However, in the absence of interactive mechanisms, learners may lack motivation and focus, which may reduce the effectiveness of learning. Game-based learning can enhance learners' motivation and concentration, and the combination of contextual design and games is expected to increase learners' engagement and alleviate excessive anxiety. Game-based learning can also introduce scaffolding to guide learners to reach higher-level thinking and problem-solving skills, thereby enhancing learning effectiveness. In addition, game situations of high fidelity can achieve learning transfer effectiveness. In this study, we propose a highly realistic distance game-based learning approach by designing a multi-dimensional cognitive scaffolding game *Strategist's Challenge* with a real-person NPC mechanism on the Gather platform, which is an online business management training game based on a real-world company environment to develop learners' knowledge and ability in strategic planning. The participants were 11 adults from Taiwan, and the objectives of the learning activity were to complete the SWOT analysis of the company in the game scenario and to propose the best strategic planning task. In this study, the flow and anxiety scales were measured. Based on the descriptive statistics, the learners scored above the median of 3 (of the 5-point scale) on all nine dimensions of flow, with the mean values of clear goals and sense of control being higher than 4.00. The learners' anxiety scores were close to the median of 3.00, indicating that the learners showed moderate anxiety during the game. The preliminary results of the study indicate that the mechanism designed in this study is effective in enhancing learners' flow and moderate anxiety in learning.

Keywords: Real-Person NPC, Educational Game, Situated Learning, Scaffolding, Strategic Planning Training, Online Distance Learning

Introduction

In the implementation of online learning courses, learners often encounter insufficient learning motivation and learning anxiety derived from a lack of concentration and lack of situational context, which reduces learning effectiveness. Phelps & Vlachopoulos (2020) found that because the synchronous learning environment is not conducive to low-autonomy learners, teachers must specially design the interactive mechanism in teaching and combining various media and online tools, such as YouTube or online learning tools (e.g., games). Therefore, by improving learning motivation through gamification, learners can be more devoted to the thing, generate a flow experience, and conduct in-depth learning. Gamification-based learning can improve critical thinking and strategy skills (Savard, 2015), and problem-solving skills (Sung et al, 2015). Situational learning is learner-centered, placing learners in a learning situation, The process involves action learning, reflective exploration, and feedback, and its purpose is to enable learners to interact in a diverse environment, and to develop and construct their knowledge and ability. Zahedi et al (2021) mentioned that gamification can provide a unique situational context that changes learners' attention and increases their learning performance and engagement.

This study proposed a new game-based learning method based on the real-person NPC mechanism. *Strategist's Challenge* is an online digital game designed for situational business management training. To achieve the fidelity effect of the company's environment, the *Gather Town* platform was used to present three floors company. Environmental architecture design, including conference rooms, factories, warehouses, offices, etc. as a total of 13 departments were developed. In addition, multi-dimensional strategic scaffolding, including cognitive scaffolding, metacognitive scaffolding, tool scaffolding, procedural scaffolding, emotional scaffolding, and peer scaffolding, was introduced into each department, and each NPC (Non-Player Character) was placed in each department to present information about the company's current situation and the communication of information about the external market environment. In addition, in this study, real-person NPCs play multi-dimensional scaffolding designs, giving learners different guidance at the right time during the activity, allowing the scaffolding to generate a mixed mechanism of active and passive, reducing cognitive load, enhancing learning flow, and then express emotional dimension to encourage learners and reduce learning anxiety. The goal of the game is to allow learners to visit each department from the perspective of a professional management team. After collecting a large amount of information in a fixed period of time using different collaboration modes, they can then discuss with their peers and complete the two-stage tasks of SWOT analysis and optimal strategic planning. The learning goal of this game is too immersive experience learners in the company situation context and to simulate the learning process of company strategy planning, to enhance learners' experience and judgment in strategy planning, and to achieve the effectiveness of learning transfer.

Methods

The participants in this study were 11 adults (2 males and 9 females) in Taiwan through a preliminary case study test. The participants were registered as a team on the internet, with three to four participants in each team. Each participant used a personal computer and participated in the learning activities in their individual space. The activity platform was designed using *Gather Town*, as shown in Figure 1. In *Gather Town*, a situational immersive scene is designed and matched with various cognitive scaffolding messages, as shown in Figure 2. The Google Meet voice function is used to do synchronous collaborative

discussions online to complete the activity learning tasks. This analysis case is to provide a company's current internal situation and external environment information at this stage. After the analysis, five major items were recorded: strengths, weaknesses, opportunities, threats, and suggestions for the best strategic planning for the case company.

To assess the participant's learning flow, the Kiili Mind Flow Scale (2006), translated and revised by Hou and Chou (2012), was used for this study. The learning flow scales include two dimensions: flow antecedents and flow experience. All scales were scored on a five-point Likert scale. The reliability of the learning flow questionnaire (Cronbach's alpha = 0.881) indicated a high degree of internal consistency. For the assessment of participant anxiety, the Affective Filter Hypothesis developed by Krashen (1981; 1987) was used as a reference, and the Chinese version was adapted to the Learning Experience Scale by Mei-Hsueh Hung (2001). In this study, the content of the Activity Anxiety Inventory (AAI) from the Learning Experience Scale (LES) was used and modified to make the narrative more consistent with this study. with a total of 8 questions. The reliability of the activity anxiety scale (Cronbach's alpha=0.748) was found to be reliable. The learning activity procedure began with an activity presentation (10 minutes), a pre-test (10 minutes), Game Task 1 (40 minutes), and Game Task 2 (30 minutes), followed by a post-test (10 minutes) and a process questionnaire (10 minutes).

Figure 1 *Gather Town-based game: Strategist's Challenge*

Figure 2 *Relevance message guidance in different departments*

Results and Discussions

The goal of the *Strategist's Challenge* is to complete two stages of SWOT analysis and optimal strategy planning. Table 1 shows the descriptive statistics analysis and one sample t test of the learning flow after completing the two stages of the task. The overall flow (M=3.78, SD=0.49) was significantly higher than the median of Likert scale (i.e., 3) (t=5.22, p<0.001). The mean values of flow antecedents (M=3.89, SD=0.56), flow experience (M=3.68, SD=0.54), and all other dimensions of flow were above 3.00. Among them, the mean values of two dimensions, goals of activity and sense of control, were even higher than 4.00. It indicates the overall game design mechanism that allows learners to have a clear activity goal and a high sense of control to actively engage in game tasks and achieve a high level of flow experience. To improve the concentration of online learning goals.

Table 1 *Descriptive statistics analysis and one sample t test of learning flow*

Dimension	***M***	***SD***	**Dimension**	***M***	***SD***
Overall Flow	3.78	0.49			
Flow antecedents	3.89	0.56	**Flow experience**	3.68	0.54
Challenge-skill balance	3.91	0.80	Concentration	3.73	0.72
Goals of an activity	4.00	0.81	Time distortion	3.41	1.00
Unambiguous Feedback	3.73	0.72	Autotelic experience	3.68	0.78
Control	4.05	0.65	Loss of self-consciousness	3.86	0.92
Action–awareness merging	3.77	0.79			

Table 2 shows the Descriptive analysis and one sample t test of learners' anxiety. The overall anxiety (M=2.95, SD=0.65) shows very close to 3.00. Moderate anxiety is helpful for learners (Wang et al., 2015) and is one of the important indicators of sustained learning flow during play activities.

Table 2 *Descriptive analysis and one sample t test of learners' anxiety*

Dimension	***M***	***SD***
Overall Anxiety	2.95	0.65

Conclusions and Limitations

This study developed an online functional training game *Strategist's Challenge* based on the daily operation situation of the company. The game is based on the daily operation situation of the company and uses a real-person NPC, Executive Assistant Kim, to simulate the feelings of senior employees towards new employees and to help them visit each department and related issues. The above data showed that there was a significant higher performance of learning flow than 3, and the anxiety was also close to median 3. Initially, this study combined with the real-person NPC design to improve the learning flow of online learners

during the learning process. More sample sizes can be added for future studies. And to explore the same online game design, whether there is a combination of real-person NPC online learning could be used for a more in-depth comparative analysis of learners' perceptions of motivation, anxiety, learning effectiveness, scaffolding effectiveness, and game fidelity.

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