

Designing an Alternate Reality Educational Game That Integrates Virtual Reality and Storyline to Learn About the History and Culture of a Local Town

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Abstract

Local cities in Taiwan actively emphasize the preservation of town cultural assets and the creation of distinctive cultural attractions. In this study, we designed an alternate reality educational game, taking the love story of the town of Puzi in Taiwan 70 years ago as the theme, and connecting several representative cultural attractions. The learning objective is for the learner to take an old man who has returned to his hometown from a faraway place to search for the places he remembered in this town 70 years ago and collect clues in each place to complete the old man's mission to find his girlfriend when he was young. The game uses *Google Form* for storytelling and allows learners to control the story by selecting different options. Learners need to actually walk to the places of interest in order to unlock the puzzles presented in the VR (Virtual Reality) surroundings. Players can deepen their understanding of the cultural sites through observation in the actual site, peer discussion, and online research, and final decision-making to solve the puzzles. The preliminary study was conducted with 23 participants from Taiwan, ranging from 12 years old to 50 years old adults. The results of the study showed that the participants' mean scores for flow, anxiety, game elements, and game feedback were all significantly higher than the median of the scale (i.e., 3). The research results preliminarily show that the mechanism designed in this study is easy to operate and will not cause learning anxiety.

Keywords: Alternate Reality Educational Game, Town Cultural Assets, Role-Play Simulation, Multidimensional Scaffolding Mechanism, VR, Location-Based

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Introduction

In an era of economic growth, urbanization and rapid development, towns and cities can be considered modern battlegrounds for the preservation of cultural assets, often faced with choices between conservation and preservation, destruction, and redevelopment (Sadowski, 2017). Therefore, the preservation of cultural assets in towns and cities has become an important policy issue in many countries around the world, especially in historical and cultural urban landscapes (Taylor, 2016). The concept of historic townscape is based on the recognition of the complexity and human history of the town's environment, which is closely related to the value of citizens and tourists (Bonadei et al., 2017). Therefore, citizens' cognitive perception of these historical and cultural locations can contribute to the preservation of cultural assets and the enhancement of the tourism economy (Riganti & Nijkamp, 2004). Moreover, local historical and cultural assets may act as a positive pull factor for the local tourism and creative economy. With the development of technology, VR is increasingly used in educational learning for landscape exploration, which can make environmental teaching easier to understand, interesting and present complex data in a simple way for students to learn (Piovesan et al., 2012). It may also enable learners to interact with objects in the VR environment to find information to discover, explore and build their knowledge (Alfadil, 2020). Piovesan et al. (2012) stated that VR can make learning more fun with the aim of increasing motivation and attention.

At the same time, the combination of storytelling scenarios and simulation games based on situated learning theory (Brown et al., 1989) can promote learners' motivation and enhance the flow (Chien et al., 2022). This study designs an exploratory alternate reality puzzle educational game, based on a love story from 70 years ago, and is guided by modern technology tools VR and connected with the *Google Form* platform for story, and allows participants to experience the urban cultural attractions in depth through walking. The purpose of this study is to enhance the understanding of the cultural assets of the town and the value of creating a distinctive cultural attraction through realistic experiential learning. At the same time, several important psychological factors of learning (flow, activity anxiety, game elements, and game feedback) in this game-based mechanism were initially explored.

Methods

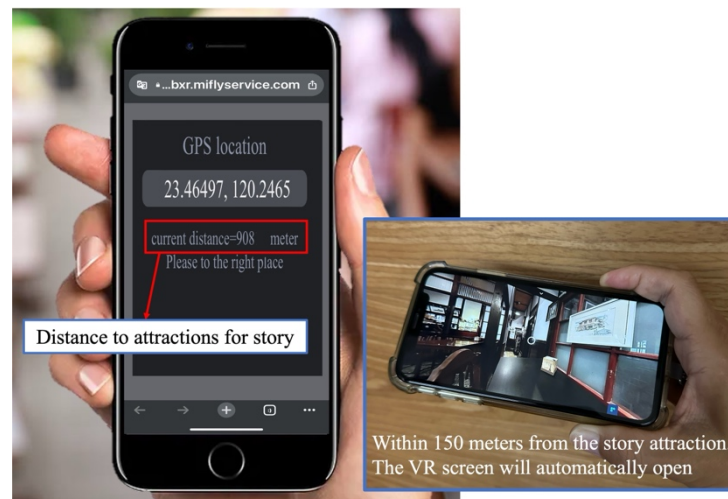
The mission of this game is to help the old man in the story to find the story of his memory of meeting his girlfriend in several locations in the city 70 years ago. Figure 1 represents the two platforms that learners need to use on their cell phones: 1) VR Surround Video technology to find the clues of story locations, and 2) *Google Form* to choose the direction of the story to achieve the task of the old man looking for his girlfriend. In addition, during the task exploration process, when learners determine the attractions where the next story unfolds based on clues, they can ask residents or use their mobile phones to search *Google Maps* to guide them to the attractions. If the attraction is one of the story attractions, and the GPS location data of the mobile phone is then calculated by the VR platform and is within 150 meters of the story attraction, the VR story attraction clue function screen will appear on the phone (location-based mechanism). As shown in Figure 2. The whole mission goes like this. This is a preliminary study of 23 participants from Taiwan, ranging in age from 12 years old to 50 years old adults, working in groups of three, with at least one cell phone or Tablet PC capable of Internet access and camera scanning in the group. Each session lasted about 80 minutes, including 10 minutes for game explanation and preparation, 20 minutes for filling out questionnaires, and about 50 minutes for walking around the scenic locations. This study

investigated the effects of using an alternate reality puzzle game mechanism on participants' flow, activity anxiety, game elements, and game feedback during a tour of a tourist location. In addition, 3 semi-structured questions were also investigated, focusing on further understanding whether the game mechanism in this study could stimulate participants' interest and emotions in traveling to the tourist attraction.

Fig. 1: Functional description of the two platforms, VR and Google Form, which are used by the mobile phone in the game task.



Fig. 2: VR startup triggering uses Location-based mechanism.



Results and Discussions

According to the single-sample Wilcoxon Signed-Rank analyses (e.g., Table 1 and Table 2), investigating participants' flow ($M = 4.44$, $SD = 0.46$), game acceptance ($M = 4.5$, $SD = 0.57$), game Usefulness ($M = 4.52$, $SD = 0.65$), game ease of use ($M = 4.46$, $SD = 0.67$), and game elements ($M = 4.53$, $SD = 0.53$), the means were significantly higher than the median of the scales (i.e., 3). It means that the game mechanism is easy to operate and does not cause learning anxiety and enhances the learners' flow. Through the analysis of qualitative opinions, the learners said that the game was interesting, novel, and immersed in the game. From the above analysis, it is inferred that the VR puzzle mechanism can promote the participants'

motivation to learn about the history and culture of the local town, and it has the potential to enhance the tourism interest and emotion of the town's tourist locations.

Table 1. *The mean and standard deviation of learners' flow*

(N=23)				
	<i>M</i>	<i>SD</i>	<i>Z</i>	<i>Sig.</i>
Overall Flow	4.44	0.46	4.20 ^{***}	0.000
Flow antecedents	4.47	0.51	4.22 ^{***}	0.000
Challenge-skill balance	4.57	0.53	4.28 ^{***}	0.000
Goals of an activity	4.54	0.62	4.21 ^{***}	0.000
Unambiguous Feedback	4.41	0.70	4.12 ^{***}	0.000
Control	4.48	0.67	4.11 ^{***}	0.000
Playability	4.35	0.63	4.16 ^{***}	0.000
Flow experience	4.42	0.50	4.20 ^{***}	0.000
Concentration	4.54	0.62	4.29 ^{***}	0.000
Time distortion	4.20	0.72	3.95 ^{***}	0.000
Autotelic experience	4.62	0.50	4.26 ^{***}	0.000
Loss of self-consciousness	4.00	1.08	3.23 ^{**}	0.001

** p < 0.01, *** p < 0.001

Table 2. *The mean and standard deviation of learners' game anxiety, game feedback, and game elements*

(N=23)				
	<i>M</i>	<i>SD</i>	<i>Z</i>	<i>Sig.</i>
Game Anxiety	1.96	0.73	-3.88 ^{***}	0.000
Game Feedback	4.50	0.57	4.15 ^{***}	0.000
Game Usefulness	4.52	0.65	4.21 ^{***}	0.000
Game Ease of Use	4.46	0.67	4.21 ^{***}	0.000
Game elements	4.53	0.53	4.14 ^{***}	0.000

*** p < 0.001

Conclusions and Limitations

In this study, an exploratory alternate reality educational game was designed to enhance the participants' perception of cultural asset preservation and local cultural tourism in towns and cities. In the game, in order to collect the puzzle clues of the narratives in the landscape, participants must plan the city sightseeing routes according to the storyline, Learners can deepen their understanding of the cultural locations through observation, peer discussion, and online research, and then make decisions to solve the puzzles, which can effectively enhance the flow and will not have too much anxiety in the game, so as to deepen the understanding of the cultural scenic spots. In addition, it is inferred that the game mechanism has the potential to promote learners' understanding of the history and culture of local towns and cities. It is suggested that future research can test the cultural landscape of different regions to determine the validity of the inference, and it is also suggested to design experimental and control groups to increase the reliability of the experiment.

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