Evaluation of a Financial Education Board Game Integrating Historical Contextual Events and Simulated Trading Mechanisms

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Abstract
The key to financial education is not merely financial knowledge, but more importantly, the skills of money investment and management. Without simulated financial operations and experiencing the effects of social contextual events on the market, learning transfer becomes challenging. Game-based learning provides a solution that motivates learners to engage actively, while also simulating contextual events, thus offering realistic experiences and feedback. By integrating real historical background events, learners can immerse themselves in a vivid trading scene. This immersive experience not only enhances the fun of learning but also facilitates historical empathy among learners, while simultaneously deepening their historical knowledge and financial skills. In our study, we developed a financial education board game set in 17th-century Europe, where learners played the role of the Dutchman. The game allowed learners to participate in the flower futures market, experiencing market fluctuations due to historical events and making investment decisions based on risk assessments. The empirical evaluation involving 16 participants indicated that the board game with historical contexts enabled learners to enter a state of flow and achieve focused learning. Moreover, learners found it beneficial to grasp the concepts of futures trading through the game. Furthermore, 80% of participants reported feeling immersed in the historical setting, and they were able to empathize the Dutch sentiments about the futures market at that time.

Keywords: Game-Based Learning, Situated Learning, Financial Education, Historical Empathy

Introduction

Financial literacy is crucial in the 21st century (OECD, 2014), and improving public financial literacy has become a significant global educational priority. Financial education effectively addresses gaps in financial literacy and enhances financial decision-making (Von Gaudecker, 2015). Promoting financial education not only improves financial literacy but also guides learners in making informed financial decisions in diverse scenarios. Game-based learning provides learners with the opportunity to make decisions by simulating financial operations and experiencing the impact of social contextual events on the market, thereby fostering decision-making skills and shaping positive financial attitudes. However, games can be overly engaging, sometimes causing learners to prioritize entertainment over educational objectives. Some games may be too complex or disconnected from real life, diverting learners' attention from the intended learning content. Previous research suggests that effective learning games integrate content knowledge into gameplay (Ke, 2016). Learning games should provide structured problem-solving experiences that facilitate knowledge and cognitive development applicable beyond the game context. According to Habgood and Ainsworth (2011), a game's educational value lies in its core game mechanism, with learning elements integrated into engaging gameplay.

In this study, we developed a financial education board game set in 17th-century Dutch history, where learners played the role of Dutchman. The game allows learners to engage in a flower futures market, draw event cards reflecting the effects of historical events on market volatility, and assess the risks of futures trading. The game mechanism is repeated in a turn-based manner, and each turn is divided into the following four stages:

(1) Information search - players can use their mobile phones to search for market information and clues as a reference for investment targets. This will help players enter the futures market and make early arrangements, as shown in Figures 1 and 2.
(2) Commodity trading - players can freely choose to buy and sell spot goods and futures, or hand over the spot goods to historical figures to complete tasks and earn rewards. The narrative of historical figures is also one of the clues in the game, as shown in Figure 3.
(3) Events occurring - fluctuations in flower market prices will be affected by wars or economic events in the 17th-century Netherlands. Players cannot predict whether a war or an economic event is about to happen, which will make the flower market full of uncertainty, as shown in Figure 4.
(4) Price Settling - players who invest in futures will experience gains and losses based on the fluctuations in futures prices.

Competition is a crucial element in a play-and-learn environment, as the decisions of other players can influence individual choices and judgments regarding the investment market. The player with the most funds will win the game.

Figure 1: Players Search for Information via Mobile Phones

Figure 2: Determine Future Changes in the Flower Market Through Information and Make Early Arrangements

Figure 3: Needs and Clues of Historical Figures

Figure 4: Impact of War Events and Economic Events on the Flower Market

By incorporating real historical situations and events, learners can immerse themselves in a vivid trading environment, allowing them to empathize with the decisions and emotions of historical figures in relation to the futures market. The purpose of this study is to explore learners' flow state, activity anxiety, and game acceptance in a financial education board game that combines historical contextual events, and to observe learners' experiences of historical empathy in the game. Therefore, this study poses the following two research questions:

(1) What are learners' flow state, activity anxiety, and game acceptance in games?
(2) Can learners experience historical empathy in games?

Method

The participants were 16 students in the 12th grade (9 males and 7 females) in Taiwan. We used a single-group posttest design. This study adopted the Kiili Flow Scale (2006) translated

by Hou and Li (2014) and revised into Chinese. The flow scale consists of two dimensions: flow antecedents and flow experience. The reliability (Cronbach's alpha=0.934) of the flow questionnaire showed a high degree of internal consistency. The reliability of the learning anxiety scale, assessed using the AMAS Anxiety Scale developed by Carey et al. (2017), was found to be acceptable (Cronbach's alpha=0.710). Regarding the scale used to measure learners' acceptance of games, this study adopts the technology acceptance scale proposed by Davis (1989) modified by Hou and Li (2014), which includes three dimensions: perceived usefulness, perceived ease of use, and game design elements. The Acceptance scale demonstrated high reliability (Cronbach's alpha=0.923). Historical empathy is the process by which learners engage cognitively and emotionally with historical figures in order to better understand their life experiences, decisions, and behaviors at that time. This study developed a questionnaire based on the concept of historical empathy proposed by Endacott and Brooks (2013) to observe the phenomenon of learners' historical empathy. The scholar divided historical empathy into three dimensions, namely Historical Contextualization, Perspective Taking and Affective Connection. Prior to the study, all participants were asked to sign an informed consent form. The study activities consisted of 10-minute game explanation, 60-minute game activity, and 20-minute post-test questionnaire.

Results

The Wilcoxon signed-rank test was used to analyze learners' flow, learning anxiety, and acceptance in this study, with results presented in Table 1. The findings revealed that the overall flow (*M*=4.26) was significantly higher than the median (median 3 on a 5-point Likert scale), indicating that the gamified activity design effectively conveyed the game's objectives to learners, prompting active engagement and resulting in a heightened flow experience. Furthermore, the overall anxiety (*M*=2.02) was significantly lower than the median, suggesting a reduction in anxiety among learners during gameplay. Similarly, the overall acceptance (*M*=4.65) exceeded the median, signifying learners' positive reception of the game's ease of use and its facilitation of understanding futures concepts and trading processes. In addition, 80% of the participants in the historical empathy questionnaire said that they were immersed in the Dutch era, empathized with people's feelings about the futures market, and deeply understood the impact and emotions brought about by the economic bubble.

Table 1: Flow, Anxiety and Acceptance Descriptive Statistical Analysis

Dimension	***M***	***SD***	***Z***	***p***
Overall Flow	4.26	0.60	3.517^{***}	.000
Flow antecedents	4.21	0.65	3.443^{**}	.001
Flow experience	4.32	0.55	3.466^{**}	.001
Overall Anxiety	2.02	0.49	-3.522^{***}	.000
Overall Acceptance	4.65	0.43	3.536^{***}	.000
Perceived Usefulness	4.75	0.34	3.591^{***}	.000
Perceived Ease of Use	4.56	0.61	3.570^{***}	.000
Game Elements	4.63	0.53	3.556^{***}	.000

$^{***}p < 0.001$; $^{**}p < 0.01$

Conclusion

This study designed a financial education board games integrating historical contextual events, enabling learners to understand the experiences of the Dutch in the 17th century. It aimed to enhance financial literacy through practical futures trading operations. Furthermore, guided by the game's context, learners can immerse themselves in the political and social atmosphere of that era, providing a first-person perspective to examine the environment of historical figures. This approach allows for a deeper understanding of the decision-making behaviors of those figures and the impact of historical events, fostering a sense of historical empathy among learners.

We adopted a single-group posttest design to analyze learners' flow state, activity anxiety, and game acceptance in a financial education board game combined with historical situations, and to observe learners' experiences of historical empathy in the game. The results showed that board games integrating historical contextual events can help learners enter a flow state, reduce anxiety, and foster a high level of acceptance for learning through board games. After preliminary analysis, this study will continue to explore learners' learning effectiveness in depth through a quasi-experimental design in the future, and explore the impact of board game learning on learners compared to video learning methods.

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References

Carey, E., Hill, F., Devine, A., & Szűcs, D. (2017). The modified abbreviated math anxiety scale: A valid and reliable instrument for use with children. *Frontiers in psychology*, *8*, 11.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.

Endacott, J., & Brooks, S. (2013). An updated theoretical and practical model for promoting historical empathy. *Social studies research and practice*, *8*(1), 41-58.

Habgood, M. P. J., & Ainsworth, S. E. (2011). Motivating children to learn effectively: Exploring the value of intrinsic integration in educational games. *The Journal of the Learning Sciences, 20*(2), 169–206.

Hou, H. T. & Li, M. C. (2014). Evaluating multiple aspects of a digital educational problem-solving-based adventure game, *Computers in human behavior*, *30*, 29-38.

Ke, F. (2016). Designing and integrating purposeful learning in game play: A systematic review. *Educational Technology Research and Development, 64,* 219-244.

Kiili, K. (2006). Evaluations of an experiential gaming model. *Human Technology: An Interdisciplinary Journal on Humans in ICT Environments.*

OECD (2014). PISA 2012 *Results: Students and Money: Financial Literacy Skills for the 21st Century* (Volume VI), PISA, OECD Publishing.

Shaffer, D. W. (2006). Epistemic frames for epistemic games. *Computers and Education, 46*(3), 223–234.

Von Gaudecker, H. M. (2015). How does household portfolio diversification vary with financial literacy and financial advice? *The Journal of Finance, 70*(2), 489-507.

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