

*A Generative AI Puzzle Educational Game for Decision Making Skill Training  
With a Clue Exploration Mechanism*

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The Asian Conference on Education 2024  
Official Conference Proceedings

**Abstract**

Decision making is an increasingly valued skill in both schools and workplace. Lectures and case analysis remain limited in fostering decision-making skills due to a lack of contextual simulation, insufficient interactivity, and low learning motivation. Utilizing game-based learning to develop decision-making skills may help overcome these limitations. Therefore, in this study, we designed a decision-making game with a story plot, generative AI (GAI) simulation character interaction, and a clue inference mechanism to solve the limitations. This study designed a Non-Player Character (NPC) in a simulated dialog style through GAI. Learners played the role of a police detective in the game and they could talk to the victim which played by a GAI NPC, which was scripted by our research team. They have to explore, collect, and analyze clues, and make decisions about the location of the robbers' hideout within a limited period of time. A total of 15 participants engaged in the empirical evaluation of this study. It was found that the learners had a high level of flow, and moderate anxiety, and a high level of acceptance of the game, and that they believed that the game could help them to develop their ability. In addition, 80% of these learners felt that the game experience was more anthropomorphic than common GPTs, and the dialogues were more like real-life interactions. Learners also mentioned that the clues provided by the NPC were helpful, including location characteristics, and experiences of the incident, which could help them reason during decision-making.

Keywords: Generative AI, Decision-Making Skills, Contextual Simulation

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## **Introduction**

Bhatti and colleagues (2022) identified the required employability skills of business graduates and business executives also agreed on the employability skills of the graduates such as problem solving, decision making skills are listed among the important workplace skills in their study. Decision making is also considered as an important skill in the workplace (Chowdhury & Miah, 2019). As decision making skill is emphasized in the workplace and schools, how to cultivate these skills has become an important issue. It has been mentioned that when learners do not receive adequate and timely guidance, it will affect their knowledge acquisition and learning effectiveness (Tsai et al., 2015). An appropriate decision-making training environment can help learners better understand the course content, and appropriately challenging tasks can help develop competence (Türkistanlı & Kuleyin, 2022). In an error-aware environment, learners are able to deal with simulated situations in their own way and acquire employability skills. However, it has been mentioned that the construction of the simulation environment and the design of the game requires a significant time cost (Lean et al., 2020).

Therefore, this study focuses on the simulation part of the storyline, character setting and dialogues, and presents the game through the Web, and designs a GAI decision-making training game. It has been found that the main function of asking the player questions in games is to: solve problems for the learner, provide guidance for the learner's task, and stimulate his/her thinking process (Sung & Hwang, 2013). The design of the character dialogues in this study contains many clues to the case. Learners must play the game and gradually piece together the truth of the events.

## **Methods**

The participants of this study were recruited through a recruitment process and consisted of 15 individuals. In order to assess the learners' flow status, this study referred to Kiili's (2006) flow status chart and used the Chinese version translated by Hou and Li (2014). In order to assess learners' acceptance of the game, this study modified the Technology Acceptance Scale proposed by Davis (1989). In addition, this study referred the game motivation elements proposed by Hou (2016). The studies used a five-point Likert scale to evaluate the game design elements.

This study designed the GAI decision-making game "The case of the kidnapping of the writer Xiang". The game featured a realistic storyline, generative AI for realistic character interaction, and a clue-based inference mechanism. Learners took on the role of a police detective in the game and talk to GAI's realistic NPC characters, which scripted by our research team, to explore, collect and analyze clues, and make decisions on the location of the gangster's hideout and the case in a limited period of time. Players were allowed to enter the words they want to ask in the dialog box and get a reply from Writer Xiang, as shown in Figure 1. At the same time, they used the map at the bottom left of the game interface to find the place where Writer Sho is imprisoned, and wrote down the result of their inference in the Google form at the bottom right, as shown in Figure 2.



Figure 1: Game Interface for “The Case of the Kidnapping of the Writer Xiang”



Figure 2: Google Form for Decision Making

## Results and Discussions

Table 1 presented the statistical results of learner's flow status after the task. Overall flow status ( $M=4.07$ ) was significantly higher than the scale median (i.e., 3), and the sub-dimensions flow antecedents ( $M=3.85$ ), and flow experience ( $M=4.25$ ) were also significantly higher than the scale median (i.e., 3). It could be seen that learners have a high level of immersion as they talk to GAI simulated NPC characters, analyze clues, locate places of captivity and make inferences. Türkistanli and Kuleyin (2022) mentioned that appropriately challenging tasks in decision-making training environments and assignments also contribute to the development of competence.

Table 1: The Statistical Results of Learner's Flow Status

(N=15)				
	<i>M</i>	<i>SD</i>	<i>Z</i>	<i>Sig.</i>
Overall Flow	4.07	.472	3.411**	.001
Flow antecedents	3.85	.498	3.301**	.001
Challenge-skill balance	3.43	.884	1.865	.062
Goals of an activity	4.27	.704	3.361**	.001
Unambiguous Feedback	3.43	.776	1.872	.061
Control	4.10	.806	3.170**	.002
Playability	4.03	.719	3.082**	.002
Flow experience	4.25	.514	3.414**	.001
Concentration	4.45	.561	3.436**	.001
Time distortion	4.33	.699	3.236**	.001
Autotelic experience	4.45	.465	3.431**	.001
Loss of self-consciousness	3.37	1.008	1.334	.182

\*p&lt;0.05, \*\*p&lt;0.01

Table 2 presented the statistical results of activity anxiety. Overall anxiety (M=2.62) was lower than the median (i.e., 3) of the scale, indicating that the learners were less anxious during the game. According to the game acceptance statistics, the overall acceptance (M=4.04), sub-dimensions cognitive usefulness (M=3.91) and cognitive ease of use (M=4.18) were significantly higher than the median of the scale (i.e., 3); and the game design element (M=4.23), was significantly higher than the median of the scale (i.e., 3). The results showed that the game was well accepted and not only did it help the learners at the cognitive level, the game was also easy to use. Kuo and Hou (2024) mentioned that learners were highly receptive and motivated to decision-based game-based training. Chien and colleagues (2023), on the other hand, mentioned that interactive and immersive contextual decision-making games, in addition to providing learners with a high level of concentration, also have high flow status and high acceptance.

Table 2: The Mean and Standard Deviation of Learners' Game Anxiety, Game Feedback, and Game Elements

(N=15)				
	<i>M</i>	<i>SD</i>	<i>Z</i>	<i>Sig.</i>
Game Anxiety	2.62	.783	-1.736	.083
Game Feedback	4.04	.700	3.24**	.001
Game Usefulness	3.91	.947	2.73**	.006
Game Ease of Use	4.18	.700	3.34**	.001
Game elements	4.23	.539	3.41**	.001

\*p&lt;0.05, \*\*p&lt;0.01

## Conclusions and Limitations

This study found that learners had a high degree of flow status, and moderate anxiety, and high acceptance of the game during the GAI decision-making game, which learners perceived as helping them develop their abilities, and also showed that the form of the game in dialogue with the GAI was acceptable to the learners. In addition, according to the feedback from the learners, 80% of the learners think that it is more anthropomorphic than the general GPT, and the conversation is more like a real person interaction. Some learners also mentioned that the

clues provided by the NPC characters were very helpful, including the characteristics of the location and the experience of the incident, which helped them to inference in decision-making.

In addition to the above findings, this study also identified some limitations and research directions. Decision making can be measured and explored in greater depth in the future, and the content of conversations between learners and GAI can be analyzed in greater depth. Include the content of the inquiry, the classification of clues, such as: the background story of the GAI character, the details of the kidnapping process, and the description of the captivity site, in order to better understand the learner's mastery of the clues and why to make the final inference.

### **Acknowledgments**

This research was supported by the “Empower Vocational Education Research Center” of National Taiwan University of Science and Technology (NTUST) from the Featured Areas Research Center Program within the framework of the Higher Education Sprout Project by the Ministry of Education (MOE) in Taiwan and projects from the Ministry of Science and Technology, Taiwan, under contract number MOST-110-2511-H-011-004-MY3 and MOST-111-2410-H-011-004-MY3.

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