The Impacts of Gameplay Anonymity and Competition/Cooperation Mode on a Multiplayer Educational Game

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Abstract: Learners as players may have different perceptions of educational games depending on contextual factors such as anonymity and competition/cooperation of gameplay. This study investigated the impacts of gameplay anonymity and competition/cooperation mode based on the multiplayer English vocabulary learning game *VocaMono*. A class of twenty six fourth grade elementary school students were recruited and exposed to four gameplay modes including anonymous/cooperation, non-anonymous/cooperation, anonymous/no cooperation, and non-anonymous/no cooperation. The results revealed the following findings. First, *VocaMono* is a well-designed digital game-based English vocabulary learning program with both high education and entertainment ingredients. Second, players tended to have higher enjoyment in anonymous modes. More players had the most willingness to recommend anonymous modes to others and had the most willingness to play anonymous modes again. Third, anonymous modes were more challenging. More players felt the most nervous and worried the most to lose in anonymous modes. Fourth, gameplay anonymity may increase the mental loading to implement both pedagogy and gameplay tasks on the game. Fifth, more players had the most intention to attack others in anonymous modes. Sixth, cooperation may reduce the gameplay anxiety and cognitive load. Seventh, players had lower goal commitment in cooperation modes. Finally, cooperation reduced players' attack behavior.

Keywords: educational games, anonymity, competition/cooperation, multiplayer game, English vocabulary learning game.

1. Introduction

The applications of information technologies on educational contexts are increasingly getting popular. Among these applications, educational games have got more interest by integrating learning materials into computer games to promote student-centered learning activities to help students drill facts, connect ideas, or synthesize discrete knowledge (Nettleton, 2008). While playing games, learners as players take control of the learning processes so that they are more willing to learn actively (Chen, 2011). One characteristic of computers is their "patience" in repetition and recycling tasks which conforms to the repeated exposure and practice requirements of effective learning so that educational games can be particularly effective in learning boring materials such as vocabulary learning (Prensky, 2001).

Games are primarily social processes. They are usually designed to compete with people or with time to stimulate players (Hwang, et al., 2013). Vandercruysee et al. (2013) stated that including competition in educational games may not only affect players' learning results but also their engagement or motivation by providing additional challenge, attention, motivational and active participation. Incorporating competition into educational games has both positive and negative effects (Lin et al., 2010). The positive effects of competition include stimulating the learning motivation which in turn promotes learning and sometimes shorten the whole learning processes (Burguillo, 2010). In multiplayer games, players can achieve better comprehension, retain the information longer, and enjoy learning more with active learning methodologies which can be structured to force learners to compete each other. The potential negative effects include the less trust between peers with the stress from competition and the reduction of motivation of incapable learners (Lin et al., 2010). Therefore, it is worthy to find solutions to take advantage from competitive learning with minimizing the negative effects, especially for multiplayer games. Recently, researchers have paid more attention on designing

game-based learning by combining competition and cooperation to moderate the negative effects of competitive learning and take the advantages of collaborative learning (Alessi & Trollip, 2001). Furthermore, the competition type and in-group cooperation levels may have impacts on players' behaviors in the game-based learning environment, which in turn influence their learning performances and motivation (Bailey et al., 2012; Vandercruysee et al., 2013).

In multiplayer games, it is important to realize inter-individual and intra-individual differences of how students act in educational games (Vandercruysee et al., 2013). Anonymity may regulate individual psychological states and perceptions, hence has an important impact on the individual behavior (Blau & Caspi, 2008; Dufwenberg & Muren, 2006). In the context of multiplayer games, the moderating effect of anonymity may have important implications (Yu et al., 2008). Players indicated that anonymous mode is more exciting, more stimulating because it is mysterious, more challenging, less stressful, less harmful to friendships, and easier to overcome stereotyping usually prevailing in the classroom as to who is performing well and bad (Yu et al., 2002). Blau & Caspi (2008) addressed that anonymity may serve as a shield to decrease the fear of criticism, therefore enhances participation and leads to a more risky behavior such as answering questions. On the other hand, in non-anonymous mode, players are easier to quarrel with opponents which may have a negative effect on interpersonal relationships, stressful to compete with those generally perform well in class, feeling terrifying and strained. Moreover, players may face those who they dislike in real life (Yu et al., 2002).

Recently, the impact of anonymity on behaviors has been investigated by researchers in areas such as social psychology and group decision making process (Dufwenberg & Muren, 2006; Knight & Chao, 1989). However, the impact of anonymity in the context of multiplayer educational games which integrate cooperation into competition has rarely been investigated. It is therefore important to explore how players play in multiplayer educational games with different gameplay anonymity and competition/cooperation contexts. This study aimed to investigate the impacts of gameplay anonymity and competition/cooperation mode on a multiplayer educational game.

2. Research Design

2.1 The Game

This study was conducted with a multiplayer English vocabulary learning game, *VocaMono* (Lo & Hsin, 2014). Being adapted from the famous game *Monopoly*, though being added with vocabulary learning activities, *VocaMono* is designed as a competitive multiplayer game which has similar gameplay rules with which players are familiar. Each player has two attributes: *money* and *credit*. The ultimate game goal of a player is to become the richest player. Players play the game synchronously. The player first clicks two rolling dices to show the number of steps which his/her token moves forward along the path on the game board. The vocabulary learning activities are integrated into the gameplay rules by requiring the player to find a correctly spelled word by dragging and dropping a series of alphabet tiles which are selected according to the defined pedagogical scopes. Spelling words correctly can increase players' credit points. Credit points can be used to trade cards to strategically play the game. Two types of cards are designed: *Self-reinforcement* cards to increase self-competitiveness and *Trap* cards to attack others. The player may choose to use cards before spelling words. Players find words either by recalling from memory or by trial and error with any combination of alphabets. A system embedded dictionary can facilitate players the trial and error process. Multiple words are possibly found with the same alphabet tiles. If a word is correctly spelled, the player's credit points increase based on the sum of each alphabet's point. Adopted from the spelling game *Scrabble*, alphabets' points are based on alphabets' possibilities to form words so that players are encouraged to spell more difficult words. The number of alphabet tiles is seven and the selected alphabet tiles are randomly ordered. In each turn, the system firstly randomly selects a word, from the vocabulary bank, whose length does not exceed seven alphabets. If the length of a selected word is less than seven, the remaining tiles are randomly chosen. For example, if the word **PLAY** is selected and the remaining three alphabets **I, G,** and **N** are randomly selected with the order A_1, P_3, Y_4, G_2, N_1, I_1, L_1. Players can find the target word **PLAY** (3+1+1+4=9 points) or other words, e.g. **LIP** (1+1+3=5 points), **PAY** (with 3+1+4=8 points). Figure 1 illustrates the *VocaMono* game board interface.
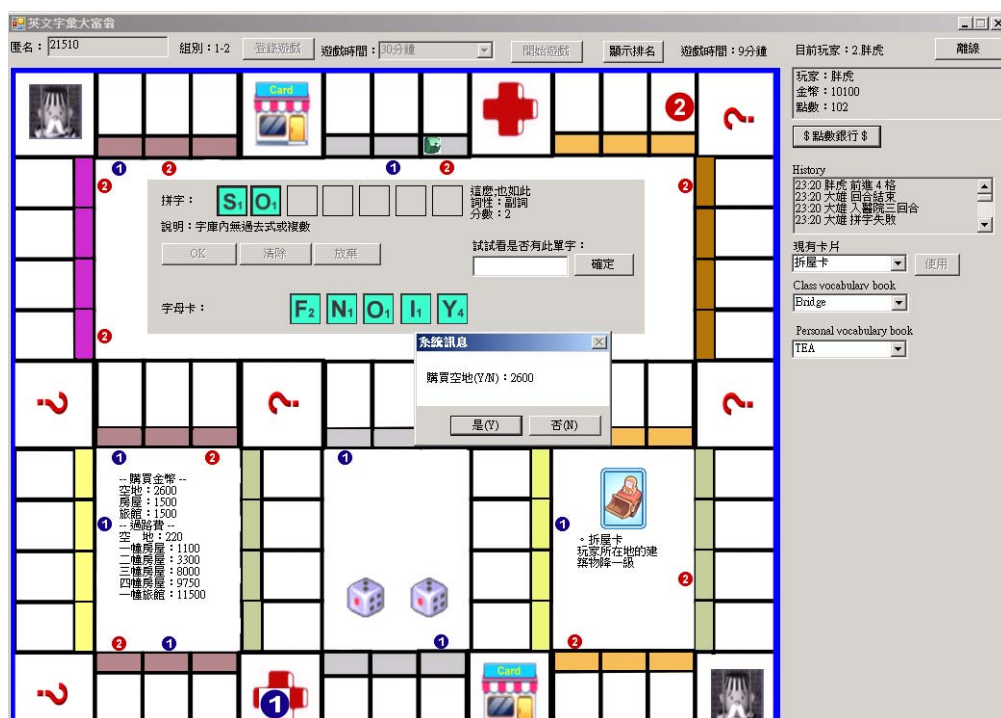
Figure 1. Illustration of *VocaMono* game board interface (no cooperation mode).

In *VocaMono*, three pedagogical scaffolding tools, *Class vocabulary book*, *Personal vocabulary book*, and *Dictionary*, are provided to facilitate learning (see Figure 1). *Class vocabulary book* includes target words corresponding to the learning goal. To encourage players to practice words in *Class vocabulary book*, if a word in *Class vocabulary book* is correctly spelled, double credit points will be rewarded for this word. All players share the same *Class vocabulary book* and they can always look up *Class vocabulary book* as references to find words. *Personal vocabulary book* records the correctly spelled words of an individual player. The player can review his/her own *Personal vocabulary book*. At the end of the gameplay, *Personal vocabulary book* provides summary of players' learning report which can be used to estimate their competence of vocabulary learning. *Dictionary* is designed to facilitate players to implement the trial and error process in spelling and recognizing words.

2.2 Experimental Setting

A class of twenty six fourth grade elementary school students was involved in this study. They were randomly divided into seven groups, six groups with four players and one group with two players. Before the experiment, there was a ten-minute introduction for *VocaMono* and players played the game for ten minutes to get acquainted with the game. Then they played the game four times, each with a different gameplay mode. The intervals between gameplays were two or three days and each gameplay took thirty minutes. The sequence of gameplay modes was anonymous/cooperation, non-anonymous/cooperation, anonymous/no cooperation, and non-anonymous/no cooperation. The cooperation modes were implemented by exchanging the alphabet tiles between players within the same team. Players can see their partners' alphabet tiles on the game board. A player can negotiate with his/her partners through the system embedded chat room for exchanging alphabet tiles or discussing gameplay strategies. The partner may or may not agree to exchange alphabets. Each team included two players. Team partners share the same ultimate game goal. Their gaming scores will be summed and the winning condition will be based on the summed scores.

After playing all gameplay modes, players completed a questionnaire to investigate which gameplay mode they perceive the most on vocabulary learning and gameplay experiences. This questionnaire included six variables, learning, enjoyment, gameplay anxiety, goal commitment, cognitive load, and attack behavior. Learning refers to one's beliefs and feelings regarding the learning that has occurred through a retrospective evaluation of the learning experience. It reflects learners' sense of acquiring knowledge in the learning process (Barzilai & Blau, 2014). Barzilai & Blau (2014)

addressed that in the context of game-based learning, self-assessment of learning is important because it not only involves metacognitive monitoring and evaluation, which might lead them to spend more time to play the game and recruit more cognitive resources but also relates to players' satisfaction with the environment. Enjoyment refers to "a positive reaction to an experience that involves intertwined physiological, affective, and cognitive dimensions" (Barzilai & Blau, 2014). The most important element for educational games is to keep players motivated. Enjoyment may stimulate players' motivation to play the game which in turn enhance their learning. It is therefore important to lead players to enjoyment during the gameplay. Gameplay anxiety refers to a feeling of apprehension and tension during the performance of the game. In multiplayer games, players compete for resources, rewards, and the possibility to win. The imbalance between players' perceived demands and the perceived corresponding capability causes gameplay anxiety. Goal commitment refers to the extent to which a player intends to win the game. Cognitive load refers to the mental loading to implement a particular task imposed on the game. It is the player's expectation of the amount of information processing to complete tasks in the game. Attack behavior refers to the intention of a player to use *Trap cards* during the gameplay.

3. Results

The results of players' perceptions among all gameplay modes are listed in Table 1. For *Learning*, no players responded that no mode helped them learn vocabulary. It implied that all players thought the game was beneficial to their vocabulary learning for both learning new words and memorizing taught words. Similarly, for *Enjoyment*, no players responded that they did not enjoy the game, want to recommend the game to others, and want to play again. It implied that all players liked to play the game. The results revealed that *VocaMono* is a well-designed digital game-based learning program with both high education and entertainment ingredients.

Table 1: Players' perceptions among all gameplay modes.

Variable	Item	A/C	NA/C	A/NC	NA/NC	All	Neither
Learning	The mode I learned the most new words.	5	7	6	3	5	0
	The mode helped me memorize the most words.	2	5	11	2	6	0
Enjoyment	The mode I enjoyed the most.	1	7	8	2	8	0
	The mode I would recommend to others the most.	3	3	7	3	10	0
	The mode I have the most willingness to play again.	2	6	10	2	6	0
Gameplay anxiety	The mode I felt the most nervous.	7	0	9	5	4	4
	The mode I worried most to lose.	3	1	11	6	2	3
Goal commitment	The mode I had the most intention to win.	1	4	8	5	6	2
Cognitive load	The mode I felt the hardest to spell words	3	2	7	2	6	6
	The mode I felt the easiest to operate	2	10	3	3	7	1
Attack behavior	The mode I had the most intention to use *Trap cards*	3	2	10	5	2	4

A/C: Anonymous/Cooperation; NA/C: Non-Anonymous/Cooperation;
A/NC: Anonymous/No Cooperation; NA/NC: Non-Anonymous/No Cooperation
All: The same for all modes; Neither: No mode fit the item.

To realize the impact of gameplay anonymity, the frequencies of players' responses of anonymous modes (summed with anonymous/cooperation and anonymous/no cooperation modes) and non-anonymous modes (summed with non-anonymous/cooperation and non-anonymous/no cooperation modes) are compared. The results revealed that players tended to have higher enjoyment in anonymous modes. Ten players had the most willingness to recommend anonymous modes to others and twelve players had the most willingness to play anonymous modes again. However, only six players had the most willingness to recommend non-anonymous modes to others and eight players had the most willingness to play non-anonymous modes again. This result is consistent with Yu et al. (2002). The result also revealed that anonymous modes were more challenging. Sixteen players felt the most nervous and fourteen players worried the most to lose in anonymous modes. However, only five players felt the most nervous and seven players worried the most to lose in non-anonymous modes. Gameplay anonymity may increase the mental loading to implement both pedagogy and gameplay tasks. Ten and five players felt hard to spell words and easy to operate in anonymous modes, respectively. Four and thirteen players felt hard to spell words and easy to operate in non-anonymous modes, respectively. Gameplay anonymity has an important impact on players' behavior, too. More players had the most intention to use *Trap cards* in anonymous modes. It is consistent with Blau & Caspi (2008) who addressed that anonymity in cyberspace may serve as a shield to decrease the fear of criticism, therefore enhances participation and leads to a more risky behavior such as attacking others.

The impact of gameplay competition/cooperation modes is investigated by comparing the frequencies of players' responses of cooperation modes (summed with anonymous/cooperation and non-anonymous/cooperation modes) and no cooperation modes (summed with anonymous/no cooperation and non-anonymous/no cooperation modes). The results revealed that cooperation during gameplay enables may reduce the imbalance between players' perceived demands and the perceived corresponding capability. For *Gameplay anxiety*, seven players felt the most nervous and four players worried the most to lose in cooperation modes. However, fourteen players felt the most nervous and seventeen players worried the most to lose in no cooperation modes. Players had lower *Cognitive load* in cooperation modes. Five and twelve players felt hard to spell words and easy to operate in cooperation modes, respectively. Nine and six players felt hard to spell words and easy to operate in no cooperation modes, respectively. The results also showed that players had lower *Goal commitment* in cooperation modes. Five players had the most intention to win in cooperation modes, however, thirteen players had the most intention to win in no cooperation modes. It might be resulted from the summation of game scores and sharing of the same game goal in cooperation modes. Players might rely on their partners. In cooperation modes, five players had the most intention to use *Trap cards*, however, fifteen players in no cooperation modes.

4. Conclusions

The effect of game-based learning is highly determined by how students perceive educational games. Students as players may have different perceptions of educational games depending on contextual factors such as gameplay anonymity and competition/cooperation mode. Anonymous environments hide players' personal profiles, hence decrease social pressure which in turn may influence players' behaviors. The competition type and cooperation levels may have impacts on players' behaviors, too. These factors may in turn influence players' learning and motivation in the game-based learning environment. As a consequence, based on the multiplayer English vocabulary learning game *VocaMono* (Lo & Hsin, 2014), this study investigated the impacts of gameplay anonymity and competition/cooperation modes of multiplayer educational games.

A class of twenty six fourth grade elementary school students were recruited and exposed to four gameplay modes with different gameplay anonymity and competition/cooperation modes. The results revealed the following findings. First, *VocaMono* is a well-designed digital game-based English vocabulary learning program with both high education and entertainment ingredients. Second, players tended to have higher enjoyment in anonymous modes. More players had the most willingness to recommend anonymous modes to others and had the most willingness to play anonymous modes again. Third, anonymous modes were more challenging. More players felt the most nervous and worried the most to lose in anonymous modes. Fourth, gameplay anonymity may increase the mental loading to implement both pedagogy and gameplay tasks on the game. Fifth, more players had the most intention

to attack others in anonymous modes. Sixth, cooperation may reduce the gameplay anxiety and cognitive load. Seventh, players had lower goal commitment in cooperation modes. Finally, cooperation reduced players' attack behavior.

Acknowledgements

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