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Gender Differences in Flow State in an English Learning Environment Achievement System

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Abstract: In recent years, a growing number of studies have been conducted on the individual differences in digital game-based learning (DGBL). Despite this growing interest, there is a lack of sound empirical evidence on individual differences (e.g., gender differences) in flow state in achievement systems in English learning environments. This study investigated whether any gender differences existed in such a system. To this end, the current study developed an achievement system including a reward mechanism-based design with learning features (i.e., interaction and rewards for correct answers) to facilitate English learning. An experiment was conducted. A total of 50 respondents participated in the study. Data were analyzed using independent sample t-tests. The results revealed that the female respondents had significantly higher mean scores for flow state than the males.

Keywords: Achievement system, English learning, flow state, gender, reward mechanism-based design.

1. Introduction

Recently educators have focused on digital game–based learning (DGBL) for language learning. In authentic use, however, the perception of flow state in the digital games used in the foreign language classroom remains limited for individual learners. Individual differences could be caused and sharpened by a learner's average intelligence, special ability, gender, and so on. The increasing individual differences make DGBL systems more difficult to design for each English language learner.

Numerous studies have attempted to explain the benefits of digital games in learning (Ronimus, Kujala, Tolvanen, & Lyytinen, 2014). For example, during play, children practice skills (De Grove, Bourgonjon, & Van Looy, 2012) and actively solve meaningful problems (Price & Rogers, 2004).

Recently, researchers have begun to focus on the elements that comprise game-based learning (Wilson et al., 2009) such as achievement-based reward systems, and rewards and achievement associated with game rules (Charles, Charles, McNeill, Bustard, & Black, 2011) that provide missions and objectives to challenge players for rewards. Rewards are a kind of positive feedback which encourage the player to continue the game, and providing fun and experience (Wang & Sun, 2011).

One fundamental aspect that is often included in the "rewards based mechanism" of a game is the ability of the game to create a flow state for the gamer. Potential control is one of the antecedents of flow (Finneran & Zhang, 2003) which leads to improved learning outcomes (Skadberg & Kimmel, 2004) by achieving a reward. In addition, Wang and Sun (2011) mentioned that flow state is generally used to analyze the rewarding experience of the learner. They used three of the characteristics of flow state to analyze how reward systems offer positive experiences: balance between challenge and skill, clear goals, and immediate feedback. In addition, different players have different flow states during a game. For example, different genders' performance differs while playing. Boys tend to focus on the achievements whereas girls are more likely to be concerned with building relationships with other players (Williams, Consalvo, Caplan, & Yee, 2009).

The current study designed an achievement system including a reward mechanism (i.e., expected and unexpected rewards) for a game-based English learning environment, with the aim of investigating whether there were any gender differences in the flow state while using the system.

2. Literature review

2.1 Gender differences

Numerous studies have been conducted to explore the effect of gender differences on performance in games. Wood, Griffiths, Chappell, and Davies' (2004) study found significant gender differences in relation to some of the game dynamics such as males rating skill development significantly higher, and preferring shooting and a variety of different forms of transportation within a game compared to females. On the other hand, significantly more females preferred solving puzzles, avoiding things (e.g., dangerous places, spells), and finding important things, and were more in favor of points accumulation than males. Inal and Cagiltay (2007) mentioned that gender differences played an important role in children's game preferences. They found that boys preferred fighting or war games whereas girls preferred Barbie-like games. Heeter, Lee, Medler, and Magerko (2011) found gender differences in an achievement system. For example, boys generally emphasize performance and super-achievement, while on the other hand, girls are more likely to be classified as non-achievers, with low performance and mastery gaming achievement goals. They are also less motivated by exploration or achievement. Females are more likely to prefer to play alone, and dislike competing to outplay other players.

2.2 Flow state within an achievement system

The present study defined flow state as one's engagement, fun/enjoyment and control while participating in an achievement system. Previous work has proposed that these indicators (engagement, enjoyment, and control) can be used to provide an overall impression of flow while learning (Trevino & Webster, 1992). A flow activity is one in which the mind becomes easily focused and engaged in an activity and learning (Whitson & Consoli, 2009), which makes it of particular interest to the serious games community, for whom engagement and learning are key concepts. Thus, engagement in an activity is a fundamental aspect of flow experience, setting the foundation for continuing learning. Other flow activities, including intellectually demanding tasks, can also be enjoyable and satisfying, and can enhance creative accomplishment and satisfaction. Such feelings may occur mainly in retrospect because all concentration is focused on the task during actual engagement (Csiksczentmihalyi, Kolo, & Baur, 2004). One's potential control leads to improved learning outcomes (Skadberg & Kimmel, 2004).

In this study, we use the concept of flow (Csiksczentmihalyi et al., 2004) in an achievement system including a reward mechanism which allows learners to continue their English learning activities. Moon, Jahng, and Kim (2011) argued that the reward system in a game is recognized as one of the most important mechanisms to engage players in active sustainable digital game playing. As Chen et al. (2009) proposed a game-based learning system including learning features such as being competitive, interactive, and visible, to design a reward mechanism-based trading card game, which was used to stimulate learners' motivation and increase their willingness to use it. The current study developed an achievement system including a reward mechanism to see whether gender differences have any impact on learners' perceptions of flow state within the proposed system.

3. Research method

3.1 System design and implementation

There are two parts to the achievement system design, the architecture of the system and English learning activities. The descriptions of these two parts are given below.

3.1.1 Architecture of the achievement system

In the achievement system, the rewards can be divided into two categories, that is, expected and unexpected reward achievement. Expected reward achievement allows learners to obtain the game goal, which is one of its criteria. For unexpected reward achievement, learners are faced with different

challenges. Once they can tackle the different situations in the game, they will have rewards and enhance their gaming experience.

There are two kinds of expected rewards, learning rewards and interactive rewards, where learning rewards are gained by answering multiple choice questions and completing problem sets. In this design, the learning rewards are designed to encourage the learners to answer the questions so as to gain the desired rewards. The more questions that are answered correctly, the better ranking will be achieved along with gaining the rewards. Interactive rewards consist of playing ball, jump rope and shopping. The design of these interactive rewards allows learners to try a variety of games in the achievement system which will enhance their gaming skills. Thus, they are not only able to develop their gaming skills, but can also buy things. For the unexpected rewards, there are three kinds of reward achievement, namely teaching, mastering, and collecting. Thus, learners will become familiar with the system through achieving rewards. After finishing the game and fulfilling the reward requirements, the learner will get immediate feedback, as shown in Table 1. This feedback system helps students to understand their gaming goals. In this way, learners will be motivated to pursue a variety of challenging goals in the game as well as enhancing English learning. In this system there are many criteria such as progressive achievement, which is designed for the learners to face the challenges of similar tasks with many difficulties. Progressive achievement provides status rewards including gold, silver and bronze rewards. In the game, the learner needs to achieve bronze, then silver, and finally gold. The different levels of icon are shown in Table 1.

Table 1: After achieving reward with different levels of reward icon

			Bronze		Silver		Gold	
Expected	Learning	MCQ-1	Stone+2		Stone+2		Stone+3	
		MCQ-2	Stone+3		Stone+3		Stone+4	
	Interactive	Play ball	Power+5		Power+10		Power+15	
		Jump rope	Power+5		Power+10		Power+15	
		Buy something	Money+50		Money+100		Money+150	
Unexpected	Understand game	Teach	Water+1					
		Master	Money+300					
		Collect	Money+500					

3.1.2 English learning activities

After logging the game, the learners are able to see the English learning content which is consist of alphabets, words and sentences. These three contents were chosen because language learning starts with lower to higher-level representations. The exercises of the learning content are designed as multiple choice questions (MCQ) and problem sets. In the process of learning activities there were a total of 360 questions where learners need to practice. Participating MCQ a learner can achieve different virtual reward and feedback. Rewards are provided by performing English learning activities from the English learning contents of the system.

Hamari and Eranti (2011) mentioned that game rewards can affect players' performance. In the achievement system design an English learner can have a reward which is visible on the screen, as shown in Figure 1(a). The system shows the rewards in words and pictorial representation. Therefore, learners may choose their desired rewards. Before they get the reward, it is shown in dark on the screen. After receiving the reward the color will change to bright. Then, learners can take challenges to win more difficult rewards by performing English learning activities. Once they finish the challenge, the system will inform the learner of their completion of the goals and of the rewards they have gained. The

achievement system will show the rewards they have acquired by English learning, as in Figure 1(b). Learners can see the acquired rewards, the grade and the quantity of rewards. The learners could then prepare for the next challenge in the game.

Figure 1(a). The Interface of Achievement System

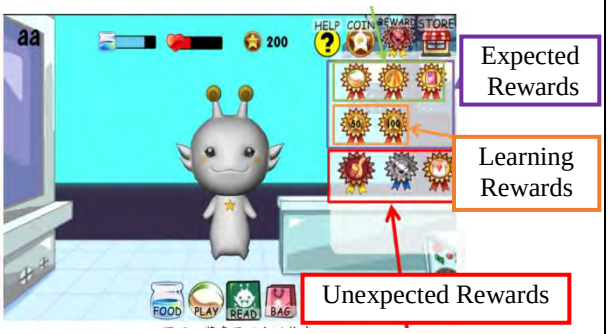

Figure 1(b). The Interface of reward presentation in the game

Figure 1. Achievement system screen

3.2 Instruments

There are two kinds of research tools used in this study. Table PCs were used as the hardware, and a questionnaire was developed to survey the learners' flow state performance while using the achievement system. A total of 11 question items were developed for identifying the players' flow state. The questionnaire was adapted from Pearce, Ainley, & Howard, (2005), and was slightly modified to fit the present study context. There were four questions for control, four for fun (enjoyment) and three for engagement. Each item was rated on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The Cronbach's alpha for the flow state items was .82.

3.3 Participants and procedure

The questionnaire was distributed to third grade students of an elementary school in northern Taiwan, in a paper-based format. A total of 53 students participated in this study, three of whom did not complete the questionnaire, giving a valid sample of 50 (94%). There were 26 (52%) males and 24 (48%) females. The respondents were 9 to 10 years old.

An experiment session was conducted once a week for two times. The total time of the three experiment sessions was about 140 minutes. The students were first introduced to the features and usage of the system including the tablet and the game with the achievement system. The researchers then guided the students through all of the different types of English learning activities. The students took turns test driving the system, and their reactions to and interactions with the system were captured.

4. Results

4.1 Learner's activity on achievement system and gender differences in the use of the achievement system

Activity on achievement system and the results of the t-tests are presented in Table 2. As can be seen, the female respondents' number of view times is higher than that of the males. Independent sample t-tests were used to compare the differences between the male and female learners in their use of the achievement system and flow sate. In Table 2, the results portray that the male respondents had higher mean scores for interactive rewards, learning rewards, unpredictable rewards and total number of rewards than the females. The t-test results show that the difference between the males and females for the interactive dimension's mean score was significant ($t = 2.10$, $p < 0.05$) but for the other values it was not. Compared to the female (5.29) respondents, the males (6.04) achieved more interactive rewards in the achievement system.

Table 2: Achievement system of each variable

Variable	Gender	Number of respondents	Maximum	Minimum	Mean	SD	t
Number of view times	Male	26	35	1	21.38	9.87	-0.01
	Female	24	51	5	21.42	12.83	
Interactive rewards	Male	26	8	4	6.04	1.00	2.10*
	Female	24	8	1	5.29	1.46	
Learning rewards	Male	26	6	3	4.38	0.85	0.47
	Female	24	6	2	3.25	1.15	
Unpredictable rewards	Male	26	3	2	2.65	0.49	0.46
	Female	24	3	1	2.58	0.58	
Total number of rewards	Male	26	16	9	13.08	1.70	1.45
	Female	24	16	4	12.21	2.45	

4.2 Gender differences in the flow state in the achievement system

In Table 3, the results portray that the female respondents had higher mean scores for flow state than the males. The t-test results showed that the difference between the males and females in the flow state dimension's mean score was significant ($t = -2.50$, $p < 0.05$). Compared to the male (46.28) respondents, the females (49.42) were more involved in the pursuit of the goal rewards in the achievement system.

Table 3: Gender differences in the flow state

	Gender	Number of respondents	Mean	SD	t
Flow state	Male	26	46.28	5.35	-2.50*
	Female	24	49.42	3.38	

*P<.05

5. Discussion and conclusion

The results of this study showed that gender differences played a significant role in predicting individuals' flow state, and that the female respondents had higher mean scores for flow state than the males. Taken together, these findings affirm the predictive power of the gender role theory, and highlight the importance of including gender as an independent variable in future work among game-based learners.

The several findings will be covered individually, followed by a discussion of the related theory. At the broadest level, the findings support past research (Wood et al., 2004) which has found that more females than males prefer accumulating points and finding bonuses. In this study, one of the features of the achievement system, "buying clothes," influenced girls' behavior more than boys' and enhanced the girls' contribution to the game, while the boys were easily influenced by other factors of the game. In addition, when the learners could see their game ranking among all learners, they were more competitive and discussed the game with others, which enhanced their motivation and accomplishment of the goal. As predicted, the male students achieved more interactive rewards than the females, and there was a significant difference while interacting with special characters, such as aliens. Our results are quite similar to those of Heeter et al.'s (2011) study in which they found that males were significantly more likely than females to be super-achievers while interacting. Thus, interaction is needed as they found that interaction was high among group members when the learners found a new game or after they achieved a given task in a game. While interacting, Inal and Cagiltay (2007) mentioned that flow experience mostly occurs among group members while they are working on difficult levels of a game and after they pass to the next level. Their results revealed that flow experience occurs more often among boys than girls during gameplay, which is quite similar to the interaction part of this study.

One of the limitation of this study is the experiment time was short (i.e., only two times), due to their regular classes, school activities, school examinations and a time limit on the game play. It is

suggested that future research could allocate more time for the experiment; then, the understanding of learners' perceptions of flow state in an achievement system for learning English will be better. One of the implications of this study is that educators could be better informed to think about how to leverage the differences in individuals' to come up with better pedagogical DGBL designs to improve their students' English learning performance.

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References

Charles, D., Charles, T., McNeill, M., Bustard, D., & Black, M. (2011). Game-based feedback for educational multi-user virtual environments. *British Journal of Educational Technology, 42*(4), 638-654.

Chen, P., Kuo, R., Chang, M., & Heh, J.-S. (2009). Designing a Trading Card Game as Educational Reward System to Improve Students' Learning Motivations *Transactions on Edutainment III* (Z.Pan et al. ed., pp. 116-128). Verlag Berlin Heidelberg: Springer.

Csikszentmihalyi, M., Kolo, C., & Baur, T. (2004). Flow: The psychology of optimal experience. *Australian Occupational Therapy Journal, 51*(1), 3-12.

De Grove, F., Bourgonjon, J., & Van Looy, J. (2012). Digital games in the classroom? A contextual approach to teachers' adoption intention of digital games in formal education. *Computers in Human behavior, 28*(6), 2023-2033.

Finneran, C. M., & Zhang, P. (2003). A person–artefact–task (PAT) model of flow antecedents in computer-mediated environments. *International Journal of Human-Computer Studies, 59*(4), 475-496.

Hamari, J., & Eranti, V. (2011, September, 14-17). *Framework for designing and evaluating game achievements.* Paper presented at the Proc. DiGRA 2011: Think Design Play, Hilversum, Netherlands.

Heeter, C., Lee, Y.-H., Medler, B., & Magerko, B. (2011). *Beyond player types: gaming achievement goal.* Paper presented at the Proceedings of the 2011 ACM SIGGRAPH Symposium on Video Games.

Inal, Y., & Cagiltay, K. (2007). Flow experiences of children in an interactive social game environment. *British Journal of Educational Technology, 38*(3), 455-464.

Kapp, K. M. (2012). *The gamification of learning and instruction: game-based methods and strategies for training and education*: John Wiley & Sons.

Moon, M.-K., Jahng, S.-G., & Kim, T.-Y. (2011). Computer- Assited Learning Model Based on The Digital Game Exponential Rewards System. *Turkish Online Journal of Educational Technology, 10*(1), 1-14.

Pearce, J. M., Ainley, M., & Howard, S. (2005). The ebb and flow of online learning. *Computers in Human behavior, 21*(5), 745-771.

Price, S., & Rogers, Y. (2004). Let's get physical: the learning benefits of interacting in digitally augmented physical spaces. *Computers & Education, 43*(1), 137-151.

Ronimus, M., Kujala, J., Tolvanen, A., & Lyytinen, H. (2014). Children's engagement during digital game-based learning of reading: The effects of time, rewards, and challenge. *Computers & Education, 71*, 237-246.

Skadberg, Y. X., & Kimmel, J. R. (2004). Visitors' flow experience while browsing a Web site: its measurement, contributing factors and consequences. *Computers in Human behavior, 20*(3), 403-422.

Trevino, L. K., & Webster, J. (1992). Flow in computer-mediated communication electronic mail and voice mail evaluation and impacts. *Communication research, 19*(5), 539-573.

Wang, H., & Sun, C.-T. (2011). Game reward Systems: gaming experiences and social meanings. *Research Paper, Department of Computer Science, National Chiao Tung University, Taiwan*.

Whitson, C., & Consoli, J. (2009). Flow theory and student engagement. *Journal of Cross-Disciplinary Perspectives in Education, 2*(1), 40-49.

Williams, D., Consalvo, M., Caplan, S., & Yee, N. (2009). Looking for gender: Gender roles and behaviors among online gamers. *Journal of communication, 59*(4), 700-725.

Wilson, K. A., Bedwell, W. L., Lazzara, E. H., Salas, E., Burke, C. S., Estock, J. L., . . . Conkey, C. (2009). Relationships between game attributes and learning outcomes review and research proposals. *Simulation & Gaming, 40*(2), 217-266.

Wood, R. T., Griffiths, M. D., Chappell, D., & Davies, M. N. (2004). The structural characteristics of video games: A psycho-structural analysis. *CyberPsychology & behavior, 7*(1), 1-10.