The Effect of Prior Knowledge and Flow on the Understanding of Poetry in Game-Based Learning

Hsin-Yi LIANG, Sheng-Yi WU and Sherry Y. CHEN*
Graduate Institute of Network Learning Technology, National Central University, Taiwan
*sherry@cl.ncu.edu.tw

Abstract: Poetry is the most concise language, which is full of creativities. Reading poetry enhances imaginations. However, many teachers find it hard to teach poetry because of the lack of pedagogical role model and the difficulties of explanation. Moreover, the difficulties to interpret the meanings of poetry also decrease student's learning motivation. On the other hand, game-based learning has been widely used to promote student learning. Thus, to improve students' motivation and the level of their understandings of poetry, this study uses a game-based learning environment to guide students interpreting poetry. Previous research found that prior knowledge and flow have positive effects on student learning so this study also examines the effects of these two factors on the understandings of poetry in the game-based learning environment. The result shows that game-based learning improves students' motivation to read poetry, but the ignorance of descriptions and the difficulty of games should be concerned to improve learning effectiveness.

Keywords: Poetry, Game-based learning, Flow, Prior Knowledge, Game Experience

1. Introduction

Poetry is the most concise language (Müller-Zettelmann, 2005). Reading poetry not only enhances imaginations, but also provides a different view of everyday experience (Harbus, 2002).More importantly, poetry evokes the empathy and self-discovery (Lee, 2000). In other words, poetry is valued for moral education in humanities (Kuzu, 2010).

Although poetry is worth in many aspects, it is difficult to teach for many teachers (Cao, 2009). Hughes (2008) notes that the lack of pedagogical role models and difficulties to explain poetry are main issues in education. Besides, hard to interpret the meanings of poetry decreases students' learning motivation (Hughes, 2008; Cao, 2009).Therefore, to promote student learning, digital technology is employed in poetry education (Müller-Zettelmann, 2005; Black, 2008; Cao, 2009). Indeed, a new form of poetry writing has been developed. This new genre of poetry is called digital poetry. Many poets believe that digital poetry motivates student reading poetry for its playfulness and visual attractions (Freitag, 2008). However, because digital poetry is written by complex sign systems, it is even harder to understand when comparing to traditional poetry. As a result, it is argued that digital poetry is able to promote poetry (Schreibman, 2008).

Therefore, to motivate students learning poetry, there is a need to address the importance to improve the understanding level of poetry. From the theory of empathy, it is hard to understand poetry due to the gap of emotional experience between poets and students (Lee, 2000; Müller-Zettelmann, 2005). Furthermore, previous studies showed the positive effect of prior knowledge in learning (Dumas, 1999; Quaiser-Pohl, 2005; Moos, 2009). Therefore, to bridge the gap between the differences of emotional experience and

prior knowledge, game is able to reproduce similar experience from narratives (Ryan, 2009). Moreover, game also avoids ambiguity by providing clear goals and feedback (McDougall, 2008). To this end, game-based learning has been widely used to promote positive learning effects (Cao, 2009; Papastergiou, 2009). In this vein, this study designs a game-based learning system to build students' interpretation skills of digital poetry. Indeed, the game-based learning system is expected to improve the level of students' understandings of poetry.

In brief, empathy may play a role to understand poetry. Therefore, this study also examines how the empathy affects students to interpret poetry. Moreover, there is a need to quantify the empathy level. Because flow refers to a state which a player is totally involved in the reproduction of similar experiences in games (Csikszentmihalyi, 1977), flow is referred to understand students' empathy level in this study. In summary, this study attempts to answer the followed research questions: (1) how prior knowledge, including game experience and literature experience, affects flow and (2) the levels of the understandings of poetry, indeed (3) how flow affects the levels of the understandings of poetry.

2. **Methodology**

2.1 Research design and experimental procedures

Figure 1 show the research model of this study. Prior knowledge was examined from two aspects, knowledge of system used (game experience) and domain (literature experience) (Dumas, 1999). The former includes frequencies and quantities of playing games while the latter contains frequency, reading preference, and writing preference.

Based on the empathy theory, we conducted an experiment to examine the effect on flow firstly, and then evaluated how it affected the levels of understandings of poetry. The experiment was taken place in a lecture for all of the participants. In the beginning, a 10-minute talk was given to introduce digital poetry, and then they were asked to play the game and clear all the levels. There are no limitations for playing time. In other words, players were allowed to decide their own progresses. After they cleared the levels, they were asked to fill out a questionnaire to give feedback. The total time was about 60-80 minutes.

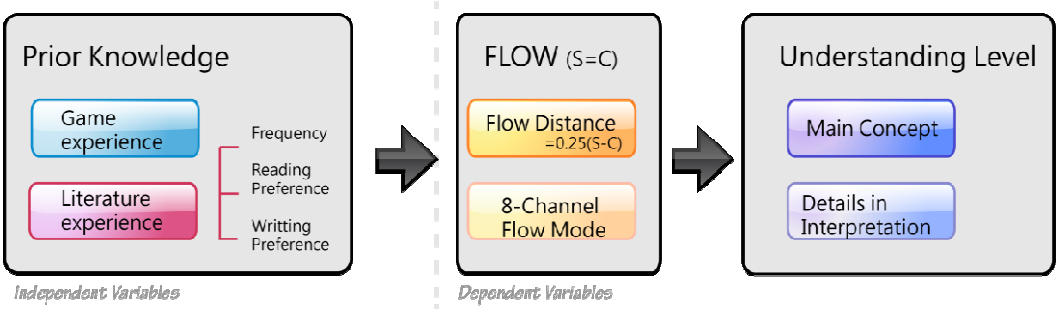

Figure1.The research model of this study

2.2 Participants

44 undergraduate students in Taiwan participated in this study. All participants had the basic computer and Internet skills necessary to play a game-based learning system but they do not have any experience and understandings of digital poetry.

2.3 Research Instruments

2.3.1 A web-based game: Skysea

A game-based learning system was designed to guide students interpreting digital poetry. The game-based learning system used narrative stories so that students' imaginations in a formal way of reading poetry are not limited.

The game included four levels, and each level was a digital poem written from single (the linguistic signs) to multiple sign systems (plus the visual and kinetic signs). Because students' actions played a key role to express the meanings of digital poetry, there were both short conversations and poems to guide students' actions in the beginning of levels (Figure2). Besides, to help students interpret the meanings of their actions, there was an animation, which provides further explanation after they cleared the level.

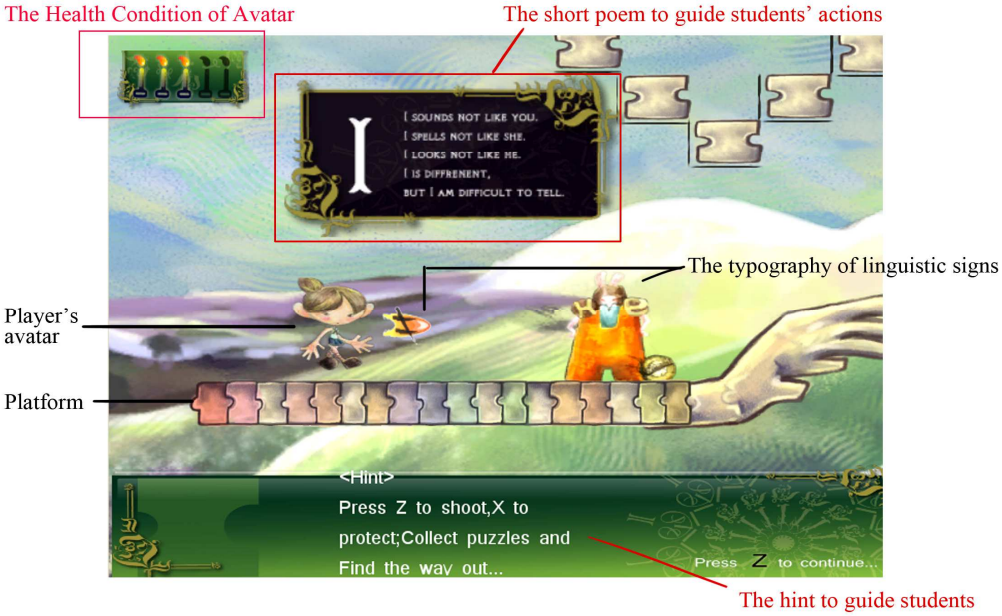

Figure2 .The opening hint of Level 2 of Skysea

2.3.2 Feedback Questionnaire

The questionnaires include three sections: (a) basic personal information and prior knowledge, including both game experience and literature experience; (b) a flow questionnaire designed by Novak (1997); and (c) 17 open questions to identify students' gaming experience and the levels of their understandings.

Regarding Section A, game experience and literature experience were assessed by self-report questions. Students were asked to rate the frequency of playing games, reading and writing. The frequency was rated in a 5-points scale. There were two questions assessing students' reading and writing frequency. The items were rated from 1 to 5, including "never", "seldom", "often", "usually" and "everyday". The frequency of game experiences was assessed based on the definitions by the International Game Developer Association (IGDA, 2012), of which classification is displayed in Table 1.

Table1. The classification of game experience

Number	Classification	Playing frequency	Game quality	Players' number (N)
1	Non-game players	Never	0	8
2	Casual players	Half hour per day	>=1	14
3	Mid-core players	Less than 1 hour per day	>=1	13
4	Core players	More than 1 hour per day	>=1	7
5	Hard-core players	Over 3 hours per day	>2 games at a time	2

The preference was assessed by 4 multiple-choice questions. Two questions asked students to select their preferred game platform and genre. The other two questions were related to the publication type and writing preference. For a statistic purpose, the literature genres were collapsed into"1" category and the "non-literature" genres were collapsed into "0" category. In the next section, the questions were adapted from Novak (1997)'s flow questionnaire. There were two parts in this questionnaire. The first part assessed students' skills and challenge from ten 9-points scale questions. All questions were rated from 1 for "strongly disagree" to 9 for" strongly agree". The last part assessed each channel of flow mode.11 questions were rated in 9-points scale from bipolar statements. The mean score of each channel was calculated for further data analysis.

The last section examined players' gaming experience and the levels of their understandings. Students were asked to answer five open questions, which are concerned with the meanings of poetry. Their answers were assessed by the details, logic rations and relationships with the main concept of the game. The total score was from 0 to 10.

2.4 Data analysis

The raw date of questionnaire was filtered prior to the statistic stage. The independent variables of this study were the participants' game experience, literature experience, reading preference, and writing preference. The dependent variables were flow and the levels of the understandings. The game experience was classified from 1 to 5 (Table1).The literature experience was summed by the score of frequencies and preferences. The flow was calculated from Pearce's flow equation (2005): Flow distance=0.25 (skill-challenge). And the scores of the levels of the understandings was summed by the questions mentioned in Section 2.3.2.

The data were analyzed by the Statistical Package for the Social Sciences (SPSS) for Windows (release 18.0). The Analyses Of Variance (ANOVA) was used to test the significance of each attributes. The Scheff's method was used for the posteriori comparisons because it was suitable for different numbers of the sample (Qiu, 2003). Additionally, ANOVA was used to test if there was a significance among the mean scores of 8-channel flow modes. Pearson's correlation was applied to examine the relationships between literature experience and flow and the levels of understandings.

3. **Results and Discussion**

3.1 The effect of prior knowledge on flow

3.1.1 Game Experience

The classifications of game experience were displayed in Section 2.3.2. According to Table1, causal players and mid-core players can be regarded as novice players while core players and hard-core players can be considered as experienced players. As showed in Table 2, there was a significant effect of game experiences ($F_{(4, 39)} = 3.86$, $p<0.05$). The post-hoc analysis showed that the flow distance of hard-core players was more than causal players ($p=0.03$) or mid-core players ($p<0.05$) but not between non-game players and core-players ($p>0.05$). According to the equation of flow distance mentioned in Section 2.5, novice players were closer into flow state than the non-game players and experienced players.

Table2. ANOVA Analysis of Game Experience

	SS	df	MS	F	Sig.
Between	1.931	4	.483	3.859	.010
Within	4.879	39	.125		
Total	6.811	43			

To further explain the result, another post-hoc analysis was used to examine the differences of skill, challenge, and four bipolar channels of flow mode. From the result, there were no significant difference of challenge, flow, and arousal channel. However, the hard-core players were better in control than non-game players, causal players, and mid-core players ($p<0.05$). Moreover, the hard-core players were less anxiolytic than the non-game players and novice players ($p<0.05$).There was also a significant difference of skills among the hard-core players and causal players and mid-core players ($p<0.05$), but not between non-game players ($p>0.05$). However, there was no significant difference of the above attributes between hard-core players and core-players.

The result showed game experience improved players' ability of control, indeed decreased player's anxiety during gamming. This result supports game experiences affects game enjoyment and performance (Dumas, 1993; Quaiser-Pohl, 2005; Richard, 2006). However, there was no significant difference between hard-core players and core players. A possible reason might be the difficulty of the design of design of this game. Because the hard-core players and core players have better performance in game, the difficulty might be too easy to compare the differences of skills.

Based on the equation of flow distance, flow is negatively related to the difference between skills and challenges. Therefore, because game experience is positively related to game performance, the experienced players may have larger flow distance because of insufficient challenges for them. Richard (2006) also found that the game experience was positive related to the achievement in motivation theory. In other words, the experienced players were more involved to challenge their skill limitations. Therefore, the hard-core players and core players were harder into flow than the novice players in this game.

In contrast, the insufficient skills of non-game players decreased their flow. The feedback from the questionnaire also supports that non-game players have more difficulties during their playing, such as hardly to clear a level, easily to die, or difficulty to control the avatar. Moreover, some players complained the over-challenges made them feel frustrated and nervous during the process of playing games

Our results showed that there were relationships between game experience and flow. Because experienced players tended to challenge their skill limitations in games, they might need more difficult challenges to be satisfied. However, for those players who lack such skills, there is a need to provide more help to improve their control abilities. Therefore, to improve players' flow in gaming, indeed to improve the learning effect, it was important to design a game with adaptive challenges for different players.

3.1.2 Literature Experience and Preferences

Prior domain knowledge also influenced flow (Dumas, 1999). Therefore, the effect of literature experience and flow was investigated. Pearson correlation showed no significant correlation between literature experience and flow ($r= 0.20$; $p >0.05$). The results of ANOVA also showed there were no significant effects of both reading preference ($F_{(1, 42)} =1.04$, $p>0.05$) and writing preference ($F_{(1, 42)} =0.14$, $p>0.05$).

As showed in Table 3, there were only two poetry readers in this study. As mentioned in Section 1, there was a gap of interpretation between poetry and other literature genres. Many poets also claimed that reading poetry required the association abilities and empathy, which was different from the other genres of literature (Harbus, 2002; Müller-Zettelmann, 2005; Freitag, 2008; Schreibman, 2008; Kuzu, 2010). This may be why there was no significance between literature-readers and non-literature readers.

Similarly with reading preference, only one student wrote poetry in her leisure time. Because of the gap of interpretation between poetry and other literature genres, there was no significance between literature-readers and non-literature writers.

Table3. The participant's number of literature preferences

Reading Preferences				Writing Preferences			
Non-literature(N=14)		Literature(N=30)		Non-literature(N=31)		Literature(N=13)	
Comics	1	Poetry	2	Dairy	31	Poetry	1
Newspapers	3	Classical Literature	4			Novel	1
						Commentary	11
Non-literature Novels	9	Literature Novels	24				
Prose	1						

3.2 The effect of flow on the levels of the understandings of understanding of poetry

As showed in Sections 3.1.1 and 3.1.2, game experiences affected flow, but the effect of literature experiences still needed to be identified. In next step, the ANOVA analysis was used to examine how flow affected the interpretation of poetry. The results showed that there was no significant differences of the levels of the understandings between flows ($F_{(28, 15)} =0.90$, $p>0.05$).

The result shown in Section 1 was against to the poets' hypnosis. However, the result might be argued because of the low levels of understandings ($M=2.25$, $SD=2.58$). 77.3% of students' scores were less than the half of maximum scores (Max. =10, Min. =0). This finding suggests that most of students were able to understand the main concept. However, they might have difficulties to explain the meanings in details. According to the feedback of questionnaire, a possible reason Is that some students tended to ignore the descriptive words in games. As a result, their ignorance of further details of meaning affected the levels of their understandings. Thus, there is a need to prevent players to skip important clues.

3.3 The effect of prior knowledge on the levels of the understandings of poetry

As described in Section 3.2, the levels of the overall understandings might be too low to compare a difference between users with different levels of prior knowledge. Thus, the ANOVA showed no significance in this stage.

3.4 Summary

Figure 3 displays a framework based on the finding of this study. Our study showed there was a positive effect of game experience on skills. The causal players and mid-core players had better flow than the non-game players, core-players, and hard-core players. This result supported flow theory (Csikszentmihalyi, 1977), which indicated that flow was negatively related to the difference between skills and challenges (Pearce, 2005).

This study also found that there was a gap of interpretation abilities between poetry and the other genres of literature. Although there was no significance between literature experiences in this study, the lack of poetry experiences might be the reason. Therefore, the effect of poetry experience still needed to be identified.

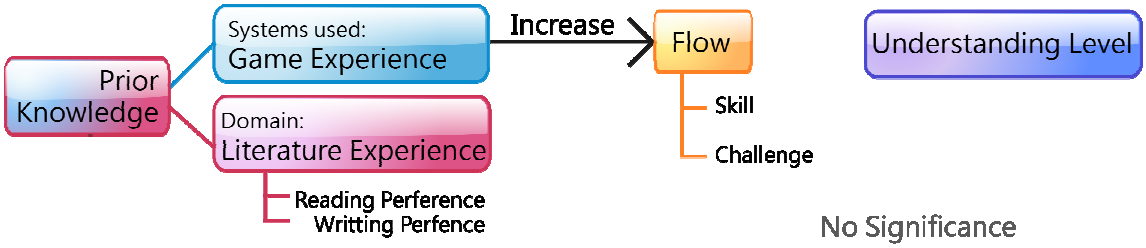

Figure 3.A framework based on the findings of this study.

4. **Conclusion**

In this study, a game was used to build students' interpretation skills of poetry. Moreover, we conducted an experiment, of which results showed that game experience was related to flow. Besides, flow is negatively related to the difference between skills and challenges. To be more specific, players with higher skills were satisfied with higher challenges. Due to the positive effect of game experience on game performance, the differences between game experiences should be considered to improve the flow. Moreover, the game was able to improve the learning effectiveness in game-based learning. Therefore, there may be a need to provide adaptive design, which provides suitable challenges for each student (Killi, 2005; Liu, 2009; Yun, 2010).

In contrast, there were no significant effects of literature experience and preference on flow. Interpreting poetry required more association ability, creativity, and empathy than other literatures (Harbus, 2002; Müller-Zettelmann, 2005; Freitag, 2008; Schreibman, 2008; Kuzu, 2010). Furthermore, this study also found that most students were non-poetry readers. Therefore, it is important to understand how non-poetry-readers interpret poetry so suitable game design can be provided for them to improve their learning effectiveness.

Finally, though there was no significance on the level of the understandings in this study, the effect of both prior knowledge and flow need to be identified because of an overall low understanding in this study. Moreover, there are some limitations of this study. The first limitation is the small sample. Indeed, there were unbalanced numbers of classifications of each attribute. Additionally, this study examined the effects of game experience on flow. However, because this game was an ARPG, players' different game experience tmay affect their performance, too.

To the end, this game demonstrated a way to guide students understanding poetry, and not to limit their imagination. It also demonstrated a way to promote poetry. Such evidence is not only helpful to develop game design for poetry education, but also is useful to understand how to develop personalized game-based learning systems.

Acknowledgements

The work presented in this paper is funded by National Science Council, Taiwan (NSC 101-2511-S-008 -010-MY3, NSC 99-2511-S-008-003-MY2, NSC 100-2631-S-008-004).

References

[1] Black, J. & Smith, K. (2008). Inspired by the poetic moving image. *Art Education, 61*(2), 9-25.
[2] Cao, Y. (2009). A web 2.0 personal learning environment for classical Chinese poetry. *Lecture Notes in Computer Science, 5686*, 98-107.
[3] Csikszentmihalyi, M. (1977). *Beyond boredom and anxiety* (2nd ed.). San Francisco: Jossey-Bass.
[4] Dumas, J. & Redish, J. (1999). *A practical guide to usability testing* (3rd ed.). UK: Intellect Ltd.
[5] Freitag, K. & Vester, K. (2008). *Another language: Poetic Experiments in Britain and North America*. London: Deutshe Nationalbiliothek.
[6] Hughes, J. (2008). The 'screen-size' art: Using digital media to perform poetry. *English in Education, 42*(2), 148-164.
[7] Harbus, A. (2002).*The life of the mind in old English poetry*, New York: Rodopi.
[8] IGDA.International game developer association. Retrieved, 2012, from http://www.igda.org/
[9] Kiili, K. (2005). Digital game-based learning: Towards an experiential gaming model. *Internet and Higher Education, 8*, 13-24.
[10] Kuzu, F. (2010). Training through poetry within the sample of Nabi's "Hayriyye". *Procedia Social and Behavioral Sciences, 9*, 1030-1035.
[11] Lee, S. (2000). *Western history of aesthetic*. Taipei: Suhsin Publisher.
[12] Liu, C. (2009). Dynamic difficulty adjustment in computer games through real-time anxiety-based affective feedback. *International Journal of Human-Computer Interaction, 25*(6), 506-529.
[13] McDougall, J. & O'Brien, W. (2008). *Studying videogames*. Poland: Auteur.
[14] Moerkerke, G. (1996). *Assessment for flexible learning: Performance assessment, prior knowledge state assessment and progress assessment as new tools*. London: Jessica Kingsley Publishers. doi:Oxford
[15] Moos,D. (2009). Self-efficacy and prior domain knowledge: To what extent does monitoring mediate their relationship with hypermedia learning? *Metacognition Learning, 4*, 197-216.
[16] Müller-Zettelmann, E. & Rubik, M. (2005). *Theory into poetry: New approaches to the lyric*. New York: Rodopi.
[17] Novak, T. (1997). *Measuring the flow experience among web users*. Interval Research Corporation,
[18] Papastergiou, M. (2009). Digital game-based learning in high school computer science education: Impact on educational effectiveness and student motivation. *Computer & Education, 52*(1), 1-12.
[19] Pearce, J. (2005). The ebb and flow of online learning. *Computers in Human Behavior, 21*, 745-771.
[20] Qiu,H.(2003).*Quantitative research and statistical analysis: SPSS (PASW) data*, Taipei: Wunan.
[21] Quaiser-Pohl, C. (2006). The relationship between computer-game preference, gender, and mental-rotation ability. *Personality and Individual Differences, 40*, 609-619.
[22] Richard M. Ryan, C. Scott Rigby & Andrew Przybylski. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion, 30*(4), 344-360.
[23] Ryan, M. (2009). From narrative games to playable stories toward a poetics of interactive narrative. *StoryWorlds: A Journal of Narrative Studies, 1*, 43-59.
[24] Schreibman, S. & Siemens, R. (2008). *A Companion to Digital Literary Studies*, Oxford: Blackwell.
[25] Yun, C. (2010). *PADS: Enhancing gaming experience using profile-based adaptive difficulty system*. Association for Computing Machinery.