# Interest Maintained and Anxiety Comparison of Static Versus Animated Agents in Gameplay

Jon-Chao Hong<sup>1+</sup>, Ming-Yueh Hwang<sup>2</sup>, and Kai-Hsin Tai<sup>1</sup>

<sup>1</sup>Department of Industrial Education

<sup>2</sup>Department of Adult and Continuing Education, National Taiwan Normal University

**Abstract.** In order to compare a static agent to an animated agent, this study designed two types of Chinese idiom games called String-Up for the static agent and Fishing for the animated agent. All participants in this study were 5th and 6th grade elementary school students. The result shows that the static agent fostered better achievement. In addition, interest in the static agent can be better maintained than that for the animated agent. No difference in gameplay anxiety was detected between the two types of visual agents. The gameplay anxiety of both games decreased slightly with each subsequent playing but did not reach statistical significance. The results suggested that educational game design should consider the use static rather than animated agents when considering helping students achieve better performance.

**Keywords:** Interest Maintain, Anxiety, Chinese Idiom Game

#### 1. Introduction

Some previous studies have asserted that animation can have significant benefits on attitudes, enjoyment, motivation and frustration levels (Rieber, 1990; Szabo & Poohkay, 1996). Animated visual input generates more competition for visual attention than do other forms of picture input. Rieber (1991) explained that visuals can be effective under certain conditions. Furthermore, Münzer (2012) conducted a study in which static pictures that required manual imagine reorientation were compared to animations showing the reorientation, and results indicated that accuracy with the static pictures was better than that with animation. Better accuracy may lead to less frustration, higher levels of maintained interest, and lower levels of gameplay anxiety. Therefore, there is a need to delineate the types of illustrations and their functions to better determine the effects that different types of media presentations have, the manner in which they function, and under what special circumstances are they successful. Accordingly, the purpose of this study was to compare static and animated designs on the Chinese idiom gaming presentation, and also examine the levels of interest maintained by the students and whether their gameplay anxiety would decrease.

#### 2. Literature Review

Compare with the traditional classroom learning practices, the game enables users to learn and have fun at the same time. Moreover, given young people's increasing use of computers, this is a way to keep them simultaneously entertained, and challenged. According to the past studies, visual enhancements often help to improve one's learning ability. This study differs from previous animation studies, however, in that there is actually no animation but only visual enhancements and graphic information are utilized. This should contribute to a more effective and experiential trial.

Processing visual images, and visually presented characters separately challenges one's cognitive capacity. Because the human eye cannot focus on two places at once, there must be an attention shift from the characters, and images to the on-screen illustration, back and forth and left to right. The cognitive theory of instructional multimedia in this study operated within the limits of the human memory system to stretch working memory, presumably to also increase cognitive capacity (Mayer & Moreno, 2002).

Studies on the use of animation in CBI have so far been limited, and the results are spread thin across diverse disciplines and disparate designs. Because time is an infinite series of single instances, a person's attention may be caught and focused and then caught again and refocused or, in essence, held for a relatively

<sup>+</sup> E-mail: hong506@gmail.com

substantial period of time. Anglin, Towers, and Levie (1996) followed Rieber's (1990) principle with their study and tested the effect of presentation strategy (static graphic and animated) on different learning objectives concerning the structure and function of the human heart. They found that learner engagement and grasp of conceptual information were improved when the subjects were exposed to visual contents. Many researchers view affection as an important factor that promotes attainment of personally emotional states (e.g., Assor, Kaplan, Kanat-Maymon, & Roth, 2005; Lazarus, 1991; Saarni, Mumme, & Campos, 1998). In this sense, the present study examined the maintenance of emotional status during gameplay, such as one's level of interest and gameplay-related anxiety.

## 3. Research Hypotheses

The present study aimed to examine whether the effect is sensitive to participant experience or practice. Accordingly, the hypotheses of this study were:

- H1: There is no difference in practice achievement between the two types of games.
- H2: There is no difference in gameplay interest maintained between the two types of games.
- H3: There is no difference in gameplay anxiety changed between the two types of games.

### 4. Research Design

## **4.1.** Research participants

The participants of this study were students from fifth and sixth grade classes in two elementary schools located in Taipei County during the fall semester of 2012. Seven classes totaling 238 students (127 boys) were invited to participate in the FCIG while six classes totaling 211 students (112 boys) were recruited for the SUCIG.

#### **4.2.** Research instruments

#### **4.2.1.** About String-Up Chinese Idiom game (SUCIG)



Fig. 1: The screen shot of the game (before fulfilling the answers)

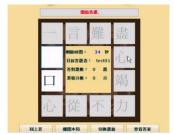


Fig. 2: The screen shot of the game (one step to complete the answers)

#### **4.2.2.** About Fishing Chinese Idiom game (FCIG)

The Digital Game-Based Learning Laboratory also developed an online game called the "Fishing Chinese Idiom game" (FCIG) that suitable for people of all ages. Idioms of the game are based on the grades 3 to 6 elementary school level material. It enables users to practice the assembly of four-word Chinese idioms at six different levels of difficulty, including beginners, intermediate, and advanced. A mix of Chinese characters, visually designed into images of fish, is scrambled onto the computer screen. Users must attempt to put together these characters into four-word idioms while the images constantly swim around. If

the idiom is being put together in the correct order, points are scored; otherwise, the user may continue to make as many attempts as time allows. To test the user's mental agility, the game lasts approximately 3 to 5 minutes (See Figure 3, and 4 for examples).



Fig. 3: The screen shot of the Fishing idiom game (fishing process)



Fig. 4: The screen shot of the Fishing idiom game (final step)

#### **4.2.3.** Survey Instruments

The survey instruments contained interest, and anxiety scale that would be described in the following paragraph.

Gameplay interest: Participants were asked to complete Lusk's (2008) situational interest questionnaire, which was revised by Hong et al. (2012) as the "Interest toward Playing SUCIG Scale" to measure interest in the gameplay. This scale was revised further to construct the "Interest toward Playing FCIG Scale". The reliability and validity of this scale is addressed in the data analysis sections.

Gameplay anxiety: A modified version of the Competitive State Anxiety Inventory-2 (CSAI-2) was used which is originally developed by Martens et al. (1990), and then revised by Hong et al. (2012) and Hwang et al. (2013), in which four items were included to examine the anxiety levels related to playing the SUCIG. This scale was further revised to construct the "FCIG Anxiety Scale." The reliability and validity of this scale are also presented in the results sections.

#### **4.3.** Research Procedure

The participants were asked to play the game for 10 minutes each time over a period of 6 weeks in a computer room. After they complete the game, participants were asked to fill out the questionnaire regarding to their perceived interest in the game, and the game anxiety scale. To increase each participant's motivation, a small gift was given to those participants who completed the questionnaires for all six weeks. Additionally, at the end of the six weeks, the three highest scoring participants in each class were given bonus gifts.

## 5. Data Analysis

Based on the research evidence, we used SPSS 18 software to perform reliability analysis to determine the reliability of the questionnaires, and an item analysis was used to examine the validity of the interest toward Playing FCIG Scale and the FCIG Anxiety Scale. Initial descriptive statistics and paired-samples *t*-tests were used to examine the research hypotheses.

The results of these analyses showed that the internal consistency values for the interest toward playing FCIG scale and the FCIG anxiety scale were .967 and .964, respectively, suggesting acceptable reliability for both values. We additionally examined convergent validity, which refers to the degree to which multiple items measure the same construct. Previous studies (Fornell & Larcker, 1981; Nunnally, 1978) suggested that evaluation can be made by checking if (1) the average variance of the extracted values was larger than .5, and (2) the factor loadings of all items were significant and higher than .5. Both of these conditions were met in the present study, indicating the acceptable convergent validity.

Items were excluded from a construct if the loading value was below <.5, because it signified the item was ambiguously loaded to a construct and was conceptually incoherent with other items on the construct (Fornell & Larcker, 1981; Nunnally, 1978). Both interest and anxiety scales to be one-factor questionnaires, accounting for 77.04% and 69.51% of the variance. Moreover, the average variance of extracted values of

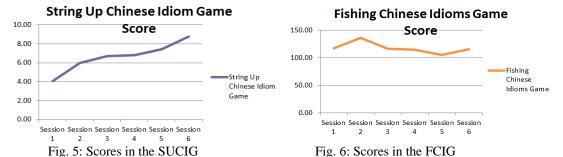
both scales were larger than .5, and factor loadings of all items were significant and higher than .5, indicating that both scales had acceptable convergent validity.

#### 6. Research Results

Using paired sample t-tests, we first examined differences in achievement between the two games, followed by differences in participant interest in playing the game and differences in gameplay-related anxiety.

### **6.1.** Analysis of Differences in Achievement

A comparison of pretest and posttest scores using a one-tailed paired-samples t-test is displayed in Figure 5 and it shows the improvement of scores from Session 1 to Session 6 for the SUCIG. By Session 6, the change in puzzle performance from pre- to posttest reached significance (t = 4.708, p < .001). However, there was no significant increase in FCIG scores from Session 1 to Session 6 (t = 0.941, t = 0.348) (Figure 6).



## **6.2.** Differences in Interest in Playing Game

Figure 7 shows the run chart of interest toward playing SUCIG and FCIG. A paired-samples t-test showed a significant change in the levels of interest toward playing the FCIG from Session 1 to Session 6 (t = -4.029, p < .001). This change was significant given that the values of Session 1 and Session 6 exposure to the FCIG led to a decreased interest in playing the FCIG. However, no difference was found in the interest toward playing the SUCIG from Session 1 to Session 6 (t = -1.489, p = 0.139).

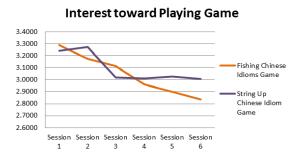


Fig. 7: Scores in the Interest to play both game

### **6.3.** Difference Analysis of the Gameplay Anxiety

Figure 8 shows the levels of anxiety experienced while playing the SUCIG and FCIG. Using a paired-samples t-test, no statistical significance was found from Session 1 to Session 6 in measures of anxiety about playing the FCIG (t = -0.902, p = 0.368). Similarly, tests revealed that the anxiety on playing the SUCIG was statistically equivalent from Session 1 to Session 6 (t = -1.471, p = 0.144).

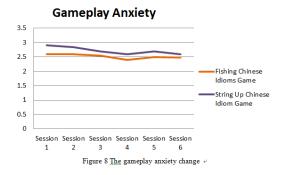


Fig. 8: The gameplay anxiety change

## 7. Findings

About first hypothesis, the result shows that participants of the animated agent displayed no significant increase in scores from the first to the sixth game. An explanation for this finding is that with the static agent, the players were allowed to think for longer. According to dual process theory (Evans, 2011), the animated presence would prompt students to react quickly and, thus, without the opportunity to think thoroughly.

About second hypothesis, the result shows that the Fishing Chinese Idioms Game "psyched up" (e.g., Hanton & Connaughton, 2002) the players initially more than the SUCIG, and with more cognitive interference. However, after becoming familiar with this game, the players' interest decreased.

About third hypothesis, the result shows that neither type of game showed a significant difference from the first to the sixth play, though the means for each play become less than the last play. We offered the view that both of the competing paradigms entailed emotional transitivity, but each one tended to tap a different aspect of it. In brief, visual imagery plays an important role in education, and visual tools can have a profound impact on how users perceive information, learn, and judge the credibility and usability of the information presented.

The results of this study indicated that educational game designers should consider that the presence of a static agent may lead to better performance achievement. Future studies should utilize contents other than Chinese idiom learning to further compare a static agent to an animated one.

## 8. Acknowledgment

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