COMPUTER SELF-EFFICACY, COMPETITIVE ANXIETY AND FLOW STATE: ESCAPING FROM FIRING ONLINE GAME

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ABSTRACT
Flow state in game playing affected by computer self-efficacy and game competitive anxiety was studied. In order to examine the effect of those constructs with high competition, this study select "Escaping from firing online game" which require college students to escape from fire and rescue people and eliminate the fire damage along the way of running. 101 students participated the game and filled up the questionnaires, after they tried 20 minutes. Three hypotheses of this study were analyzed and the results indicated computer self-efficacy and game competitive anxiety had a positively association with flow state, but computer self-efficacy had a negative association to game competitive anxiety.
Keywords: Computer self-efficacy, competitive anxiety, flow state

INTRODUCTION

The emergence and success of new technology sectors in both new and established educational settings is inextricably linked with individuals able to recognize new opportunities and lead their exploitation. New technology use is advanced by those with self-efficacy, with confidence in their abilities to perform the learning tasks. Computer self-efficacy (CSE) was derived from the social–psychological concept of self-efficacy which postulates that an individuals' perception of his/her abilities affects his/her actual performance (Bandura, 1994). As applied to the field of computer usage, CSE is believed to influence an individual affect, persistence, motivation (Deng, Doll, Truong, 2004), to use that device. CES has been found to influence an individual's willingness to learn and use a computer (Wilfong, 2006).

Parayitam et al. (2010) assumes that computer anxiety is a kind of emotional and cognitive reaction that occurs while the individual is working and interacting with computer and it happens as a consequence of the lack of awareness and the individual's attitude towards the computer as a threatening object. While some studies focus on computer attitudes and utilization (Al-Khaldi & Al-Jabri, 1998), others stressed on testing the effects of self-efficacy and competence on computer anxiety and computer use (Shih, 2006). However, increasing CSE can lower computer anxiety thus improving performance and willingness to learn (Konerding, 1998; Thatcher et al., 2007).

Csikszentmihalyi's (1975) *flow theory* described the experience of the intrinsically motivated; individuals who engage in an activity because they enjoy it, find it interesting or challenging, and perceive they have the necessary skills to accomplish it. Flow occurs when someone perceives the challenge of an activity to be balanced with his or her skills. Schweinle, Meyer, and Turner (2006) pointed out that flow affect is an important factor in students' perceived learning skills and that challenge can pose a threat to students' self-efficacy. As such, this study used "Fire Escape" game which is situational problem solving in firing and the play time for each run is limited to 3 minutes and 30 seconds that would cause supposedly different flow state and computer anxiety by individual players with different computer self-efficacy. Therefore, the purposes of this study are to examine the correlation between computer self-efficacy and flow state, and game competitive anxiety; and game competitive anxiety and flow state.

RESEARCH CONTENTS AND HYPOTHESES

According to self-efficacy theory, an individual's behavior is predicted by the beliefs they hold about their capabilities, rather than their actual capabilities. Bandura argues that individual's level of 'motivation, affective states, and actions are based more on what they believe than on what is objectively true' (Bandura, 1997, p. 2). Self-efficacy judgments with respect to some specific tasks such as anxiety may elicit some emotional reactions in terms of their ability to perform such tasks, which in turn, influence their emotional states.

Computer use and Computer self-efficacy should be directly related since we are more likely to attempt and persist in behaviors that we feel capable of performing. Confidence or autonomy competence in self-efficacy is considered as one important factor that enhances the flow of intrinsic motivation because learners are given a sense of control over choices they may take in learning (Ryan & Deci, 2000). Quinn (2005) argues that flow is

the merging of action and awareness and the other dimensions form the antecedents and consequences of the engagement experience. In this sense, the computer self-efficacy might positively affect the flow experience, then, the research hypothesis is:

H1: Computer self-efficacy will be positively related to flow state
Psychologists have classified general anxiety into two areas. One domain is trait anxiety, and the other is state anxiety (Biggs & Moore, 1993). Trait anxiety can be described as "a general readiness to react with anxiety in many situations" (Biggs & Moore, 1993, p. 243). State anxiety refers to "anxiety actually experienced in a particular situation" (Biggs & Moore, 1993, p. 243). Competitive anxiety was viewed as negative and predicted to have debilitative consequences for performance (Jones, 1995). In game-playing, players have a tendency to perceive competitive situations as threatening will respond to these situations with competitive state anxiety (Scanlan, 1978).

H2: Game competitive anxiety will be positively related to and affect the flow state
Individuals experienced an increase in anxiety when attempting to perform behaviors they didn't feel confident performing (Stumpf, Brief, & Hartman, 1989). That is, as anxiety increased, efficacy beliefs decreased due to self-doubt and emotional arousal when performing the behavior (Oliver & Shapiro, 1993). In the sense, the present context this means that Computer self-efficacy should be positively related to the anxiety and the flow state

H3: Computer self-efficacy will be positively related to game competitive anxiety

RESEARCH MODEL
Based on the above research hypotheses, the research model of this study was proposed as in Figure 1 below.

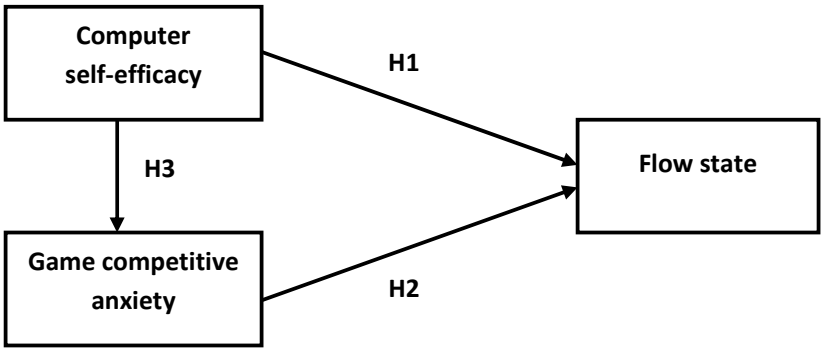

Figure 1. Research model.

Design of Game
Author et al., (2009) classified the educational games into five categories: practice way, fighting way, simple confrontation way, evolution way and plotting way. Although games were classified to be many kinds, speaking from the viewpoint of learning by playing or learning for playing, all games have educational meaning (Dewey, 1938). The study takes online game as the research situation, and uses a disaster prevention game, "Fire Escape" (Patent No.: 201010266147.7) developed by Digital Game Learning Laboratory of XXXXX for making survey. Players have to select the role to involve fire escape action and have to rescue 4 persons along the way to get out from the building, so this game is a kind of Role play. Through Flash technology, the game creates 2.5D scenes and simulates the objects of house, department store, commercial office building. The game scene is shown in Figure 2. With cognition of disaster prevention knowledge through learning by playing, players have to possess several important concepts at a site on fire, including turning off the gas, carrying wet towel, and walking with the body close to the ground, in order to finally achieve the objective of helping children escape from the site on fire successfully. From the backstage with scores of players, we can review players' performance.

Figure 2. The game scene.

Research Instruments

Computer self-efficacy

The primary focus of this study will be the relationship of computer self-efficacy to game playing. This study should also be able to identify if high levels of CSE are more closely linked to the anxiety and flow state. There are several computer self-efficacy scales. Most begin by listing computer related skills and asking respondents to identify the computer skills that they possess. Various scales have been developed to measure this computer self-efficacy, the Cassidy and Eachus scale are expressing the belief that they feel competent and confident about using computer systems; they expect to encounter few difficulties and believe they will be successful in what they are trying to achieve (Cassidy & Eachus, 2002).This study utilized their version of the Computer Self Efficacy scale, with the following 7 items: I think computer is easy to learn, I think computer is easy to use, It is not difficult to operate a computer, It is easy to do things with computer, I am confident that I can learn computer skills, I can learn to use computer well without guidance, and I can solve computer problems with operating instructions.

Competitive anxiety

The competitive anxiety is measured through the continuum of "not worried" to "very worried". This study referred Cox, Russell and Robb (1999) Anxiety Rating Scale (ARS) which is a short form for assessing competitive state anxiety during and immediately prior to competition, and developed 4 items to measure this dimension, includes: Playing the game, I am worried that I can't pass, Playing the game, I feel my heartbeat, Playing the game, I am worried that I will not get a high score, Having difficulties during the game, and I feel very nervous.

Flow Scale

The Flow State Scale II (FSS-II) (Jackson & Eklund, 2002) and the Work related Flow scale (WOLF), (Bakker, 2005) have been popularly used in quantitative measure. This study utilized Bakker (2005) conceptualization of the flow experience with the three dimensions of absorption, work enjoyment and intrinsic work motivation, items included: I can handle game, I can concentrate on the game, I enjoy the game, I can't feel happened around while playing the game, I like this game, I fell the time is too fast while playing the game, and after playing the games, I still want to continue.

Data collection and analysis

The study took online game as the research situation. The sampling target used the only account and password to sign in the fire escape online game (website: http://140.122.79.240/escape2, attached with online description) developed by Digital Game Learning Laboratory of National Taiwan Normal University, and start playing it for

20 minutes. Then the player was asked to fill out the online questionnaire, which was edited through the free office suite, Google Docs. The group of players of the online game was mainly students. Therefore, the study carried out convenient sampling of the students of national and private colleges and universities, and invited them to do the online questionnaire survey.

After collection of the returned questionnaires, the samples suspected of being filled out carelessly were deleted. With the remaining valid samples, descriptive statistics, reliability analysis and correlation analysis were carried out by SPSS. Besides, a statistical software, Amos was also used to make path analysis, and study testing of hypotheses.

RESEARCH RESULTS

Basic data analysis of sample

The questionnaire survey took place during the period from Nov. 28, 2011 to Jan. 1, 2012. It was carried out by the way of "convenient sampling," with "students" taken as samples. There were 111 online questionnaires collected, with 101 questionnaires being valid samples, achieving a validity rate of 90.99%. In the aspect of gender, the proportion of female participants (56.4%) is higher than the proportion of male participants (43.6%). In the aspect of distribution of faculties, most of the participants study at Faculty of Management (46.5%), and the next ones are Faculty of Humanities and Social Science (20.8%) and Faculty of Design (or Tourism Design) (15.8%). The total number of participants from these three faculties occupies almost 70% of all samples. In the aspect of college and university type, 42.6% of the participants study at public university of science and technology, and 57.4% of participants study at private university of science and technology.

Descriptive statistics and reliability analysis

According to the research situation of online game and operational definition of the idea, most suitable questions were designed for the questionnaire. Regarding content validity of the questionnaire, the study reviewed the quality of the questionnaire by means of item analysis. Item analysis mainly takes each item of scale or each question of the test questions as the target, and gradually analyzes its usability. Reliability and validity are the major features of a test. These two features have to be determined by the quality of questions, which can be enhanced through item analysis. The study carried out item analysis of the questionnaire by firstly calculating the total scores of the participants. After that, the participants were rearranged according to the descending order of their scores. 27% of the total participants counting down from the one with highest score and 27% of the total participants counting up from the one with lowest score were selected to be high score group and low score group respectively. T-test was taken for the results of these 54% of total participants. The questions with significance level reaching .001 were selected. As shown in Table 1, each of the questions reaching significance level is retained.

Table 1. Summary of item analysis on the studied questionnaire

Construct	Question No.	t-test		To be deleted or retained
		t value	Significance (two-tailed)	
Computer self-efficacy (total 7 questions)	1	5.289	.000	Retained
	2	6.171	.000	Retained
	3	4.747	.000	Retained
	4	4.829	.000	Retained
	5	5.277	.000	Retained
	6	6.308	.000	Retained
	7	6.252	.000	Retained
Game competitive anxiety (total 4 questions)	1	4.605	.000	Retained
	2	5.851	.000	Retained
	3	5.936	.000	Retained
	4	5.011	.000	Retained
Flow experience (total 7 questions)	1	3.023	.000	Retained
	2	8.276	.000	Retained
	3	9.774	.000	Retained
	4	6.089	.000	Retained
	5	5.043	.000	Retained
	6	7.880	.000	Retained
	7	7.174	.000	Retained

From Table 2, a descriptive statistical analysis of the various research constructs is known. The one with the

greatest standard deviation, being 0.921, is the subjective norm; and the one with the smallest standard deviation is 0.694, showing that the degree of variation among the various constructs is small. In the test of internal consistency analysis on reliability, a coefficient factor, Cornbach's α is taken to measure the consistency degree of the detailed items inside in order to ensure the correctness and preciseness of measurement procedure with computer self-efficacy (α= .905); game competitive anxiety (α=.857); flow state (α=.795); and total construct (α=.816). These results show that the questionnaire of the study has good reliability.

Table 2. Descriptive statistical analysis of the various constructs

Construct	Mean	Standard deviation	No. of questions	Cronbach's α
Total scale	3.35	.498	18	.816
Computer self-efficacy	3.58	.741	7	.905
Game competitive anxiety	3.08	.921	4	.857
Flow state	3.28	.694	7	.795

Correlation Analysis

As known from Table 3, the degree of correlation between two constructs, game competitive anxiety and flow state, shows a positive correlation, with correlation coefficient being (r=.503, p<.5). Between computer self-efficacy and game competitive anxiety, the correlation is negative but not significant, being (r=-.176, p>.5). Between computer self-efficacy and flow state, the degree of correlation appears to be nil (r=.100, p>.5).

Table 3. Matrix of product-moment correlation coefficient

Construct	Computer self-efficacy	Game competitive anxiety	Flow state
Computer self-efficacy	1		
Game competitive anxiety	-.176	1	
Flow state	.100	.503**	1

Path analysis

As known from the research model chart shown in Figure 3, computer self-efficacy has direct positive relationship with flow state; game competitive anxiety has direct positive relationship with flow state; and computer self-efficacy has direct negative relationship with game competitive anxiety.

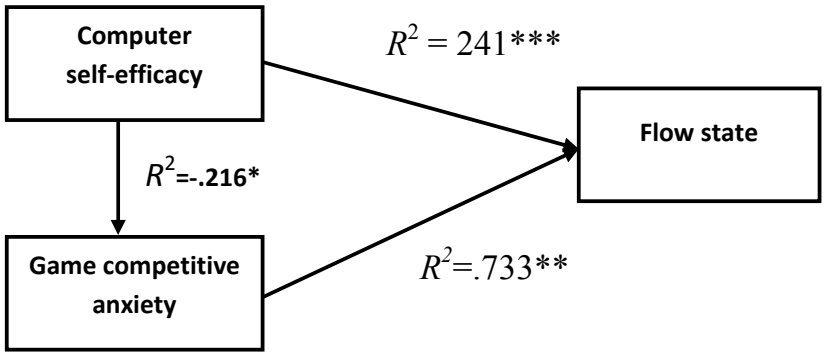

Figure 3. Verification chart of research model

The study uses path analysis to explore the maximum likelihood path coefficients among different variables in the research structure, attempting to verify their cause-effect relationship and direction. The significance and overall situation of different path coefficients can be seen from the direct effect value.

As known from Table 4, the direct effect value of computer self-efficacy on game competitive anxiety is -216; the direct effect value of computer self-efficacy on customer satisfaction is .241; and the direct effect value of game competitive anxiety on flow state is .733. Viewing at the square (R2) of multiple correlation coefficients,

the explained variance of computer self-efficacy on game competitive anxiety is 4.7%; and the explained variance of computer self-efficacy and game competitive anxiety on flow state is 51.9%

Table 4. Direct effect value

Construct	Computer self-efficacy	Game competitive anxiety
Game competitive anxiety	-216	.000
Flow state	.241	.733

DISCUSSION

Using the factor constructs of computer self-efficacy, game competitive anxiety and flow state, the study explores whether different individuals of college students have different flow states during learning from game. Regarding research hypothesis1: Computer self-efficacy will be positively related to flow state, the findings of the study are: (1) The study's Hypothesis 1, supposing that computer self-efficacy has significant positive relationship with flow experience, has been supported. It implies that when college students have stronger feeling of computer self-efficacy, their flow experience will be raised. This conclusion is consistent with the viewpoint of the abovementioned scholars, proving the significance of computer self-efficacy to the entry to flow state. According to Ryan and Deci (2000) assertion, self-efficacy is a kind of intrinsic motivation while engaging in a game, one will have positive flow state The result is also supported by Zhao and her colleagues' (2011) study on the relation between the internet self-efficacy and flow experience, and found they have positively association.

Regarding research hypothesis 2: Game competitive anxiety will be positively related to flow state, the results of this study indicated that Game competitive anxiety has significant positive relationship with flow state. It implies that when game competitive anxiety is raised, flow state will rise accordingly. The result is consisted to Jones's (1995) suggestion which indicated that competitive anxiety was viewed as negative and predicted to have debilitative consequences for performance. Csikszentmihalyi (2002) assesses the influence of personality in situation characteristics, such competitive anxiety, and the interaction on flow, and find that situation characteristics would enhance individual flow state.

Regarding research hypothesis 3: Computer self-efficacy will be positively related to game competitive anxiety, the findings of this study suggests that computer self-efficacy has significant negative relationship with game competitive anxiety. It implies that when computer self-efficacy is higher, the game competitive anxiety produced will be lower. In the current study we focus on if computer self-efficacy affect to competitive anxiety. The result is supported by Caprara et al. (2008) which refers to an individual's self-efficacy to be regulated by stressful or anxiety

FUTURE STUDIES

There are three episodes to play, in order to understand the game behavior, the future study may focus on if the cognitive style affect the interest of play. 2. To allow students to play more times to examine their anxiety and flow curve with inverted U hypotheses to realize the tendencies of game playing.

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