The Factors Affecting Players' Problem-solving Performances and Knowledge Acquisitions in a Role-playing Game Environment

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Abstract: Problem-solving as the core concept, the computer games have thus been proposed to couple the ever increasing interest in using such type of interactive technology in training as well as knowledge construction. The major focus of the present study intends to explore how players' learning styles and quest types might affect their emotional responses, and how the above three issues might in turn impact their knowledge acquisitions and problem-solving performances.

Keywords: Learning Styles, Quest Types, Emotion, Problem-solving

Introduction

With the widespread use of the internet, computer games have deeply impacted the life of new generation users with the forms of cultural symbols, economy, and technologies Today, online games have thrived to become one of the primary gateways to the virtual world. With attributes rooted in facilitating communication, information sharing, and problem solving, this new media has aroused people to take interest in applying its advanced technologies to solve problems faced by divisions of governments, corporations, schools, the military, and other social groups

Theoretical Framework

1. Game Quests and Problem-solving

By using playful and vividness elements, computer games first capture players' perceptional attentions then further flow them into the completely concentration level through an appropriate arrangement of quest challenges [1]. A game quest can be viewed as a problem space. By trial and error and hypothesis testing, players constantly search for solutions and construct knowledge of goals, rules, and concepts (operators) through this inductive discovery process (Greenfield et al., 1994). By recognizing the differences, users might start to adopt specific strategies or approaches with hope of achieving the set goals. Such a series of goal-directed cognitive activities is called problem solving [2]. The process of problem solving requires users to make good use of their previous knowledge and skills in order to find out appropriate solutions. That is, users' mental models will possess new experiences and skills after solving the problems [3]. Csikszentmihalyi's [4] flow experience reflect the similar concept. Players' skills and knowledge will be gradually enhanced as they conquer challenges of difficult levels from easy to hard. The primary part of the game challenges are embedded inside the game quests. The present study will adopt Dicky's quest category [5] to divide game quests into four types: *Bounty & collection quest*, *Escort quest*, *goodwill quests*, *Messenger quests*, to be the main experiment tasks.

2. Players' learning styles

Learning style refers to the manifest reflection of an individual's preferred and habitual learning mode in perception, imagery, organization, and elaboration during knowledge acquisition or problem solving processes [6]. Kolb's learning style model [7] is selected for this study because its usefulness and validity have been extensively testified [8, 9, 10]. This model is based on two preference dimensions (concrete experience / abstract conceptualization; active experimentation / reflective observation). As a result, these two dimensions frame four types of learning styles: *Divergers*, *Convergers*, *Accomodators*, *Assimilators*. The present study will adopt Kolb's style model and together with the game quest types as the independent variables to observe how these two variables might affect players' emotion and problem-solving performances.

In sum, the present study mainly tries to explore how players' learning styles (*Divergers*, *Convergers*, *Accomodators*, *Assimilators*) and quest types (*Bounty* and *collection quest* / *Escort quest* / *goodwill quests* / *Messenger quests*) might affect their emotional responses (*arouse / valance*), knowledge acquisitions (*declarative / procedural knowledge*), and problem solving performances (*Identifying and defining the problem / Exploring problem & mental representation / Planning proceed & strategy selection / Executing the solution plan / Evaluating performance / reflection to feedback*) in an role-playing game environment.

Methodology
1. Research questions
Five research questions are generated accordingly to test out study hypotheses.
Q1. How might the player's learning styles affect his/her emotion in a role-playing game environment?
Q2. How might the player's learning styles affect his/her problem-solving performances and knowledge acquisitions?
Q3. How might the game quest types affect the player's emotion in a role-playing game environment?
Q4. How might the game quest types affect the player's problem-solving performances and knowledge acquisitions?
Q5. How might the interaction effects among player's learning styles, the game quest types, and emotion affect the player's problem-solving performances and knowledge acquisitions?

2. Study Design
The experiment environment, *Fulade Online* (http://cb.fulade.com.tw), is chosen to be based on two reasons. First, the content of this game environment should be as unfamiliar as possible to most players to increase the possibility of showing signs of change in subjects' knowledge acquisitions. Secondary, the beginner-level quests should closely fit with the operational definitions of four game quest types by this study. The present study is planning to recruit at least 72 subjects to participate in this experiment. The Kolb Learning Style Inventory (v.3.1)[11] will be used to identify subjects' learning styles. There will be a total of four game quest groups. Each group included approximate numbers of learning style participants. Subjects' emotional responses will be collected and analyzed by using the following two instruments: Noldus FaceReader™ to collect valance data and MindMedia NeXus-4 to collect arousal data.

After completing the required 4 quests of each group, subjects will move on to answer the *Declarative Knowledge Test* developed based on the framework of Ju & Wagner [12] and the *Procedural Knowledge Test* developed based on the framework of McClure, Sonak and Suen [13]. Subjects' experiment processes will be video taped and a retrospective approach

(stimulated recall) together with a deep interview will be followed right after the completion of the game quest experiment to collect subjects' oral data. The qualitative rubric method will be used to identify subjects' six steps of problem-solving.

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