Case Study of Game Design for E-Learning

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Abstract

In 21st Century, through the E-learning, students can be fostered the abilities of critical thinking and skills of problem solving. Resulting from this learning, learners can apply their learned knowledge in daily problem solving and can create a new attitude to their living. This study is to develop a new computer Role-Playing Game (RPG). In the game, it will blend the ideas of RPG and theory of Problem-Based Learning (PBL), which leads the players to develop their learning strategy and strengthen their problem solving ability. The spectrum ideas of this game will focus on the daily life problems and common knowledge. In a RPG, the player can use learned knowledge to solve problems. Furthermore, in the process of problem solving, players learn to know the concepts implied in the game.

Keywords : game design, E-learning

1. Introduction

In the report to United Nation Educational, Scientific, and Cultural Organization (UNESCO) of the International Commission on Education for the Twenty-First Century, it stated that the four pillars of education were Learn to Learn, Learn to Do, Learn to Develop, and Learn to Live Together. These four pillars were requisite among various people or culture for coping with the future global community. Therefore, in 21st century, the E-learning may utilize digital media to help students develop their ability and skills in critical thinking and problem solving. This may also motivate the learners to apply the learned knowledge in real life problem solving and to create a new way of living.

This study is to design and develop a role-playing computer game—Virtual Filial Piety Legend. Blending the strategy of the Problem Based Learning (PBL) and leading to problem solving process, which based on the reality situation, this game inspires the player actively to apply the learned knowledge and, in playing, to understand the concepts implied in the game. The structure of this game story is based on the legendary figure—Young Xiang—who rescued her father by fighting with a tiger. As the protagonist going through levels in order to rescue her father eventually, the player realizes the important virtue of "filial piety comes before every virtue."

2. Reviewed Literature

2.1 Game

For some time, people have entertained themselves by playing games on computer. In the human history, playing games has existed in various cultures and societies. Early childhood psychologists have observed and known that young children played games to channel their emotions, to consume their excess energy, furthermore, to enjoy the time spent with their companions. Turkle assumed that playing games was to develop individual's living functions [1]. He emphasized that playing games was the best way of knowing oneself. Playing games is a way of simulation of reality. In an unreal situation, an individual could open oneself to express without being embarrassed. Through playing games, the individual interacted with others and the environment and developed his/her own psychological growth. Through playing, one could cope with demands and problem solving in simulated situations. When computers first available to everyone, they were used for the playing games in early stage. Computer games became one of the popular leisure time entertainments. Computer games playing worked a human factor—playing—for the

psychological needs. Therefore, if understanding the role of playing games in human activity, a game designer can devise a game based on the human factors, so that the players may actively involve in playing games.

2.1.1 Motivations of Game

Lepper and Malone categorized the motivation of playing games involvement as (1) individual's motivations, including challenge, curiosity, control, and imagination; and (2) the interpersonal motivations, including competition, cooperation, and cognition. They are simply stated as below [2]:

1. Challenge is to match up with the player's ability and development, to provide many levels of challenge to enhance the surprise and uncertainty, also to use feedbacks to establish the positive self-evaluation.
2. Curiosity is to provide the player with proper complexity and variety to inspire the player's curiosity, in the way of creating sensory or cognitive stimulus.
3. Control is to satisfy the player with freedom and privilege, meaning, the player can feel the level of controlling in playing.
4. Fantasy is to satisfy player with the imaginative feeling of the virtual social situation and environment.
5. Competition is to compete with others or with computer in term as an individual competing with others in a community.
6. Cooperation is, when competing with others, to pursue cooperation with others in order to succeed.
7. Cognition is, when recognizing one's own status in a community, to feel the fulfillment from others' acknowledgement and appraisement.

2.1.2 Elements of Game Design

The scholars, Alessi and Trollip suggested that there were seven basic elements in game designing. They were included as below [3]:

1. Goal: The so-called goals are the final target that the player tried to reach. They can be the score, the answer of puzzles, or the solution of problems. Every game has its own goals in the beginning of design. Some explain the goals in the beginning of the game. Some need to be explored and guessed. In the process, the player can enhance the ability or skills of critical thinking and problem solving.
2. Rule: Rules are limitations or controls in the playing games. They could be non-active or active. The characteristics of rules are artificial and modifiable, meaning that rules are justifiable by the established and simulated condition. In this way, player can avoid the crucial situation. The game becomes more interesting and fair. The fixed rules should enhance the interests, challenge, and the fairness.
3. Competition: The playing games usually involve competition. The antagonists could be the other players, the character, the individual, the fate, and the time. Some game uses Internet connection to compete with other players on the line. This enhances the variety and attraction of a game.
4. Challenge: Challenge is different from competition. The player struggles for all challenges and overcomes the hardships to reach the goals. Alternatively, the player needs to develop some strategies to challenge others. The uncertain result of strategic development creates challenge. The most attractive and unique characteristics of a game are to challenge the player. The challenge will change whenever the goals change.
5. Fantasy: Fantasy is the inducement of a game. The flexibility of a changeable fantasy can come from reality or a virtual reality.
6. Safety: A game displays the dangers in simulated phenomena, through a safer way. Besides, the player plays the game in a safer way in dangerous (or expensive) virtual reality, such as virtual war game, or trading and investment game. The result is to lose the game but not to actually pay for the failure. The player may figure out every different way to win without taking the risk of paying in real.
7. Entertainment: Entertainment is usually not the main goal of a game. However, a game often possesses entertaining quality. This may motivate the player in a more effective learning.

As designing this game, the considerations included the player's involvement and motivation. These considerations help forward the cooperation of the story and the game. Based on Alessi and Trollip's game design

elements, the author created many outposts to challenge the player. The end is to rescue the father—Yang Xiang's father. Various problems and rules would be found in these outposts, which to stimulate the player's curiosity and desire to manipulate. This study is to lead out an attractive computer game so that the player can play and learn in a safe situation, and the self-acknowledgment and assertion might be attained at the same time.

2.2 Characteristics of Game Design and E-learning

2.2.1 Characteristics of Game Designing

Howland suggested that a computer game design had to include the following five characteristics [4]:
1. Graphic: Graphics indicates the graphical picture and effects in the game, including the style, environment, character, setting, and so on.
2. Sound: The selected music and sound effects are decisive elements to express the atmosphere of a game.
3. Interface: A user's interface is the communication between the game and the player. It can be a keyboard, a mouse, or a joystick. The communicating contents consist of graphics, tables, hot keys, and so on. In whichever ways, the operation should be easy handling and flowingly. A good user interface enables a game easily handled and operated, thus the quintessence of a game showed.
4. Game-play: The interests of a game make one immersed in playing. In a dramatic game, the antagonist often has to overcome the artificial hardship. It includes non-active and active. The active one is to beat down the fighting system of the monsters. The success of this kind of game is to offer stimulating audio-visual effects, fighting challenge, and the fulfillment of controlling demand. Fine audio-visual effects provide the player with sensual stimulus and increase the interests of conquering the hardship. A non-active game is puzzle dissolving. The profundity of the puzzles and the progress of the courses decide the success or failure of a non-active game.
5. Story: The soul of a computer game is the story. A good story is unfolding a climatic

and appealing drama, combining with a series of audio-visual and animating effects, to create a fine computer game. The story writing should consist elements as below:
a. Dividing the drama by unit of scenes
b. Describing every character, settings, plot, time, terms, condition, and so on
c. Connecting cause and effect between each scene; good transition increasing the continuity and unity

2.2.2 Characteristics of E-learning

As the multimedia technology and World Wide Web (WWW) progressed and became popular and available, they created immense influence on the information technology and education. The E-learning, integrated with multimedia, WWW, research browsing, and digital library, has developed into an important learning channel [5]. The E-learning changed the conventional learning interaction between teachers and students. It also changed the teaching system and educational structure. In the traditional teaching system, teachers, students, and teaching materials play the main roles. In contemporary education, the educators are confronted a challenge of the possibilities of applying information technology and digital media in pedagogical strategy. Nevertheless, this is evolutionary and revolutionary. Educators have to take in charge.

In general, E-learning includes the following characteristics and functions[6]:
1. Integrity: is to integrate various media and information as to encompass inter-related fields.
2. Interaction: is to communicate between learners and computers as to motivate the student's learning and increase his/her involvement.
3. Intimacy: is to break through the barrier between user and interface as to operate in a more convenient and simple mode.
4. Non-linear: is to demonstrate vivid, lively, and flexible information, by the way of hypermedia, at the same time, to provide instant, on-line information browsing.
5. Instantaneity: is to provide instant information on-line as to keep up with the global trends.
6. Virtual Reality: is to provide a virtual world simulating the real world.

Thus, it can be seen that game design is not only to demonstrate eyes attracting audio-visual effects of an integrated multimedia. Furthermore, it consists of the elements of drama, operation and interaction. Its characteristics are paralleling with the ones of E-learning elements. The computer game seems to be an appropriate and workable platform for E-learning. The author intended to develop such characteristics in his game design. This game is a multimedia production, containing such characteristics as the sound, image, animation, and text, which became an integrated game interface. Furthermore, the virtual story attracts the player to interact with the characters (NPC) encountered in the story course.

2.3 Problem-Based Learning

Problem-Based Learning (PBL) is the student-centered learning. It emphasized the organization of a curriculum, the teaching strategy, and the progressive learning process [7]. The ill-structured problems initiate the learning of PBL. Students will at first to be assigned the task of solving content related problems. These problems could be complex, incomplete clues, and with no correct answers. The students have to actively involving in problem solving process, which provide the opportunity of learning how to learn. Through problem solving, students will become life long learners. The learner can possibly access and attain the learned knowledge. The learner can also possibly transfer their problem solving skills in different situation or in reality[8]. There are two theoretical basis of PBL: Constructivism and Situated Learning. They will be stated as below:

2.3.1 Constructivism

Constructivism emphasized that the individuals constructed their personal knowledge system. The individual operated the procedure, accumulated experiences, and then, constructed personal owned knowledge system. In PBL, based on the constructionism, the learners can learn through experience (by hands and by thinking) to construct personal owned knowledge system [7].

2.3.2 Situated Learning

Situated Learning theorists assumed that knowledge could not be isolated from the social environment. It existed in the social situation and contained in the entire cultural content. The knowledge can only make sense to the learners when they were made and applied in social environment [9]. Therefore, education should provide learners with social events and environment so that they can actually get involved and take the advantages to improve their problem solving skills.

The PBL especially emphasized on learning to solve problems in real world. The learner can play various roles to sense the facts, to realize the truth, to experience the interaction, then to learn the knowledge when involved in various situations.

The player plays an important role as a problem solver. He also is responsible for the learning, in other words, he is leading the learning process. The learner's ownership is the key concept of the PBL [10]. If the living related problems interest the player, the player feels the ownership, then, the direction and motivation of learning would most possibly lead to the application of learned knowledge [11].

3. The Study of Game Design and Creation of a Game

3.1 Analysis

3.1.1 Learning Goal Analyses

This game is based on the Chinese folk legend—24 filial piety stories. Young Xiang fought with a tiger to rescue her father. The story was re-written. The graphics design is in a cute version. The author intended to create a lovely and interesting game world. The player can learn the Chinese traditional idea of filial piety—every virtue comes from filial piety.

Figure 1 : First Page of the Game

3.1.2 Learner Analyses

The PBL has two characteristics of learning mode: one is to begin with problems; second is to learn the knowledge by problem solving. It is very important to consider the learner's ownership of the problems. The entire process continues checking learner's interests and stimulus of learning, such as the events, discussion, mission, and activity in virtual reality.

In this game, the player can freely move to many directions in many perspectives and interact instantly. The game is full of mission to carry out the filial piety, such as, if the father is hurt, Young Xiang would go out to pick up the medicine; or if the mother is busy, Young Xiang help grocery shopping in traditional market. The player can operate the character freely and interact with the Non-Player character (NPC) in dialogue.

Figure 2 : The Characters

3.2 Development Stages

3.2.1 Deciding the Learner's Role and Situation

Each character is situated in different problems. Problem solving process may be different. The author listed down the questions: In the real world, who would face certain problems? Which character is most likely to involve the player? Which problems are most likely to be solved and can attain the learning goals? Only after careful considerations, the situation can be setup and the character can be constructed. In this game, Young Xiang plays the role of protagonist. She passes through every test—situations, such as, learning to use tilters in a farming store, learning to calculate the payment in the butcher's shop, learning to use the watering machine in the farm, and so on. These simulated situations offer opportunities for the player to experience and fulfill the accomplishments.

Figure 3 : The Dialogue to a NPC

3.2.2 Demonstrations of Problem Models

A complete explanation of the character and situation would help the learner grasp clues of the problem solution, and instantly start learning in the problem-solving situation. The demonstration of a problem model supplies the related information. The game designer should carefully arrange it to motivate the learning.

The first page provides the manual of operation. It helps understand the rules and start playing right away. Every page has NPC, such as the peddler, hunter, explained in details so that the player can understand the missions. Whatsoever, the player has to fight with various monsters, to conquer each challenge and solve each problem.

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Figure 4 : The Design of Monsters

Figure 5 : Background Scene Design

3.3 Creative Stages

3.3.1 Problem Analyses and Selection

If the learner can grasp the ownership of a problem, the PBL is half way of achievement in learning. The problems include disputes, conflicts, questions, possibilities, and so on. Yee-Ling Shiao's research indicated that good problems have to possess the following characteristics: (1) open-ended and ill-structured problems—no definite answers; (2) related to the learner's prior knowledge; (3) disputing topics and inter-disciplinary; (4) relating to the future specialized field; (5) complicate; (6) challenging; (7) combining with living [12].

This game arrange many events which may interest and challenge the player, such as, grocery shopping, feeding the chickens, buying house wares, picking up father's medicine, learning the farming, and so on. These educational dialogues and activities are devised to understand the filial piety virtue but not to be bored.

This interface inspires the players to accomplish the missions accessed by some fighting but not to master levels in violently fighting in many fierce situations.

3.3.2 Evaluations

Conventional evaluation is not appropriate for learners of the PBL. The implementing of the PBL affects the evaluating methods. The educator has to differentiate the evaluating objects then to evaluate the assessment, which will help the learners. Wiers suggested that contextual assessment is most appropriate for the PBL testing, aided by Skill Assessments and Progress Tests [13]. In the process of fighting with a tiger to rescue the father, the player keeps his/her curiosity and learning motivation because of the growth of Experience Points (EXP). However, the player has to solve all the problems in every level to succeed the goal of rescuing the father and realize the concept of "filial piety comes before every virtue".

Figure 6 : Young Xiang Fought with the Tiger

4. Conclusion

This study is to design a educational

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computer game, which includes the characteristics below:

1. To enhance the player's game play and learning motivation, the considerations includes:

a. Based on the player's ability and developmental process, this game provides various challenge in different levels;

b. As this game creating personal related problems, it stimulates the player's ownership and curiosity;

c. In the game play, the player develops a self-acknowledgement, and in the end, the player achieves the fulfillment by the positive feedback of winning games.

2. As designing this game, the considerations also focus on the characteristics of a game play and digital learning. These characteristics are as below:

a. They have the same final target; in the game play, the player has to break down the outposts to rescue Yang Xiang's father; in the learning process, the player realize the importance of filial piety.

b. The virtual reality created the learning situation, which is interesting and safe for learning and game play.

3. The visual art design in this game is based on a unique pseudo-Chinese style. The unification was achieved by uniting the background, images, furniture, buildings, architectural structures, environmental items, background music, and sound design.

Playing games is worthy experiences. It especially emphasizes the coping in-between individuals and the community [14]. Through Role-Playing Game, the player consciously plays a special character in the game. At the same time, he/she solves the problems by following certain rules. By role-playing, the player is involved in an important functioning socialization process. Consciously and unconsciously, the player empathizes with the characters in the game, learns the objective views to the living modes, and internalizes the social rules, then becomes one part of the community, which is an important element of social stability [15].

The Role-Playing Game offers the function of playing games. It also simulates the social group, and provides opportunities to function the self-discovery and re-establishment, motion expressions, and fantasy fulfillment. To identify with the society, the teenagers have to un-centralized, learn to play different roles, hold different views, and carry out different missions. In the Role-Playing Games, the teenagers can play different roles, fulfill different expectations in the roles, solve problems, and accomplish different missions. They can choose not to play the same character and to avoid the stress and frustration coming from the reality. This is a safe way of creating environment for learner to practice but not to pressure them. Thus, they can attain the concepts of human relationships and access the practice through a game, which is very critical step for them to live in a grow-up society.

In summation, this study develops an E-learning game, which combines playing games and learning theory. In a virtual reality, the player can manipulate the strategy; join in a competitive activity and problem solving. This motivates the learning and retains the interests; learn the knowledge and skills of the player, who can transfer the learned concepts to real life without difficulty. The authors strongly recommend that a Role- Playing Game design is a good way of trying.

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