

The Research and Application of Education Game Design Model in Teaching Chinese as a Foreign Language

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Abstract—Based on the effective learning environment and multiple intelligence theory, by using a gaming concept in the learning environment, an education game design model to Teach Chinese as a Foreign Language can be proposed and the detailed steps of the design can be shown. The proposed design model is applied to design and implementation an education network game—— East Learning, and the questions of how to combine the characteristics of education game design, design model and game contents with curriculum content is studied. Finally, the game is developed using a game engine and the C++ language. The successful development of the game not only allows players to complete various tasks in the virtual situations to achieve the educational purpose of learning Chinese language and culture, but also provides some reference for the future development of similar games.

Keywords—teaching chinese as a foreign language; education game; effective learning environment; multiple intelligence theory

I. INTRODUCTION

With development of information technology and innovation of instructional methods, new instructional ideas such as game-based learning, teaching in joy have gradually been accepted by people. Education game is a product combining game and education, integration of the advantages of sound, animation, video, interactive games and other multi-media, which can provide a relaxed, free learning environment for learners, really embodying instructional mode of student-centered learning; and help to train learners' comprehensive quality of teamwork, thinking exploration and innovation. Therefore, game-based learning is quite similar with new instructional concepts of the 21st century.

At present, foreign student education and Confucius Institute have been booming. Teaching Chinese as a Foreign Language (abbreviate TCFL) is making rapid progress. According to Hanban's statistics, the number of people learning Chinese all over the world has more than 40 million; Chinese Fever and Chinese culture Fever have already been obvious fact. If educators can use the advantages of the game and network to promote innovation in TCFL, it will

effectively spread Chinese culture, and promote Chinese learning. Based on effective learning environment and multiple intelligence theory, this paper brought a design model for TCFL game and developed an online game called East Learning, which explained how to integrate instructional theory to game development.

II. APPLICATION ADVANTAGE OF EDUCATION GAME IN TCFL

TCFL is not only a language teaching, but also a way of external communication for Chinese culture, therefore, in the instructional process of TCFL, besides paying attention to the Chinese knowledge teaching, we need attach importance to the communication between teachers and students and culture information transmission. Because education game can create immersive, interactive environment [2] [8], so applying it to language instruction has an unparalleled advantage.

1) Embody interesting of learning

Interesting is the most significant characteristics of education game, which can provide a realistic picture, pleasant music, complex roles and so on, making learners to feel the fun of learning and stimulate the learning motivation.

2) Create a virtual learning environment

Education game can provide a good interactive learning environment for learners. With game scenarios' show and plot driven, it brings learners into a virtual environment containing Chinese culture. Exposed to this environment, learners naturally interact with the environment to maximally improve the learning efficiency and depth.

3) Integrate learning objectives to game tasks

Education game can organically integrate learning objectives to game tasks. Carefully designed teaching objectives manifested in new forms, the learners complete game tasks, meanwhile explore relative Chinese knowledge, which not only activate their learning enthusiasm, but also form a mode of student-centered learning.

4) Embody competitive and concealed

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Education game owns competitive with entertainment game, and stimulates learners' internal needs. Through the network, most of the players can hide their true identity, and practise listening and speaking ability boldly, thus making up for lack of classroom practice time and conquering cowardice, which is conducive to the deep communication of teachers and students, between students in game.

5) Simplify the study and practice links

Education game can simulate many real-life plot or historical allusions, etc., so this can simplify the practice process of language, and help learners to get virtual practice experience. It is beneficial to complete the construction of the Chinese knowledge, consistent with human cognition characteristics.

III. RELATED THEORY OF EDUCATION GAME

A. Effective Learning Environment

Learning environment is the unity of all kinds of supporting conditions to promote the learners development [1], its purpose is to develop meaningful learning, enhance students' self-understanding and mastering of the teaching content, promoting student self-awareness capabilities.

Norman defined seven prerequisites of effective learning environment [3]: (1) to provide a high level of interaction; (2) to have clear objectives and planned procedures; (3) to have the incentive mechanism; (4) to provide continuing challenge and can not be too difficult to make people lose confidence and produce a sense of failure, and not be simply to make people tired; (5) to provide direct sense of involvement, resulting in the direct experience of the environment and a sense of direct mission of the tasks; (6) to provide the proper tools to enable people to get help and do not give up; (7) to avoid interference and interruption to damage the subjective experience [4].

B. Multiple Intelligence Theory

Multiple intelligence theory had been proposed by the American psychologist Howard Gardner first. It had seven kinds of intelligences, and later extended to nine, namely: verbal/linguistic intelligence, logical/mathematical intelligence, visual/spatial intelligence, body/motion intelligence, musical/rhythmic intelligence, interpersonal intelligence, self-awareness intelligence, naturalist intelligence and life existence intelligence.

According to the views of multiple intelligence theory [4], each person has nine more or less intelligences, some intelligences show high level, but others show low level; these intelligences are independent of each other, so they can explain the individuals' intellectual differences. We can improve education by culturing students' multiple intelligence. Concept of multiple intelligence makes everyone find his/her own entry and exit, and everyone can be excelled in a particular field through his/her efforts.

C. Two Theories on the Education Game Design Inspiration

Construction of effective learning environment in the education game can set out seven necessary conditions, and create conditions and factors stimulate the learners' multiple intelligence in this environment. From the perspective of an effective learning environment [6], education game creates a Chinese atmosphere, making difficult Chinese learning to be

understood easily in a rich cultural background; from the perspective of the theory of multiple intelligence, learners in a special cultural environment, can be stimulated and improved the language intelligence and interpersonal intelligence.

The best way to learn language is in the specific teaching situation, and let the students perceive the language and understand the true meaning of language. Using of game development technology can create a virtual game environment and realize the effective combination of sound and image, vision and hearing, language and scenarios. In such an immersive environment, learners will be able to continue to strengthen the language application from unconscious, develop their thinking ability.

According to multiple intelligence theory, intelligences exist the different combinations between individuals, therefore it showed intelligent difference, which represents a different potential of each student, these talents are only developed fully in the appropriate context. Education game is full of challenges, in order to complete tasks, learners need to find a variety of information, thinking and exploring, solving problems [5]. Therefore, if the design has strong game nature, then it will not pay attention to cultivate the knowledge level of learners studying language, it should design scenarios, level elements, and learner control based on the combination of different intelligence, so that learners obtain skill improvement, emotional experience, culture experience and exotic values from the game play.

D. The Study of TCFL Game Design Model

Based on the above theoretical study and analysis of the characteristics of TCFL, this paper proposed a systematic game design model of TCFL—AAADRTEM shown in Fig. 1. The major ideas of AAADRTEM consist of eight steps listed as below:

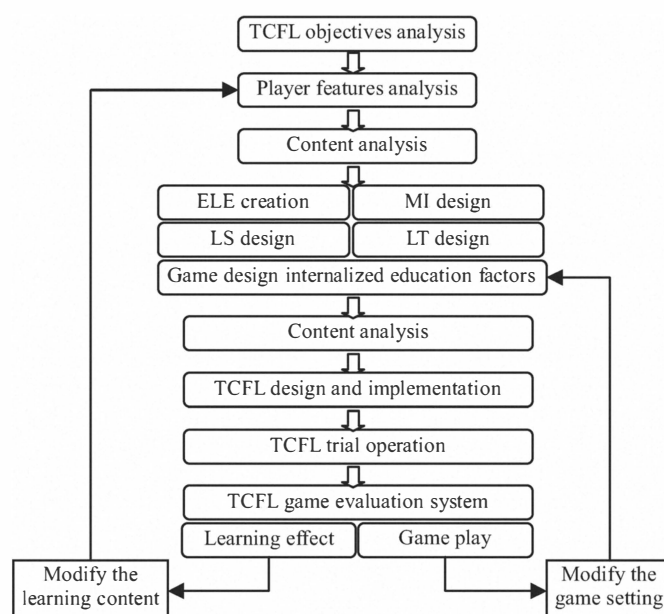


Figure 1. Design model of TCFL game

1) A— to analyze game objectives.

Deciding game objectives is the first step of design, only it is clear, the designers can select the appropriate game type and strategy. A good education game should have clear

education objectives; learners can learn what knowledge and skills through play, and how to improve their ability and intelligence. The game aims of TCFL are to provide a virtual language environment for understanding Chinese, and cultivate learners' Chinese ability and Chinese communicative competence.

2) *A— to analyze learners' characteristics.*

The learners' characteristics, including sex, age, learning, socioeconomic, and cultural background, will be analyzed. These characteristics seem no direct relationship to the learning content. Through understanding the learners' background, the designers can consider the learning level based on the learner's background and also choosing an appropriate instructional design.

3) *A— to analyze game content.*

Game content design is based on the analysis of objectives and players, then making comprehensive consideration about game's style, learning content and cultural. According to the objectives of TCFL, instructional content can be divided into several units, then designing the game's scenarios and tasks based on them, organizing games plot development, making game rules, and determining the game process.

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5) *D— the design of game internalizing educational factors.*

The design of game internalizing educational factors depends on effective learning environment creation (ELE creation), multiple intelligence design (MI design), learning situations design (LS design) and learning tasks design (LT design) to achieve the combination of education and games. First of all, Designers consider how to satisfy the seven essential conditions of an effective learning environment; Second, in accordance with the objective needs analysis which intelligence can be embodied in the design; third, analyzing the correspondence of learning situation and task, with a heuristic teaching method, and purposefully induce players to explore the activities, so that players find Chinese knowledge. After players obtain the relevant experience in the game, on the basis of concrete experience in getting the rational distillation, they will abstract reasoning in general.

6) *D— to develop game.*

Game development include four elements: planning, programming, art design and sound design. Planning requires the results of previous analysis and design, considering merging TCFL game objectives, the player features and instructional content into a whole. After the completion of planning, the designers can use the appropriate technology for developing game programming, then testing them. The main tasks of art design are role design, scene design, interface design and animation content and so on. Sound design is used to make the game sound effects and background music to adapt the game story plot development.

7) *T— to trial operation of game.*

Before formally launching the game, the game is demanded to enter the trial operation phase to test whether it reaches all the requirements and functions, whether to meet the player's needs.

8) *E— to evaluate game.*

TCFL game evaluation system is essential, which is applied to collect the learners' feedback and comments to provide the basis for following perfect. Evaluation needs to judge game nature and instructional effect. Evaluation of instructional effect should be based on instructional objectives, and determine, measure, judge the process and results of learning activities and the results through scientific criteria. Evaluation of game nature can be acquired through the degree of learners' participation and game reviews; it can reference the general game measurement.

9) *M— to modify game.*

As soon as obtained game evaluation, the game will be modified content and internalization of educational factors in game, so that improving the game system.

IV. DESIGN CASE OF TCFL GAME—EAST LEARNING

East Learning is a TCFL education game, in which effective learning environment and multiple intelligence theory merged into education game itself. Specifically, in the East Learning situation, it can develop the learners listening, speaking, reading, writing and communication ability through the attractive role, rich plot and challenging task.

A. Game Design of East Learning

1) Story background

Story takes place in a mysterious ancient oriental country - China. According to legend, there was a monkey named Monkey King, lived in Waterfall Cave, Huaguo Mountain to protect and teach many little monkeys. Monkey King wanted to teach his all skills to other monkeys, and needed to select a suitable successor who must has strong Chinese ability, so these little monkeys began to long long way to the academic.

2) Game objectives

East Learning provides practice scenarios to help the learners to study, through multiple intelligence design to improve their intelligence of language, interpersonal communication, nature observation, cultural experiences, music, and space control. The game tends to practise listening, reading and communication ability, but also extends to speaking and writing ability.

3) Role design

When the game begins, each learner can choose to play a major role, its property as follows (see table 1):

TABLE 1. GAME CHARACTER INFORMATION

Name	Job	Features
Humans	Adventurer	Skill: Middle Chinese level: High Adaptation: Middle
Monkeys	Guardian	Skill: Middle Chinese level: Low Adaptation: High

Pixy	Stalker	Skill: High Chinese level: Middle Adaptation: High
Supernatural	Supervisor	Skill: Middle Chinese level: High Adaptation: Low

One of the necessary conditions for effective learning environment is the appropriate challenge, and when challenges, skills and knowledge achieve "balance", the learner will try his/her best to study the system policy to enhance ability. East Learning sets up the different skill levels for the learner. The learner can flexibly choose and set the difficulty of the game according to own ability before the game begins.

4) Scene design

Because most foreign students are more interested in China's natural scenery, historical sites, which are as game backgrounds, learners will prefer this style. Therefore, the game scenes design of East Learning was mainly with China's natural scenery, historical sites, such as: Waterfall Cave, Huaguo Mountain, Dragon Caves, Flaming Mountain, etc.; at the same time, scenes also included some urban landscape of modern China.

5) Game tasks design

Game tasks have Chinese listening, reading, communication, grammar exercises and training on cultural sensitivity. In every conversation, learners are given by the game's menu to select the appropriate response, then achieving the purposes of understand Chinese culture by various observation and training; at the same time, reaching language freedom to compete with other learners so that gaining prestige and honor in the challenge. Learners get some awards and achievements by completing one after another challenging task, which not only stimulate their enthusiasm for learning, but also imperceptibly increase their sensitivity to Chinese culture and intelligence of language / communication / observation.

6) Sound design

The sound effects existing in the game are as follows: broadcast, the sound of dialogue, background music, etc., so that when players move, they can get information of many cities through broadcast, and through other sound effects to increase the learner's telepresence.

7) Game content design

East Learning hopes to combine game nature together with educational nature, so whether game's content, learner control settings and so on, all elements reflect a combination of both. Its purpose is to inspire the learner to cultural sensitivity and improvement multiple intelligence, and to promote learner-depth exploration.

a) Content setting

Original design intention of East Learning is not be a substitute for classroom teaching, but it provides an environment for learners to practise the knowledge learned in the class. So the game levels and design elements have a strong relationship with traditional courses (see table II).

TABLE II. RELATIONS WITH COURSES AND GAME

Course structure of TCFL	Game setting
Lesson: Greeting Word: Hello, etc greeting	Learners learn greeting from Monkey King, to understand the grammar and mode of Chinese greeting.
Lesson: Hobbies Word: The words and expression about hobbies	Learners need to complete some tests to master their characters and interests, and they can acquire individualized instruction. Next, accept the different tasks. According to their aptitude give different tasks.
Lesson: Shopping Words: Buy, Sell, Money	Players go to the grocery stores to buy products, and ask the price or bargain, or go to China's restaurant to eat. Practice learners' skills of buying products, be familiar with the use of monetary and understand the goods knowledge.
Lesson: Time Word: Number, Week, Year, Month	Learners use the system timekeeping to understand time, or complete the tasks of setting time. Learn Chinese time expressions.
Lesson: Transportation Word: Direction, Place Name, Vehicle	Each learner is at a new place for an accurate location, he must seek the proper direction and location. If the learner wants to go through time and space, he should use transportation vehicles. Learn vocabulary of transportation means.
Lesson: Currency Exchange Word: Exchange, Bank, Money	Learners according to their own nationality to get the initial money, then they can go to the World Bank to change them into RMB. Practice currency exchange and learn RMB discrimination.

b) Learners control setting

Education game is the learning activities in which enable learners to immerse themselves and actively participate in the game, education game design has to pay attention to balance of education and game, only the proportion between the two conditions reaches coordination, learners can be immersed in the game naturally [7]. In East Learning, the learner control include: the decision to spend (such as: accommodation, tea, etc.), and interact with others through game menus to test the role of each phrase, and some study help, for example, dictionaries. These controls well solve the balance of learner control and elements level, according with the game target audiences' age characteristics.

V. THE IMPLEMENTATION OF EAST LEARNING

The development of East Learning used with self-designed game engine based on an open source OGRE 3D graphics engine, using C++ language and object-oriented technology, and completing the functions of map editor, game client, game server and game script editor. Fig. 2 shows a game scene - Waterfall Cave, in where the player can get own first task, that is say hello to other player with Chinese.



Figure 2. Game scene - Waterfall Cave

In East Learning, the game script system is responsible for editing game's learning tasks and game logic, which loads the content of TCFL, task logic, and help into the game, then controlling game logic and making players to get tips and hints after finishing mission. Teachers can use script editor to set the game tasks, and these tasks processed can be transformed into the game plot. Fig. 3 shows the players faced to first learning task - greeting other players with Chinese. Task window is divided into upper and lower parts, the top part of the task explains the requirements with English, the following explains some differences of the Chinese greeting of "Nan halo" and "Ni halo", to help players better understand these two words meaning. Players can click on the task box below the "acceptable" or "give up" button to decide whether to complete the task.

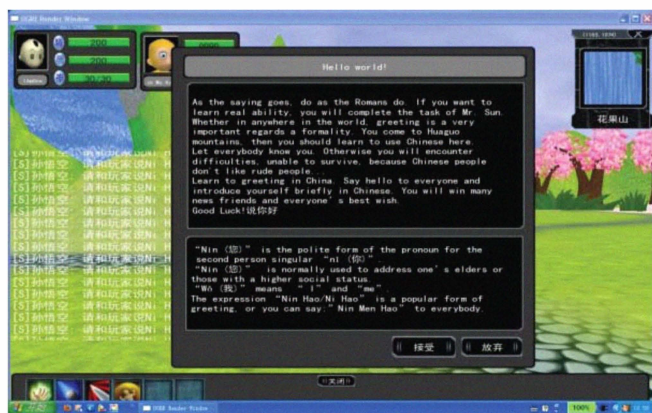


Figure 3. An education game task

VI. EVALUATION

After the development of East Learning was completed, in order to evaluate its effect, we took some foreign students from a Chinese university and divided them into two experimental groups with each group having 20 students. Group 1 learned Chinese using traditional teaching methods, while group 2 learned Chinese using traditional teaching methods combined with the network education game. After two months of testing, the abilities in listening, speaking, reading in group 2 students have been significantly improved. The virtual learning environment and the well-designed teaching scenarios provided by East Learning allowed the group 2 students to be more easily immersed in the game environment. These foreign students acquire the knowledge and skills in Chinese by completing the game tasks

continuously and increase their application of Chinese and experience by exchange and communication with other game players. From these results, it can be shown that the East Learning as a foreign language teaching network game has achieves its design purposes.

VII. CONCLUSIONS

TCFL game has shown great advantages, this new game type has brought more enjoyable for the learners, has brought new opportunities for the Chinese culture propaganda. However, spreading education game to TCFL needs to the efforts of game designers, producers, teachers and experts. East Learning studied education game's design features, design model, and how the game content and curriculum integration and other related contents; its realization has a certain reference for other TCFL games. Next job will focus on East Learning application and evaluation, and promote the theory creation of practical, comprehensive, scientific TCFL education game, promote TCFL game popularity.

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