Application of Game-based Learning (GBL) on Chinese language learning in elementary school

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***Abstract*—The purpose of this study is to explore the effect of applying game-based learning (GBL) in Chinese language learning for elementary school students in Taiwan. This study used the "Millionaire Language Game" was the research tool in the team competitions in Chinese language instruction. It then conducted survey on the students' attitudes and feedback regarding their usage experience, and interviews with teachers and students. The main conclusions of this study are: 1) the application of GBL on Chinese language instruction has a positive influence on the learning attitude of learners; 2) the influence of the application of GBL on Chinese language instruction on the learning attitude of learners is not restricted by gender; 3) the application of GBL on Chinese language instruction influences the learning attitude of learners transcending usage experiences; 4) for teachers, GBL is beneficial to Chinese language instruction.**

Keywords- game-based learning, computer multimedia, Chinese language learning, elementary school

I. RESEARCH MOTIVES AND PURPOSES

According to the Computer Usage Conditions Report released by the Directorate General of Budget, Accounting and Statistics, Executive Yuan in 2010, in Taiwan the overall prevalence of personal computers by the end of 2010 has reached 73.34% [1]. This shows that information technology has become an indispensable tool for teachers and students. Some studies have suggested that proper visual and audio multimedia can attribute to over 94% of perceptive abilities [2]. This shows that multimedia can facilitate student learning. Furthermore, the interesting and challenging characteristics of games can draw users' attentions on the games and allow them to be immersed in games, thus effectively attracting their concentrations. The concept of game-based learning (GBL) was proposed by scholars in 2002. Many empirical studies have confirmed that GBL can enhance students' learning effect, enhance their memory retention and knowledge development, and facilitate proactive and affirmative attitudes [3-5].

The Chinese language is the basis of learning, and is a necessary tool for life-long learning of all citizens. It is also an important ability for individuals and national competition. Thus, in the elementary school stage, Chinese language instruction is very important. Under the traditional curricular structure, students only need to learn one language; however, since the implementation of the Grade 1-9 Curriculum, they need to learn three languages, thus decreasing the number of course hours for Chinese [6]. This has caused difficulties and pressure for elementary school teachers in Chinese language instruction. Thus, how to use abundant and diverse instructional methods to inspire students in learning, infinitely extend learning, or even autonomous learning, are all important issues in Chinese language instruction. In view of this, this study aims to investigate the teaching strategies of GBL based on literature review, and design interesting game media Chinese language instruction.

Based on the above research motivation, this study designs a Chinese language learning tool, Millionaire Game, the concept of which originates from a popular television game show in Taiwan. It can elicit students' motivation for competition and the desire to know. This is the digital game-based learning (DGBL) instructional strategic tool in this study. The research objectives of this study are:

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1) To explore how the presentation of GBL instructional materials affects students' feedback regarding Chinese language learning.

2) To explore how the presentation of GBL instructional materials affects teachers' feedback regarding Chinese language learning.

II. Literature Review

A. DGBL instructional strategy and Chinese language instruction

1) Research of GBL

The concept of GBL could be track back to the early education scholar, Friedrich Froebel, who proposed that gaming begins with happiness and ends with wisdom; this accentuates the motivation of gaming to inspire learning [7]. Piaget suggested that games can help children to learn. Games do not require changing of oneself or adaptation to the environment, so in the game, one does not need to deliberately learn new techniques, but can use games to repetitively practice new techniques until familiarization [8]. Cheng and Kao [9] indicated that DGBL is student-centered, and is an innovative instruction that incorporates digital games. Tsai, Yu and Hsiao [3] found that GBL can inspire learner motivation, and resolve the problem of traditional digital learning, the inability to attract learner engagement.

One instructional strategy for multimedia instruction is to combine games with education, and to form digital games through elements of text, audio and video, and animation. This allows the learners to achieve the learning objectives in the process of exploring and resolving problems, and to gain a sense of accomplishment [5, 10].DGBL is a complete system that uses the learning objective as its basis. For instance, Garris, Ashlers and Driskell [11] proposed a DGBL model to explain the application of games to learning. The process of the learner from input to outcome is shown in Figure 1. The input portion includes instructional content (i.e., the knowledge and instructional materials to be conveyed to the learner), and game characteristics, including the game's own elements, such as competition, challenging, and sound and video, as well as animation. After three internal cycles of processing, learning outcomes are ultimately produced.

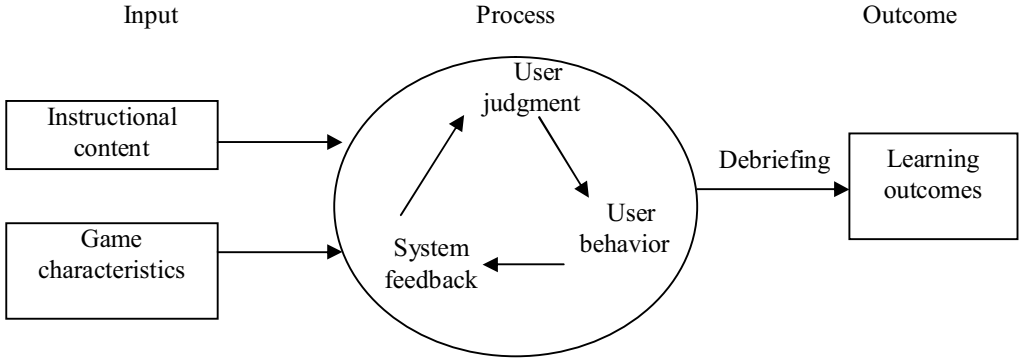

Figure 1 DGBL model
Source: Garris et al., [11]

In sum, the DGBL instructional strategy is learner-centered. Through creative integration of information-related hardware and software, an innovative instructional strategy is created to allow learners enjoyment and inspiration of learning motivation.

2) Chinese language instruction theory

When Chinese language teachers engage in language instruction, they need to use the means of listening, speaking, reading, and writing. Chinese language instruction at the elementary school level includes using Zhuyin symbols, listening, speaking, character recognition and writing, reading, and composition [12]. The modified Bloom 2001 definitions about cognition are divided into knowledge, understanding, application, analysis, evaluation, and creation, which are defined according to the fields [13]. These serve as the basis for the framework for Chinese language instruction in this study.

III. Research Procedures and Implementation

A. Research Method

This study adopted by qualitative and quantitative methods. It conducted experimental instruction on fifth and sixth grade elementary school students, and used questionnaire survey to find out about the attitudes and feelings of teachers and students. The results were also supplemented with interviews and researcher's observant participation.

B. Research Subjects

This study treated 36 sixth-grade students and 6 fifth-grade students in Pingtung City, Taiwan, as research subjects. They were in three classes, with one teacher in each class.

C. *Research Tools*

The research tool in this study included the "Millionaire Game instructional materials" and "Survey on opinions regarding applying GBL to language instruction activities." The research tools are explained as follows:

1) Basic programming framework of the Millionaire Game

The game program modified from the materials shared by a well-known instructional materials design blog in Taiwan, "Teacher A-Gang's Imaginary World". In the game, there are three stages with 15 missions, which go from $1,000 to $1 million, as shown in Figure 2. In the game design, there are three lifelines, as shown in Figure 3.

In the first lifeline (as in Figure 3a), the options go from 1 out of 4 to 1 out of 2. In the second lifeline (as in Figure 3b), gamers can discuss with each other, when the class is gaming they can engage in intra-group discussion or inter-group cooperative team instructional methods. In the third lifeline (as in Figure 3c), it is a statistical suggestion of the answer, that may not be correct.

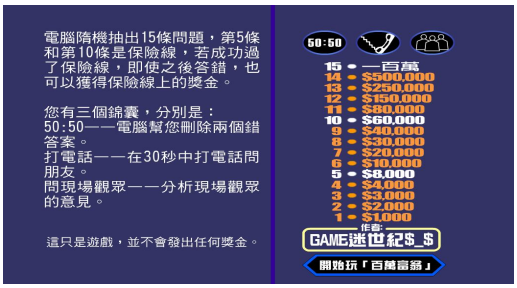

Figure 2 Explanation of game rules

The teacher can use inter-group votes to tally the answers. This lifeline design makes this tool more suited to group gaming, to promote group learning and team instruction.

a b c

Figure 3 Game lifeline function interface

2) Construction of the question bank and modification for the Millionaire Game

The question bank was based on the Kang Xuan Edition Chinese textbook for elementary school third and fourth graders, as well as the objectives of the Chinese language instruction in the Grade 19 Curriculum. Chinese question items were selected from each version of the textbook, with a total of six question types. The cognition level dimensions are modified version of Bloom 2001, which are divided into four levels [13], as shown in Table I. The questions are evenly distributed among the four types of abilities as much as possible.

TABLE I. ITEM ANALYSIS CHART

	Knowledge	*Understanding*	*Application*	*Analysis*
Character sound, form, meaning	4	3	3	6
Distinguishing homographs	3	3	3	4
Idioms	3	4	5	4
Semantics (usage)	3	4	4	3
Language use	3	4	4	4
Symbol usage	0	0	1	0

D. *Procedures for Research Implementation*

This research tool was evaluated and modified by experts and teachers. The game was performed on fifth and sixth grade elementary school students using projectors and screens. The teacher first explained the rules, and then the teams drew lots to determine the order. After the game, the questionnaire surveys and interviews were conducted.

IV. RESEARCH RESULTS

A. *Students' attitude after usage*

The measurement on students' attitudes after usage was based on a Likert 5-point scale. The general test mean level of 3 was used as the standard for the single sample t-test. The results are as shown in Table Ⅱ. All students indicated satisfaction after playing the Millionaire Game (t=7.393, sig.=.000<.05 and the mean difference is 1.00251>0).

TABLE II. SINGLE SAMPLE TEST

	t	df	p-value	Mean difference
Overall attitude	7.393	41	.000	1.00251

B. Analysis of different attitudes by gender

Based on genders of the subjects, independent sample t-test was performed. The results are as shown in Table Ⅲ. The gender variance is similar (F=0.755, sig.=.390>.05), and there is insufficient data to support differences in attitudes (t=-0.745, sig.=.460>.05). Apparently, GBL produces sufficient satisfaction for both male and female players.

TABLE III. GENDER INDEPENDENT SAMPLE TEST

	Levene test with equal variance		***t-test with equal means***				
	F	p-value	t	df	p-value	Mean difference	Standard error difference
Overall attitude	0.755	.390	-.745	40	.460	-.20706	.27779

C. Analysis of attitudes caused by different usage experiences

An independent sample t-test was conducted on subjects with or without prior usage experiences. The results are shown in Table Ⅳ. The two groups of variances are similar (F=0.027, sig.=.871>.05), and there is insufficient data to support differences in attitudes after playing the Millionaire Game (t=-0.447, sig.=.657>.05). All subjects, whether have or do not have prior usage experiences, indicated high satisfaction toward GBL.

TABLE IV. INDEPENDENT SAMPLE TEST FOR USAGE EXPERIENCE

	Levene test with equal variance		***t-test with equal means***				
	F	p-value	t	df	p-value	Mean difference	Standard error difference
Overall attitude	.027	.871	-.447	40	.657	-.13922	.31149

D. Analysis of overall usage experience and attitudes

In this game, the attitude is one of satisfaction, as high as 71.5%, and the ratio is far higher than dissatisfaction, at 4.8%.

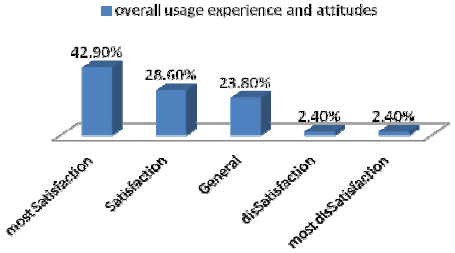

Figure 4 Analysis of attitude inclinations after overall usage experience

E. Interviews and observation

In the game process, the researcher observed that the students are highly concentrated, and enthusiastically answer the questions. When team members encounter difficulty in answering, they would actively engage in group discussion. They also feel proactive about the competitive scores (the dollar amounts) between groups. In the interview process, the students responded: "having class like this is so exciting." They would also discuss with other classmates: "The first question's answer is A." Students also told the researcher, "I hope I can play the game again later." Apparently, for the learners, they feel like they are playing and not learning. Thus, students' responses and learning concentration are enhanced. Some students expressed that even though the bell rang, they still did not want to end class.

F. Interviews and views of teachers at the site of instruction

The teachers expressed that: "students did enjoy the game process." The test questions compiled in this game can assist teachers in engaging in reviewing Chinese. Regarding students' performance in class, the on-site teachers stated: "in class, the students performed more enthusiastically." This shows that, the Millionaire Game received positive feedbacks from both teachers and students, so learning through games can promote learning interest.

V. CONCLUSIONS

After related analysis and exploration, this study reaches the following conclusions:

A. The effect of applying GBL to Chinese language instruction on learner attitude is positive

The overall analysis of language game instruction using the Millionaire Game shows that the learning satisfaction of learners and instructional processes of teachers are positive, who all suggest that learners have become more interesting, and the learning attitudes are more proactive.

B. The effect of applying GBL to Chinese language instruction on learner attitude is not restricted by gender

Using the Millionaire Game to conduct language game instruction is enjoyed by both genders who are enthusiastic about the game. It may be because that the Millionaire Game is gender-neutral, so it can transcend gender differences.

C. The effect of applying GBL to Chinese language instruction on learner attitude transcends usage experience

The experience influences for using related games does not exist, and the researcher suggests that there

are two possible reasons. One is that the usage method of this game is easy to understand, the operations are not difficult; the other is that perhaps the form of the game is similar, but the content (question bank) is different, so the focal point of the challenge to students is the questions themselves. This also shows that this type of game can be used multiple times.

D. For teachers, applying GBL to Chinese language instruction is beneficial to instruction

In the interview process, the experience of teachers who implement this approach suggests that in the teaching process, students showed more enthusiastic responses, and some students who were less interested in Chinese also attempted to give answers and engage in discussions. Teachers thought that this type of Chinese language instruction is indeed more interesting than traditional instruction, and the Millionaire Game is suitable for group instruction.

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