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“The Four Arts”  
- A prototype interactive game for  
engaging and interacting with Chinese  
culture using touch screen interfaces

*An exegesis **to be presented** in partial fulfilment of the requirements for the  
degree of  
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*Li Wang*

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# Abstract

The main objective of this project is to explore the possibilities of digital media, to help users understand traditional Chinese culture through an immersive virtual experience. Through playing an interactive game one experiences and explores Chinese culture. Chinese culture is rooted in an ancient history, which might be difficult for other cultures to understand clearly and fully (Moore, 1967). Chinese language is poetic but it can even be obscure to even native Chinese speakers. Full understanding of traditional Chinese philosophy can take many years of learning, reflection and instruction.

“The Four Arts” aims to introduce Chinese culture through music (“Qin”), the Chinese traditional board game (“Qi”), Chinese traditional calligraphy (“Shu”), and Chinese traditional brush painting (“Hua”). The single-player game is based on the “Four Arts” and has been designed in Adobe Flash for a touch screen display. Users can experience traditional Chinese culture through play, which will help them to learn about key features of traditional Chinese culture and related philosophical concepts. To evaluate the effectiveness of the design, a qualitative methodology was applied for user testing. The results suggest that interactive computer game can help users appreciate and understand aspects of Chinese culture. The open-ended conversations with the participants have provided useful feedback on future design improvements for “The Four Arts”.

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*Li (Neil) Wang*

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# **1 Introduction**

## **1.1 Background**

The principle traditions of China are so diverse and ancient that many people in the western world find it difficult to understand (Moore, 1967). Even native Chinese sometimes find their own traditional culture difficult to learn and introduce to those who come from different cultural backgrounds.

Interviews with two Chinese cultural scholars (Lan Wang, Lecturer of Chinese Literature, at the School of Arts and Social Sciences, Wuyi University Guangzhou, China, and Qi Zhang, Lecturer of Comparative Literature, at the School of Arts and Social Sciences, Xidian University, Xi'an) suggest that the most typical way of promoting Chinese culture is through written manuscripts. However, even native Chinese speakers often find these manuscripts difficult to interpret. As many aspects of traditional Chinese culture emphasise inner perception, it cannot be experienced only by reading written materials.

In ancient China, various activities were invented to help people experience, appreciate and understand aspects of traditional Chinese culture, such as poetry, Yayue (elegant music), calligraphy, ink painting, and Qigong (prana force). The four activities, “Qin” (music), “Qi” (Go-a traditional Chinese board game), “Shu” (calligraphy), and “Hua” (ink painting), are together seen by Chinese scholars as the Four Arts of China, also known as “Siyi” (Dillon, 1998). These four activities are still being practiced in the modern world. However, a great deal of effort is needed for mastering the Four Arts because a practitioner needs to buy the tools and materials, to learn the rules and theories, and to spend an enormous time practicing.

## **1.2 Significance/Purpose**

In this project, four digital media interactive games have been designed, based on the Four Arts of China introduced above. The four games can help users learn and experience traditional Chinese culture. Furthermore, instead of putting too much effort into a learning process, users can expect to enjoy learning, and thus appreciate the

culture more. The computer games designed in this project also have the potential to be put online; that is, the games can be accessed by billions of people around the world. The games are designed for touch screen computers, so that they are intuitive and available via different platforms, such computers, digital touch screens, tablets and smart phones. This approach may make learning process more accessible, entertaining and meaningful. Once the concept of using computer games to help people learn traditional Chinese culture has been proven to be effective, the idea can be transplanted to promotional scenarios and learning about other traditional cultures.

### **1.3 Aim**

By doing this study, the researcher aims to design four digital interactive games that can provide the users a short but immersive experience of traditional Chinese culture. To achieve the success of the game design the researcher have to find out an appropriate way to transform the practices of the Four Arts into digital interactive game forms, and to ensure the digital games are easy to get “hands-on” experience with. It is also important to achieve playful experiences without losing the educational value of the original games. At the end of this project, a user test will be conducted to find out how effective the digital games are for learning about Chinese culture, and which particular areas need more attention for possible future development.

## **2 Literature Review**

To inform this study, literature in several fields has been reviewed, and cross-disciplinary lenses have been utilized. First, studies on important aspects of traditional Chinese culture have been examined. Second, this study draws on the work which addresses those issues that make the culture complicated to understand and learn, and that investigate what people think about traditional Chinese culture. Furthermore, the existing literature on the Four Arts of China has been reviewed to find out how the four practices connect to traditional Chinese culture. Finally, this study summarizes the findings from relevant existing literature on the use of digital media to promote Chinese cultural heritage.

### **2.1 A brief review on some important aspects of traditional Chinese culture**

Scholars have written that Taoism and Confucianism have been two essential ingredients of Chinese culture through the past twenty five or so centuries. Both of these philosophical traditions still have significant influence today, even outside Asian countries (Roberts, 2004).

#### **2.1.1 Daoism**

“Daoism (Taoism) is an ancient Chinese combination of religion, philosophy, and folk beliefs, including ritual healing. Its different strands of belief date far back in history. Daoism is deeply entwined with Chinese culture and history.” (Roberts, 2009, p. 28)

Daoism, also known as Taoism, has a more than 2,000 year-long history. As it has impacted on many important aspects of Chinese culture, knowledge gained from Daoism can be helpful in understanding traditional Chinese culture.

The main idea of Daoism is to reveal the “Dao” (the ultimate way), which exists in everything and has never been influenced by the change of time. Daoism teaches that the highest goal of human life is to mingle with the “Dao”.

Some theories and concepts Daoism can be seen as an explanation of how the universe works. One of the most important aspects of Daoism that concerns the power that keeps the universe working is YIN AND YANG. Another important idea in Daoism is the

concept of the FIVE ELEMENTS that are regarded as five agencies, which represent the flow of its ever-changing energy through everything that exists in an endless cycle (Roberts, 2009).

### **2.1.2 Confucianism**

“Undoubtedly, Confucianism is one of the most important cultural heritages of the nation in that it played a key role in the formation of Chinese culture for about two thousand years, up until the Qing Dynasty (1644 - 1911).” (Alon, 2003, p. 29)

Confucianism has enormous significance in traditional Chinese history. Confucianism teaches that the fundamental principles of a society are human harmony and human interrelatedness. Chinese culture is based on a web of interrelatedness, in which all members of the society are bound by social relations (Heisey, 2000).

Confucianism emphasizes the idea of how a person fits into the society according to his or her state of being. The foundation of Confucianism includes two main aspects, the Three Principles and the Five Norms (Alon, 2003).

In conclusion, Daoism and Confucianism are core parts of traditional Chinese culture. They have a very significant impact on Chinese people's thinking and behaviour even in modern society. To experience traditional Chinese culture, it is important to incorporate these two essential ingredients.

## **2.2 What people think about traditional Chinese culture**

“There is nothing ‘inscrutable’ about the Chinese or Chinese mentality. However, there is much that is subtle, at first unclear, and, to a Westerner, sometimes even enigmatic and paradoxical.” (Moore, 1967, p.3)

Chinese thought and culture can appear to be very hard to grasp and to understand, which in turn can lead to many misunderstandings of Chinese culture. One misunderstanding is that some people perceive Chinese philosophy as dominated by intuition and by the absence of any logic or rational thinking; another is that there are no science, nor any scientific method in China; and yet another misunderstanding is that the

philosophy of China has made no contribution to the West or to Western philosophy (Moore, 1967).

Why are there so many misunderstandings and what are the obstacles which make the traditional Chinese culture hard to get close to? As described above, to gain a good understanding of traditional Chinese culture, it is necessary to study Daoism and Confucianism.

The “Daodejing” (also known as “Tao Te Ching”) is regarded as the main source of literature reference to study Daoism. “... Laozi is a major figure and the Daodejing an important source of Taoist references.” (Robinet, & Brooks, 1997, p. 26). The “Analects” (also known as “Lunyu”) is the major literature reference to study Confucianism. “The Analects is a record of the life and saying of Confucius.” (Seow & Xu, 1998).

However, the writing style in both the Daodejing and the Analects is both poetic and obscure, even to modern native Chinese speakers, let alone foreigners. The writing style of the two books has been described as “obscure” and “paradoxical” by researchers in the West (Giskin, & Walsh, 2001).

A full understanding of traditional Chinese philosophy can take many years of learning, reflection, and receiving instruction.

### **2.3 The Four Arts of China**

“And in later periods, the principal arts were gradually formulated into the four arts, siyi 四艺 (the lute qin, the game of weiqi 围棋, calligraphy and painting) which had to be mastered by a well-educated gentleman.” (Dillon, 1998, p. 15)

The Four Arts were regarded as the four major achievements of Chinese scholars. A person who can master the Four Arts will be considered to be a well-educated gentleman. This means the Four Arts have considerable significance in the education field of ancient China.

Given the above, this study will aim to discover if the Four Arts of China can made more understandable and engaging to a modern Chinese and non-Chinese audience through a game-based learning approach.

### 2.3.1 The Art of Qin (Music)



**Figure 1. A scholar is playing Guqin (zither), finds he is part of nature**

“Qin” literally refers to a unique seven-string Chinese musical instrument “Guqin”, which was invented 3,000 years ago in ancient China. Qin is not only a form of art but also a science and philosophy. Guqin is also regarded as a Daoist instrument, and

playing it is traditionally considered to be a form of meditation, accompanied by burning incense (Marre, & Charlton, 1986).

Beside Qin, as an ancient Chinese instrument, the music played on it had a very important role in ancient China. Both the Confucian ideas and the Daoist concept find that music is an expression of the harmony between human beings and nature (Jin, 2011).

The temperament theory of traditional Chinese music reflects how music is connected to the nature and philosophical ideas of Daoism. In traditional Chinese music, Five Sounds *Gong* 宫, *Shang* 商, *Jiao* 角, *Zhi* 徵, and *Yu* 羽 stand for the five-tone scale. These Five Sounds corresponded to the Five Elements 五行, and by the means of the Five Elements, the Five Sounds can be related to all the existing forms of things (Chan, Clancey, & Loy, 2001).

The relations of the Five Elements and the Five Sounds can be used in the game design of this project to demonstrate how in traditional Chinese culture music theory can be linked with traditional Chinese philosophy (Daoism).

### 2.3.2 The Art of Qi (Go)



**Figure 2. Two scholars are playing Qi (Go)**

The art of “Qi” is also called the Go game. The Go game is a traditional game that originated more than 2,500 years ago to aid astrologers. The board represents the Earth, and the Black and White game pieces represent the Yin and Yang of the universe. Practicing weiqi can help players understand the way of Heaven and the way of Humanity in traditional Chinese culture (Liang, 2007).

The relation of Yin and Yang is a very important concept in traditional Chinese culture. This concept is one of the essential concepts of Chinese culture that need to be demonstrated in any games disseminating the fundamental aspects of traditional Chinese culture.

### 2.3.3 The Art of Shu (Calligraphy)

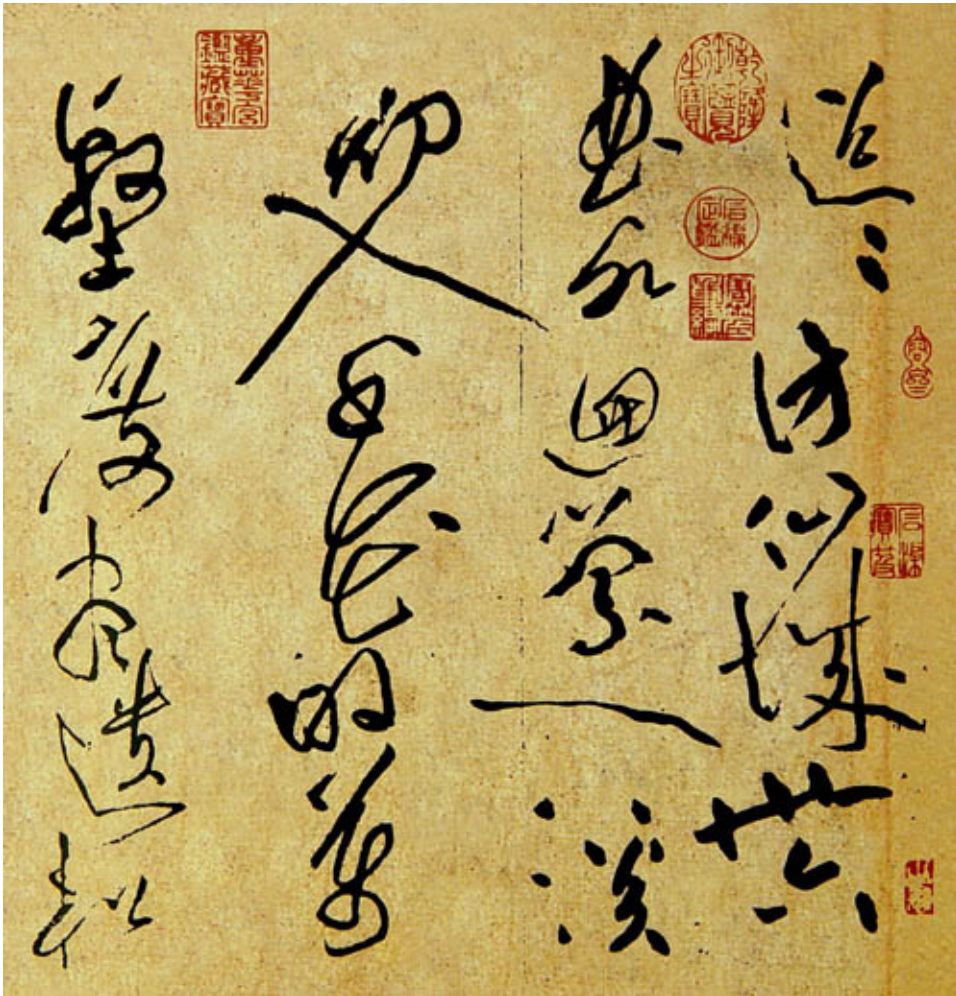


Figure 3. An art work of calligraphy by the famous Song Dynasty calligrapher ‘Huang Tingjian’

The art of “Shu” is the art of writing Chinese characters, which have evolved over time from abstract writing and pictures. The pictographic characters in the ancient Chinese inscriptions were regarded as the childhood of Chinese calligraphic art (Chen, 2001). The Chinese believe that Chinese calligraphy helps people express their soul and spirit, and that practicing and perfecting calligraphy allow understanding of the aesthetic, moral and spiritual values of traditional Chinese culture (Ch'en, Link, Tai, & Tang, 1994). Chinese calligraphy therefore is a true embodiment of Chinese traditional cultural features (such as the ideology of Daoist aesthetic) that are distinct from those Western cultures (Li, 2005).

To experience traditional Chinese culture it is important to understand the idea behind Chinese calligraphy. Thus, this project will simulate the way of learning Chinese calligraphy in order to help the users develop an appreciation of traditional Chinese culture.

#### 2.3.4 The Art of Hua (Painting)



Figure 4. A sample of Chinese ink painting

The art of Hua is a form of Chinese art which does not paint real world objects. Instead, this art is about expressing one's heart and views of the world. The art of Hua does not use any preliminary sketching or models, and is performed freehand so that all strokes come from one's heart, and it is regarded as the reflection of one's philosophical concept and attitudes towards the natural world (Dillon, 1998). Only three tools are needed to perform Chinese ink art, and they are: brush, ink, and rice paper.

Compared with the Western language system, there are an enormous number of ideas in Chinese culture about calligraphy, and writing and painting are profoundly connected. Thus, learning and practicing these two arts can help people learn and understand traditional Chinese culture (Hodge, & Louie, 1998).

This project will use a simulation of Chinese ink painting process to help users develop an idea of the philosophical concepts behind the practice of Hua.

#### **2.4 Touch screen and digital technologies on promoting Chinese cultural heritage**

A project was conducted by National Chengchi University, in Taipei, Taiwan, using digital mobile media and touch screen technology which apparently achieved an effective and efficient way of learning the written Chinese language. In that project, they employed intelligent character recognition technologies combined with a "touch-based user interface" to create real-time image content understanding (Kuo, Huang, Liao, and Huang, 2011).

However, the above project only focused on how to help users memorize the meanings of the Chinese characters. It did not reveal any conceptual or philosophical ideas of traditional Chinese culture. In this project the researcher will develop applications for a touch screen user interface using interactive digital media to provide users a virtual experience of traditional Chinese culture, not to memorize the features and meanings of the Chinese characters, but to develop an understanding and appreciation of the deeper cultural meanings that lie behind them.

## **2.5 Research questions**

From the review of the existing literature, a range of research questions has emerged to focus the aims of this research project. They can be shaped into three major questions, as follows:

- Can digital interactive games provide help to users for learning and understanding a different culture?
- How can a digital interactive game be an effective aid for learning and understanding Chinese culture?
- Which kind of digital technologies would be suitable for designing interactive digital games?

### 3 Methodology

In this section, the research methods that have been used in this project will be introduced. Studies on literature and case studies have been utilised to assist in finding potential answers to the research questions.

#### 3.1 Qualitative Research literature

An academic paper retrieved from the ACM (Association for Computing Machinery) Digital Library states that one important factor in the process of successful learning is motivation, “a motivated learner cannot be stopped.” (Prensky, 2003, para. 1). It emphasizes that in the present age of technological advancement, much of the content is not directly motivational for students, which causes considerable problems in the educational field. The paper further points out that video and computer games can inspire motivation in learners, and that merging the content of learning and the motivation of games seems to be very promising. The study “*Interacting with Video*” describes video games as cultural artefacts. “...video games are cultural artifacts that require and develop a particular set of cognitive skills; they are a cultural instrument of cognitive socialization.” (Greenfield & Cocking, 1996, p. 87). It points out that as a cultural artefact, video games can simulate elements of particular cultures.

However, we do not wish to simulate culture and encourage cultural learning, if what is learnt does not accurately and faithfully portray that culture. The ICOMOS Nara Document on Authenticity Appendix 1 advocates

“Respect for cultural and heritage diversity requires conscious efforts to avoid imposing mechanistic formulae or standardized procedures in attempting to define or determine authenticity of particular monuments and sites...[Continue] efforts to ensure attributed values are truly representative of a culture and the diversity of its interests, in particular monuments and sites.”(ICOMOS, undated).

The above paragraph suggests that ways to help teach forms of cultural learning should be more dynamic and intuitive, and that one should consider the ways a culture is learnt by its own people. Digital media may thus have advantages as a platform for tacit learning. Initiatives have already been taken towards utilizing digital media to spread

and promote traditional Chinese culture. Apart from aiming to share the content of cultural heritage and cultural artefacts, people may also feel a desire to communicate and express a higher level of philosophical understanding of traditional Chinese culture (Veltman, 2006).

“There is a quest to express philosophies, such as Taoism, using the new media.”  
(Veltman, 2006, p. 345)

In this context, the novel “*Three Kingdoms*” is one of the most appreciated pieces of the classical Chinese traditional literature, and is highly valued by scholars of traditional Chinese culture (Besio, & Tung, 2007). A multidisciplinary exploration of this first great classical novel, “*Three Kingdoms and Chinese Culture*”, has been used in the creation of both a TV drama and computer games (the most commercially successful games are “*The Battle of the Red Cliffs*” and “*Romance of Three Kingdoms*”) which in turn have had an enormous impact on Chinese society. The authors of this book also point out that in those new media forms, “*Three Kingdoms*” promotes various aspects of Chinese traditional cultures.

### **3.2 Case studies**

#### **3.2.1 Case study: “Zon”**

“Zon” is an online role-playing game designed to support the learning of Chinese language and Chinese culture. The game can be played online by visiting: <http://enterzon.com>. This project has been developed by the Confucius Institute at Michigan State University, and its proponents believe that an immersive virtual environment of China can assist in stimulating and sustaining players’ interest in learning Chinese and enhance their understanding of Chinese culture (Confucius Institute at Michigan State University, 2009). Similarly, a case study has been conducted on this game to find out the methods that can make a digital game more helpful in learning and understanding Chinese culture.



**Figure 5. A screenshot of the game scene during the play**

According to the official document “*Zon Handbook*” (CIMSU, 2010), the “Zon” game mainly uses the following methods to engage users and to help them learn Chinese language and understand Chinese culture:

- Provides users with cultural elements throughout the game play that potentially help them understand Chinese culture;
- Provides users with real-life situations for authentic culture and language interaction;
- Uses videos to provide users with authentic language input;
- Provides tasks to engage users in meaningful language learning activities; and
- Provides users with computer-driven and human-driven interactions (all online users can interact with each other) to offer an enjoyable flexible platform.

An arcade game is used inside the “Zon” game, which offers mini games to help players exercise their language knowledge, and experience a traditional Chinese custom. For example, a player can receive a fortune note by playing the “New Year Fortune” game,

which is based on a Chinese traditional custom. The game itself is quite simple, and the player just needs to “shack” the gold piece to receive a fortune note. Despite the simple gameplay, the graphics of the game scenes and the simulation of the cultural practice help create a strong sense of Chinese tradition. Those methods that the “Zon” mini games used can be applied in other settings, such as in the design of game simulations of the Four Arts of China.



Figure 6. A mini game of “New Year Fortune” which is part of the “Zon” game

### 3.2.2 Case study – CCTV “Ink”

“Ink” is a sixty-minute television commercial made for CCTV (China Central Television), which is the leading television network in China. The animation starts with a drop of ink in water, which transforms into mountains, gold fishes, cranes, the Great Wall and other iconic traditional Chinese symbols. In the ending, the ink droplet transforms into Chinese modern civilization landmarks such as the Oriental Pearl Tower and the Bird’s Nest National Stadium. This television commercial won the Gold World Medal in the New York Festival 2010 Television & Film Awards (Troublemakers.tv, n.d.). The reason for choosing this television commercial as a case study subject is the inspiration drawn from the fluid visual style of this animation. This inspiration has been greatly helpful in forming the visual style of the game design in this project in a way

appropriate to Daoism, for Daoist aesthetics involve the use of space, spontaneity, and the fluid inter-relationship of objects, particularly between nature and humanity (Kwo, 1990; Sartwell, 2009).

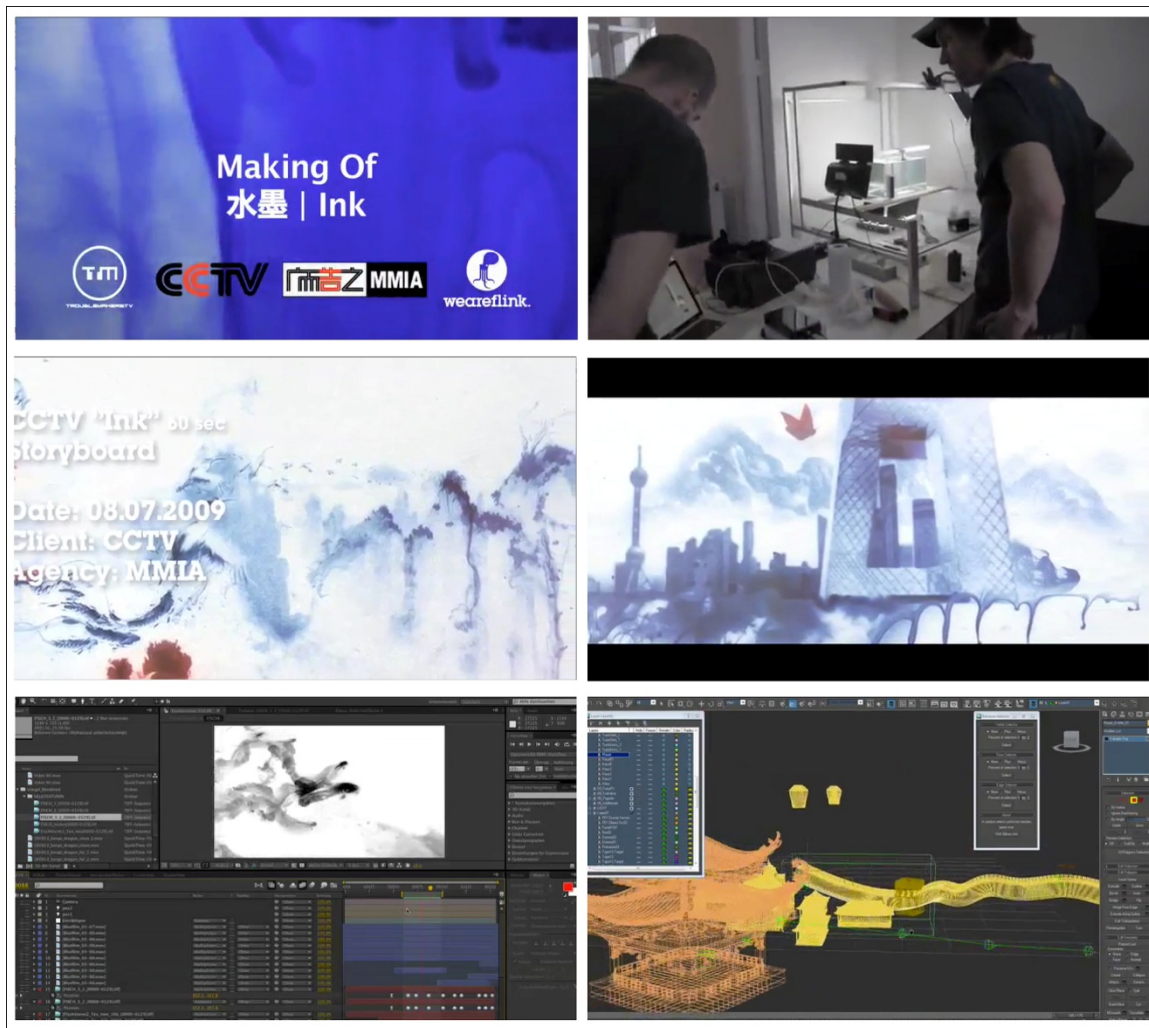


**Figure 7. Screen shots of the “Ink” – CCTV commercial**

By using Chinese calligraphy style ink and ink wash painting strokes, the resulting animation aimed to present a visual journey from ancient to modern China without changing the essence of Chinese culture and tradition (represented by the change of ink). The use of ink is prevalent in Chinese traditional practices such as calligraphy and painting. The image of ink in water can create a feeling of subtlety and ambiguity, which

is similar to people's perception of traditional Chinese culture, as explained in the Literature Review. For these reasons, the style of ink in water was chosen as suitable for the visual elements of the four games developed for this project.

The researcher has also conducted a study of the production process used in the above case studies. For example, a movie clip called “Making of Ink” can be found at the website of the production company – Troublemakers.tv (<http://troublemakers.tv>, 2010). This movie clip contains recorded interviews with the directors and lead designers, as well as some key methods that have been used in the creation of the animation in their project. The method of shooting ink in a cloud tank proved to be particularly useful for creating visual elements of the game design in this project.



**Figure 8.** Screen shots of “Making of Ink” which demonstrate methods used to create the TV commercial

### **3.3 Interactive Game Design**

#### **3.3.1 Interactive Technologies**

There are many tools to choose from for game design, such as Java, C++, and Dolphin. Although Java and C++ are powerful tools, it is costly and time-consuming to use them for coding and organizing files, in addition to the installation of plug-ins and libraries - that they require. Furthermore, they are more effective tools for large game system development, whereas tools such as Flash ActionScript and JavaScript are light-weight and easy to handle, which makes them more suitable for simple game development. However, they may need more maintenance. Taking into consideration the time required for this project to be completed, as well as the researcher's experience as a Flash developer, it was decided that Flash ActionScript 3.0 was the best choice for the game development.

As part of this project a small study was carried out to find out the advantages and disadvantages of using Flash for lightweight game design. The advantages of using Flash as a game development tool are its ease of use, smaller file size, plug-in capability, readiness for web deployment and ease of file sharing between programmers and graphic artists/designers (Makar 2002). Makar also points to some weaknesses of using Flash such as limitation of system performance, lack of 3D support (not such an issue with recent versions of Flash) and lack of operating – system integration. Fortunately, these weaknesses cannot affect this project because it does not require such fast performance from the hardware, and no 3D features have been used. However, given the recent dropping by Apple and other mobile developers, HTML 5 or similar may prove a better technology to use in the future.

#### **3.3.2 Interface Design**

To improve interaction between the user and the game, choosing the most effective technology for the game interaction is essential. While a mouse, a keyboard and a display are standard equipment for human and computer interaction, a question arises, is there a better way of combining the functions of these three pieces of equipment to provide users with a direct and intuitive interaction? Compared with a mouse, a touch screen allows an easy and direct interaction between the user and the applications

(Lentz, Turner, & Chia, 2002). Furthermore, a touch screen-based game design can be more user-friendly for popular mobile devices used today, such as iPhones. In 2010, the demand of iPhone 4 in China exceeded supply, and it has been reported that there were over 200,000 pre-orders had been made on the first day of launch (Pan, 2010), from which, we can see that the popularity of the touching screen mobile device is enormous in China. Using touch screen interaction, the game could be easily transplanted onto mobile devices to reach a larger audience.

### **3.4 Summary**

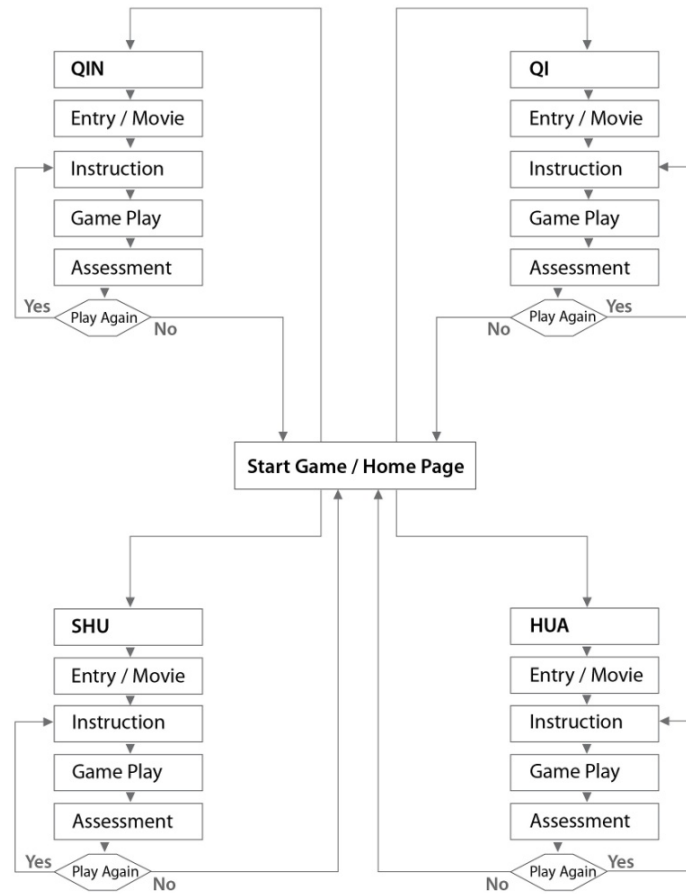
The previous studies indicate that digital games can assist learning, and hence also cultural learning; the understanding of a culture. The case studies reveal valuable methods (for example, applying the knowledge learnt from the games to complete a mission) that can enhance effectiveness of a game for learning and understanding traditional Chinese culture. They can provide users with access to recreated and simplified cultural elements and they can simulate traditional culture practice in appropriate and thematic ways.

## **4 “The Four Arts”**

### **4.1 Design concept and the structure of the games**

The games in this project are based on the authentic practice of the “Four Arts of China”, and some variations have been introduced to make the games fit into the traditional interaction patterns of computer games, and to make the game play easier for the users who have no background knowledge of these cultural practices.

The player begins the game from the main stage, which contains four buttons. The player chooses the game to be played by hitting the button that represents the game and then the game starts. When the player finishes each game, he/she may go back to the main stage and choose another simulation to engage in. The game tracks the scores of the player and displays them as traditional Chinese style presentations (Figure 9).

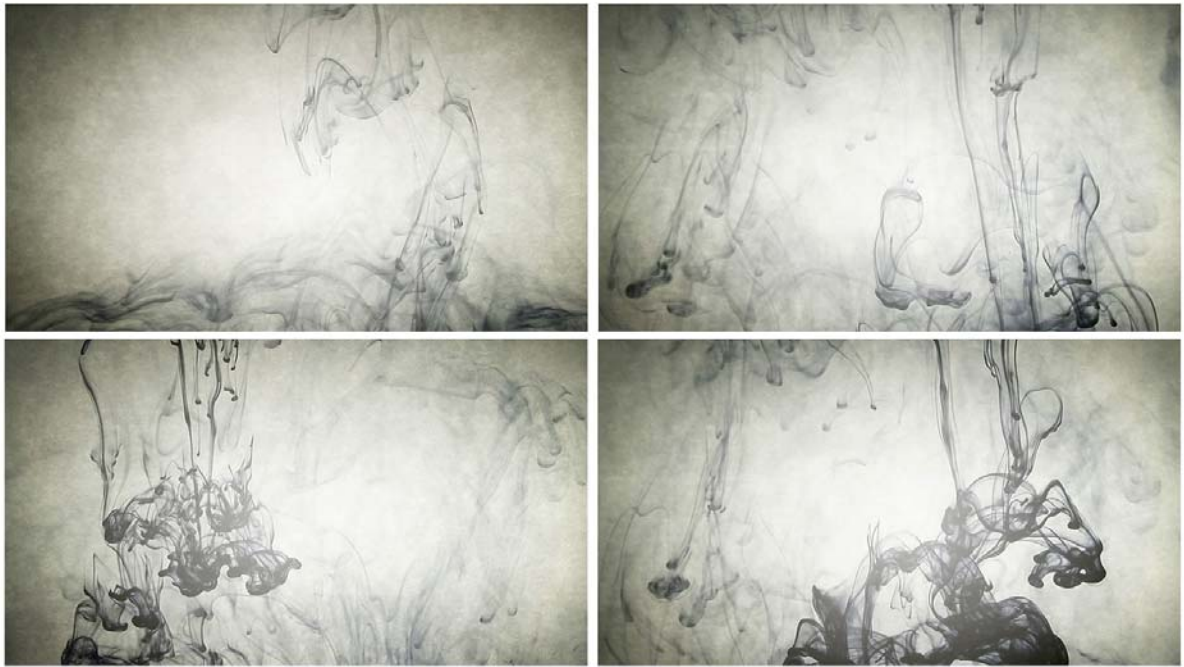


**Figure 9. The flow chart that illustrates the structure of the games**

## 4.2 Graphics

Inspired by the CCTV commercial “Ink”, described in the methodology section, the idea of “ink drop in water” has been implemented consistently throughout the game design. A video footage of the ink drop in water has been shot in a cloud tank (using an aquarium), and some adjustments have been made on lighting and colour by using Adobe After Effects CS5. The still frames have been taken from the video footage and used as backgrounds of the game scenes (Figure 10). Four movie clips will be selected

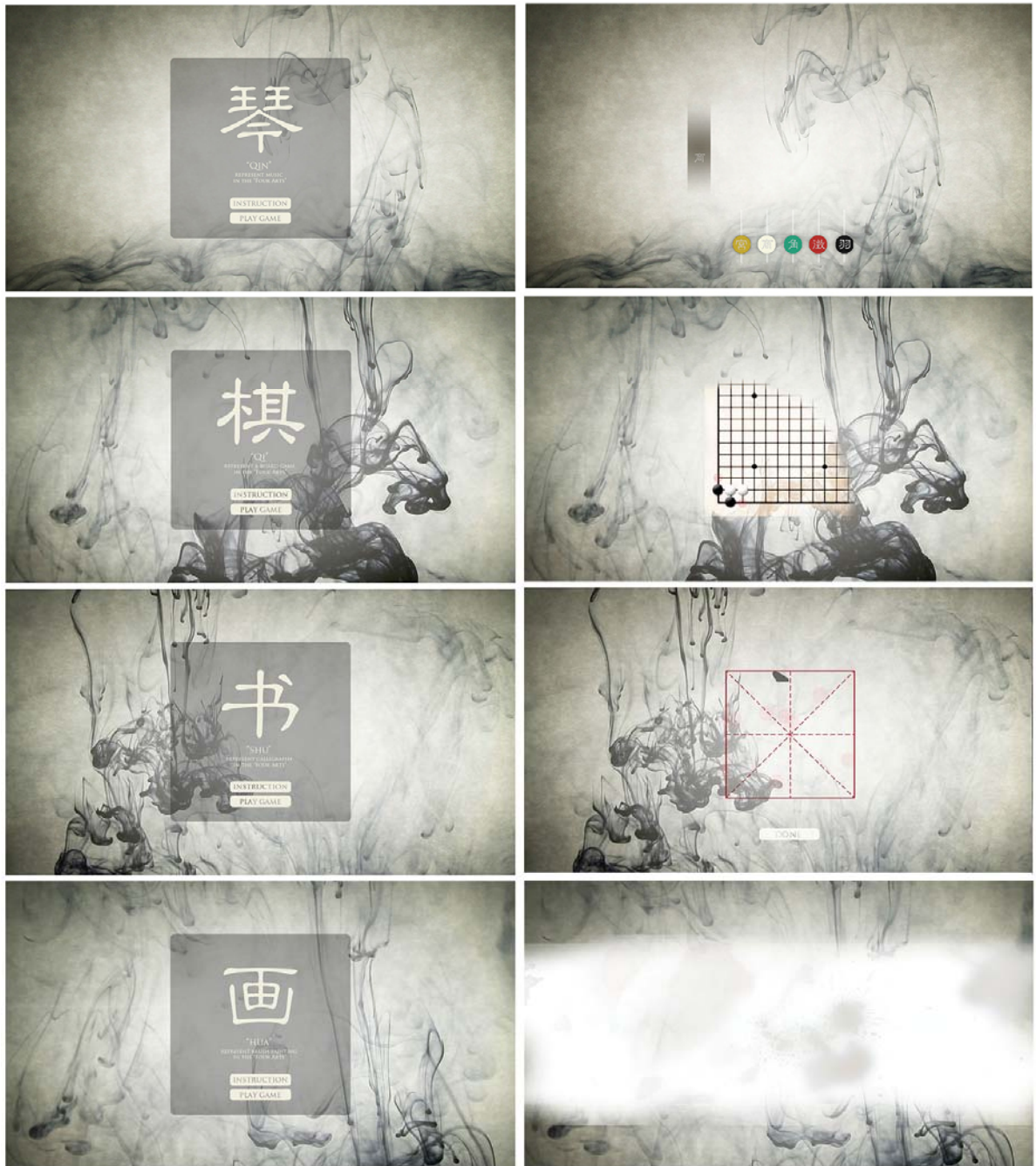
from the video footage shot by the researcher, and edited to become introduction movies for the four digital interactive games.



**Figure 10. The background of the game scenes, taken from the still frames of the video footage**

### **4.3 Interface**

The interface of the games has been designed in a simple style which merges with the overall design of the games. To increase the authenticity of the games, buttons with a mechanical appearance were not chosen.



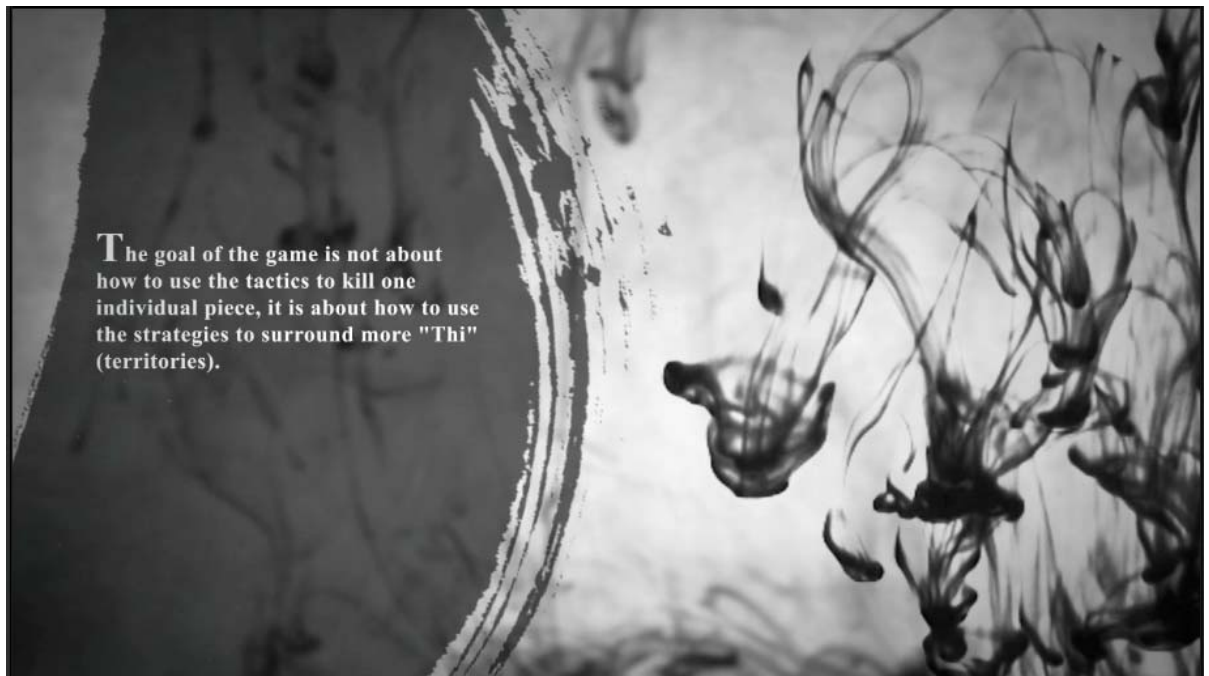
**Figure 11. The design of the interface**

The initial idea of applying elastic effects has been rejected because it would cause the buttons to respond like liquid when the player presses the buttons. Using elastic effects can create a smooth and elegant feel in order to reflect the idiosyncrasy of the traditional Chinese culture (Figure 11). However, more importantly, they can create too many bugs which would cause the games to malfunction.

To make the game more suitable for touch screen interfaces, the researcher made the interactive objects in the games larger, such as buttons, so it is easier for the player to click with their fingers. The feedback of ‘hover’ effects of the interactive game objects had been removed, because in the touch screen interaction there are no ‘hover’ actions applicable. Since, there are no ‘hover’ effect applicable, so the feedback from the ‘hover’ actions are not available, it makes the users harder to get the information of what are the interactive objects in the games than simply hover the objects and get the information from the popup feed backs. Thus, the researcher designed the interface of the games in a simple and concise style, so it will be easier for the users to figure out what are the interactive objects without ‘hover’ effects.

#### **4.4 Motion Graphic**

The CCTV commercial “Ink” inspired the researcher to design four simple motion graphics (Figure 12) to provide users with a brief introduction for each of the Four Arts. These four motion graphics will be played at the beginning of the four individual digital games.



**Figure 12. A screen shot from an introduction movie**

#### **4.5 Development Specifications**

The tool used to develop the game, Flash ActionScript3.0, is a full OOP (Object Oriented Programming) language. Timeline based animations and logical processes were added to the games. The screen shots below (Figure 13; Figure 14) explain some of the layout and code of the game design.

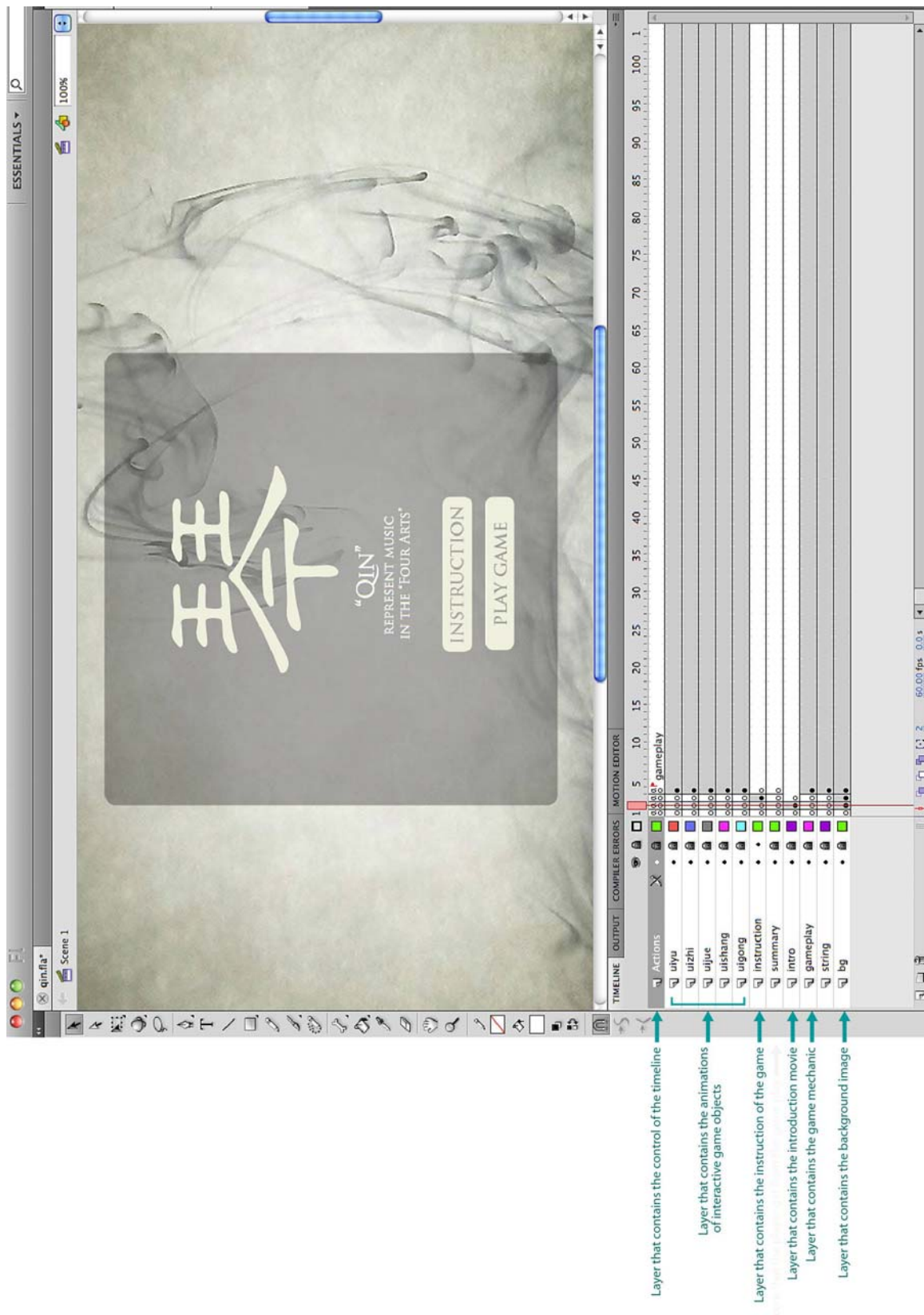
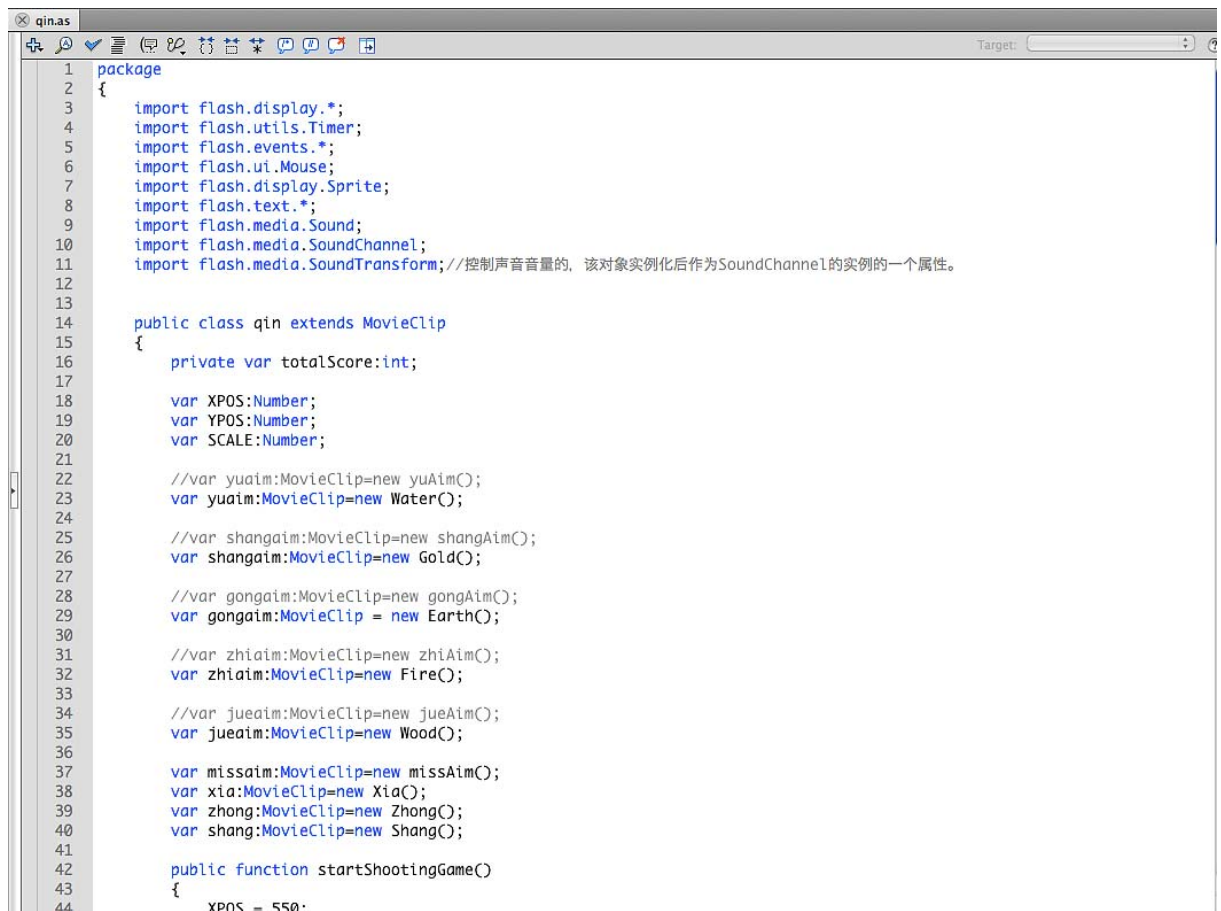


Figure 13. A screen shot of the Qin game interface



```
1 package
2 {
3     import flash.display.*;
4     import flash.utils.Timer;
5     import flash.events.*;
6     import flash.ui.Mouse;
7     import flash.display.Sprite;
8     import flash.text.*;
9     import flash.media.Sound;
10    import flash.media.SoundChannel;
11    import flash.media.SoundTransform; //控制声音音量的，该对象实例化后作为SoundChannel的实例的一个属性。
12
13
14    public class qin extends MovieClip
15    {
16        private var totalScore:int;
17
18        var XPOS:Number;
19        var YPOS:Number;
20        var SCALE:Number;
21
22        //var yuaim:MovieClip=new yuAim();
23        var yuaim:MovieClip=new Water();
24
25        //var shangaim:MovieClip=new shangAim();
26        var shangaim:MovieClip=new Gold();
27
28        //var gongaim:MovieClip=new gongAim();
29        var gongaim:MovieClip = new Earth();
30
31        //var zhiaim:MovieClip=new zhiAim();
32        var zhiaim:MovieClip=new Fire();
33
34        //var jueaim:MovieClip=new jueAim();
35        var jueaim:MovieClip=new Wood();
36
37        var missaim:MovieClip=new missAim();
38        var xia:MovieClip=new Xia();
39        var zhong:MovieClip=new Zhong();
40        var shang:MovieClip=new Shang();
41
42        public function startShootingGame()
43        {
44            XPOS = 550;
```

**Figure 14. A screen shot of the coding section of the Qin game development**

Over 1,200 lines of ActionScript have been used in coding the games. The following lines show the most often-used libraries in the game design:

```
import flash.display.*;

import flash.utils.Timer;

import flash.events.*;

import flash.ui.Mouse;

import flash.display.Sprite;

import flash.text.*;

import flash.media.Sound;

import flash.media.SoundChannel;
```

```
import flash.media.SoundTransform  
  
import flash.display.Sprite;  
  
import flash.events.Event;  
  
import flash.events.MouseEvent;
```

## **4.6 Music**

The music incorporated in the game was designed to enhance the player's experience. The composer is Chen Xiyao, who is completing a Master degree course in Music at WINTEC, and his research subject is traditional Chinese music. The composer has used many typical patterns and musical scales of traditional Chinese music. "Guzheng", which is the instrument that can be heard in the background, is an ancient Chinese zither created more than 3,000 years ago.

## **4.7 Implementation of the game design**

### **4.7.1 The game design of "Qin" (Music)**

The purpose of this game is not to develop Guqin playing skill or the mastery of composing Chinese music. The game is about acquiring basic knowledge of traditional Chinese culture through music and about connecting with "Wuxing." The game is designed in such a way as to give the player a feeling of how traditional Chinese music sounds. To make the game easier for the player, the music in the game is produced by five strings although traditionally this music is played with seven strings. Each of the five strings represents one of the five primary tones of traditional Chinese music. The five tones are related to the basic elements in "Wuxing." The composer is Chen Xiyao, introduced in the previous section.

The game begins with a simple introduction of the basic features of traditional Chinese music and then the player starts to play. The game will offer the player a clue to the tone which is to be played next (Figure 15). If the player hits the correct string, the program will present an animation of the element which is related to the music note on the string that has just been hit. If the player hits an incorrect string, ink will splash on the screen to indicate the mistake (Figure 21). After completing the game, instead of being showed a score, the player will be introduced to a short animation describing the result (Figures

16-21.). Such presentation of the result is intended to evoke a more authentic sense of Chinese culture.

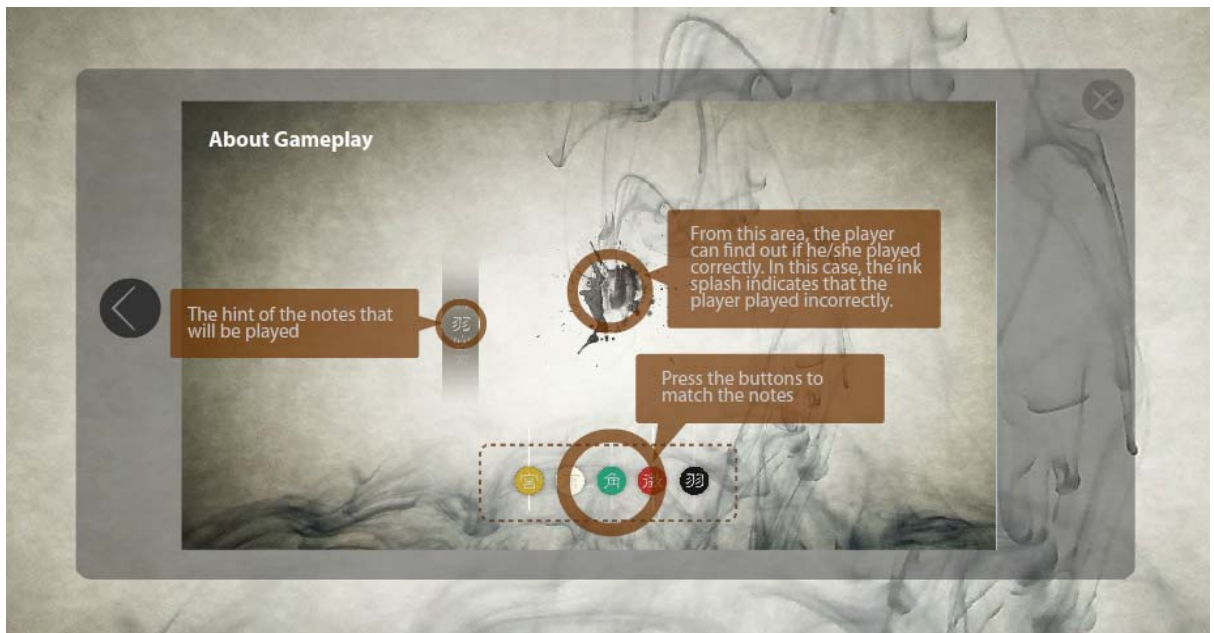


Figure 15. The instruction for game play in “Qin” (cropped for improved legibility)

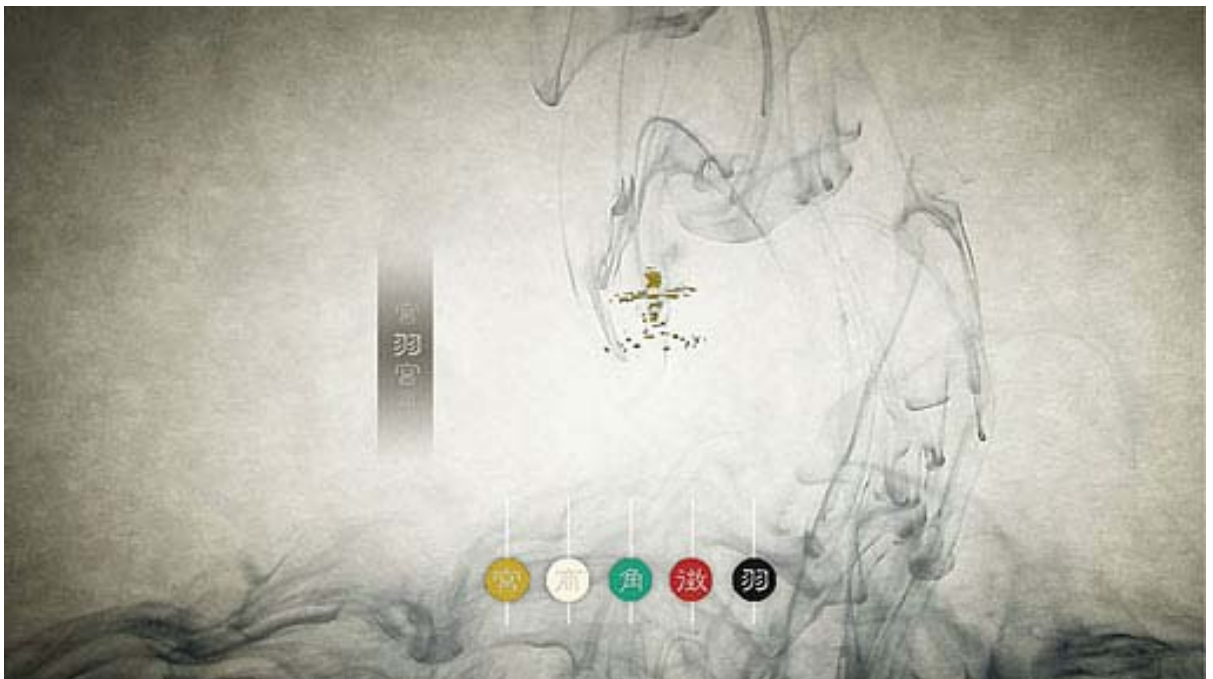


Figure 16. When the player hits the “Gong” correctly, the animation of the element of “Earth” moves upwards

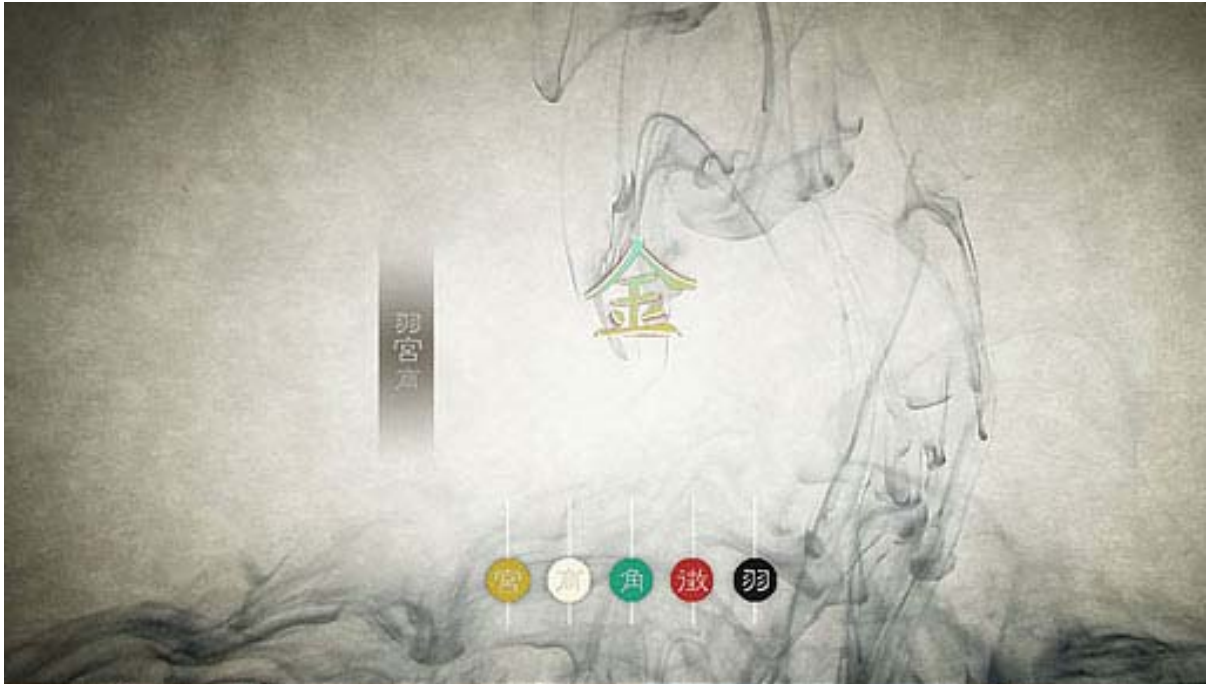


Figure 17. When the player hits the “Shang” correctly, the animation of the element of “Metal” moves upwards

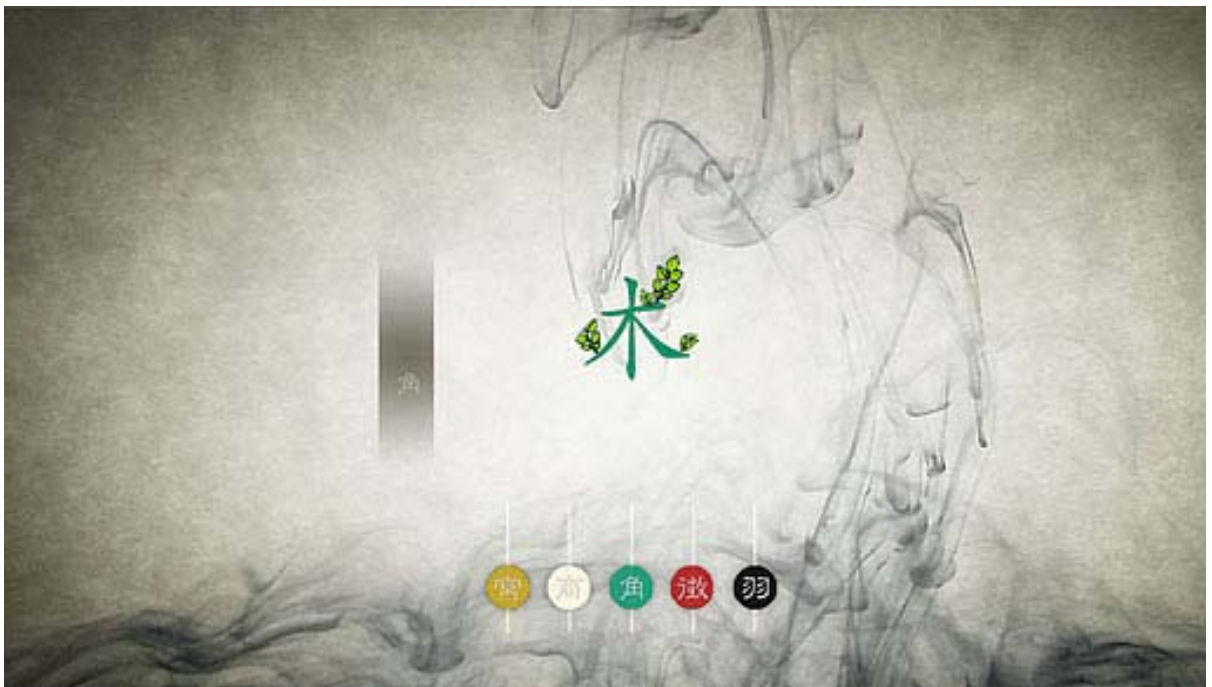


Figure 18. When the player hits the “Joe” correctly, the animation of the element of “Wood” moves upwards



Figure 19. When the player hits the “Zhi” correctly, the animation of the element of “Fire” moves upwards

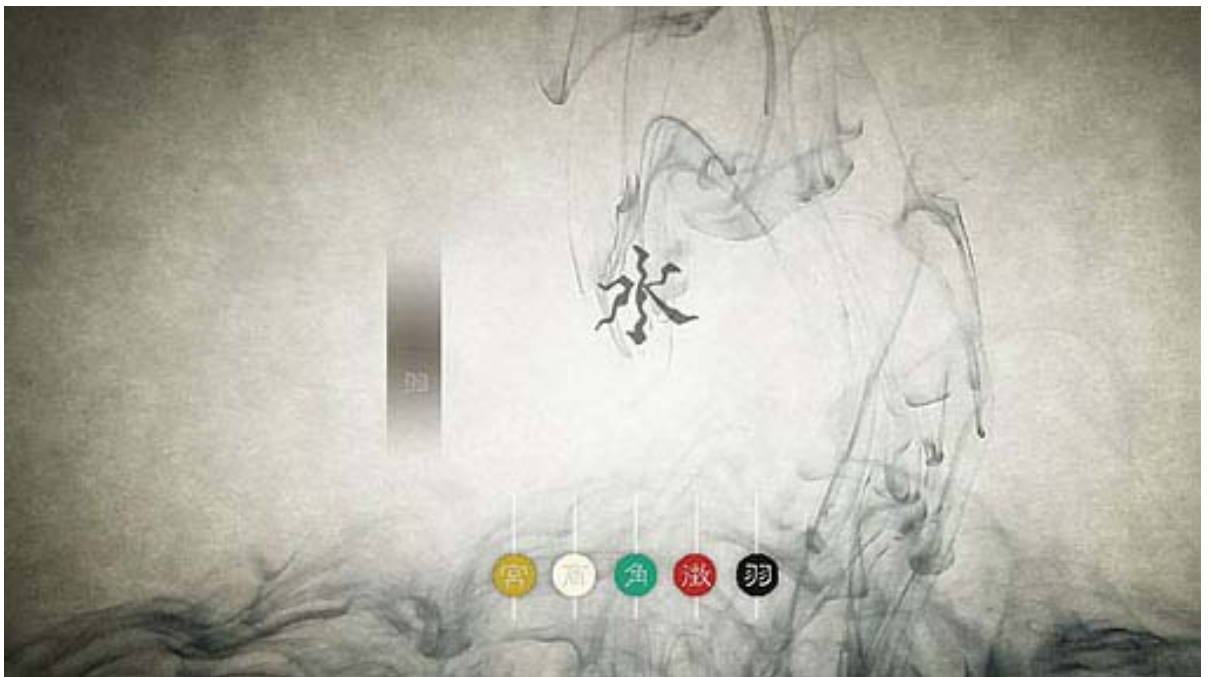


Figure 20. When the player hits the “Yu” correctly, the animation of the element of “Water” moves upwards



**Figure 21. When the player hits the string incorrectly, an animation of an ink splash moves downwards**

#### **4.7.2 The Game Design of “Qi” (Go)**

As a long learning curve is required to understand how to play “Go,” this game reveals only two simple local area battles to the player, who will be guided by hints indicated by red dots that appear throughout the game play. The first battle is a very basic local corner battle; the second one requires more comprehension and will reveal one important concept in traditional Chinese philosophy – “Coexistence.”

Throughout the game, the player needs to choose one of the optional points provided, by deciding which would be the best move. The program plays the role of an opponent. Every battle can be completed within five simple steps. The game consists of two parts which both begin in the middle of the development of a partial battle over a corner. The player plays as the White force and the computer plays as the Black force. The game provides the player with a few visual clues as to where the player may want to place the piece. The computer will make the second move, and each round consists of two moves. The battle will end after merely three to five rounds. There are three types of possible outcomes of the battle: a complete victory, a loss of the battle and a loss of superiority.

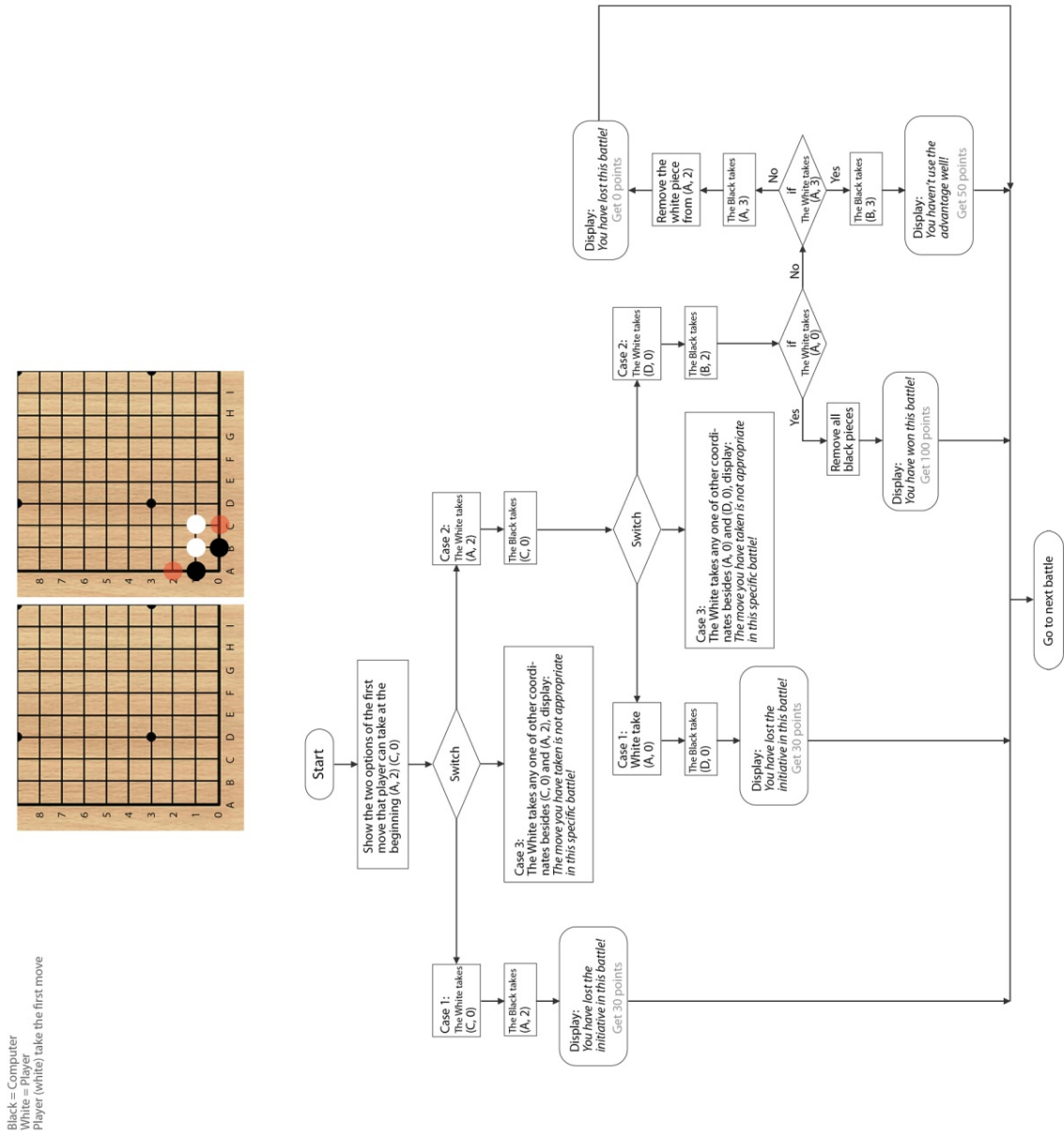
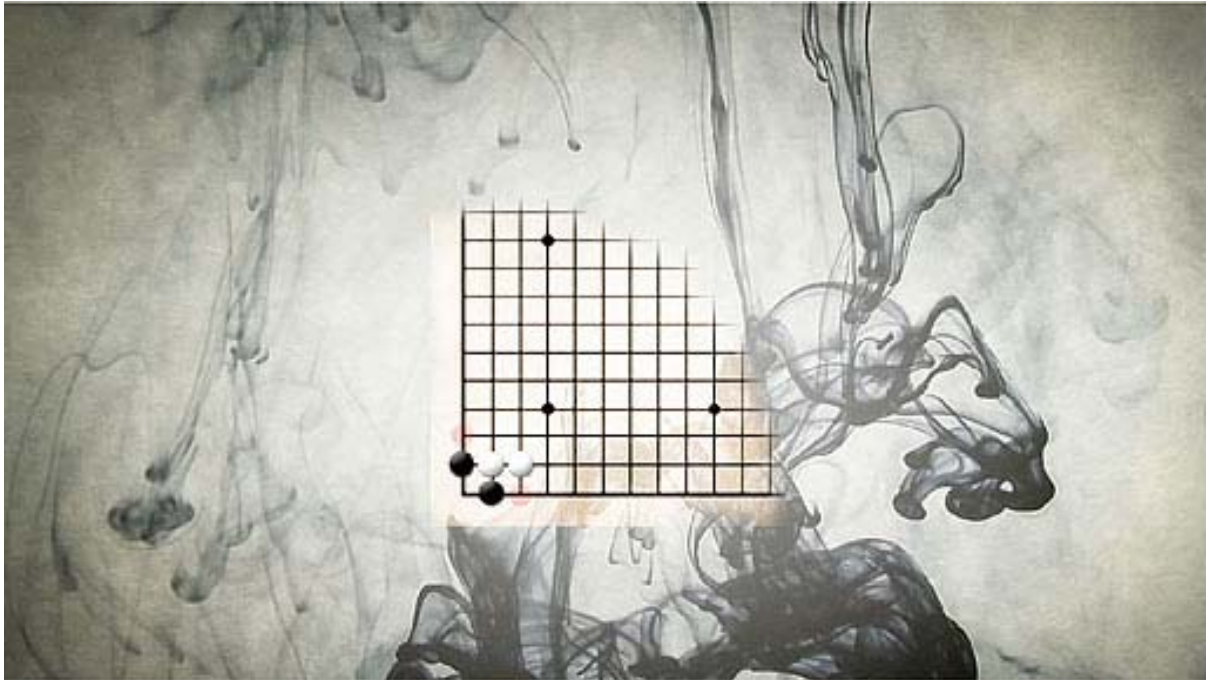
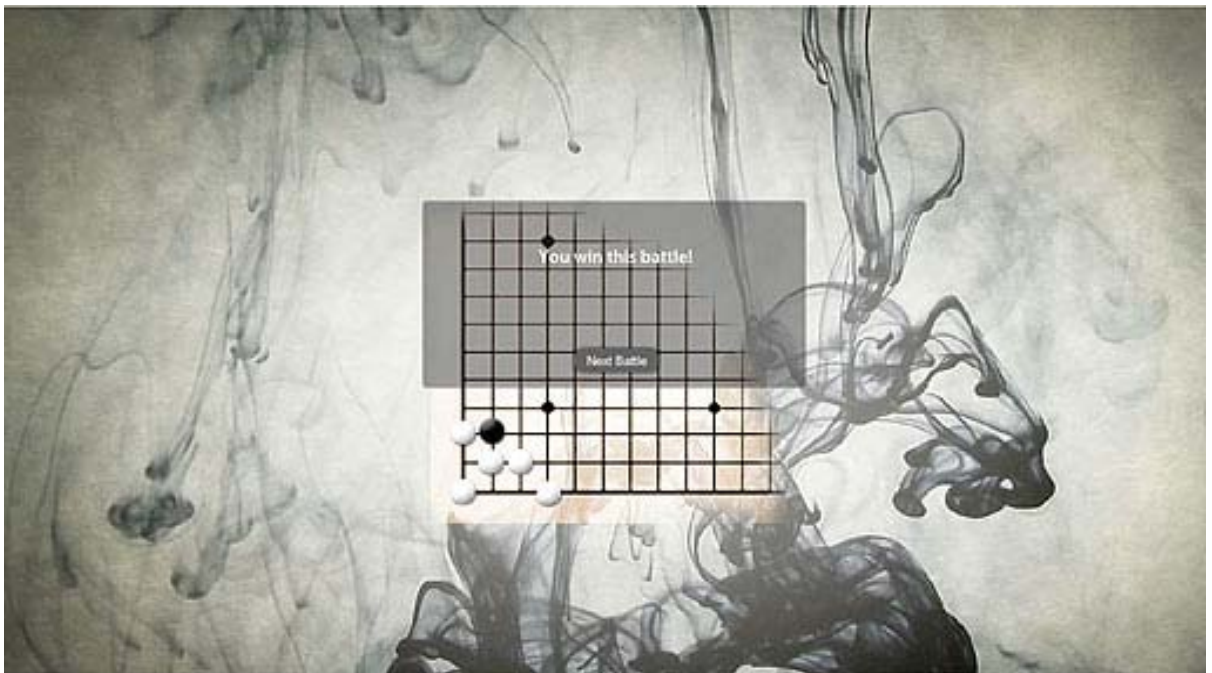


Figure 22. The logical structure of the first battle in the Go game



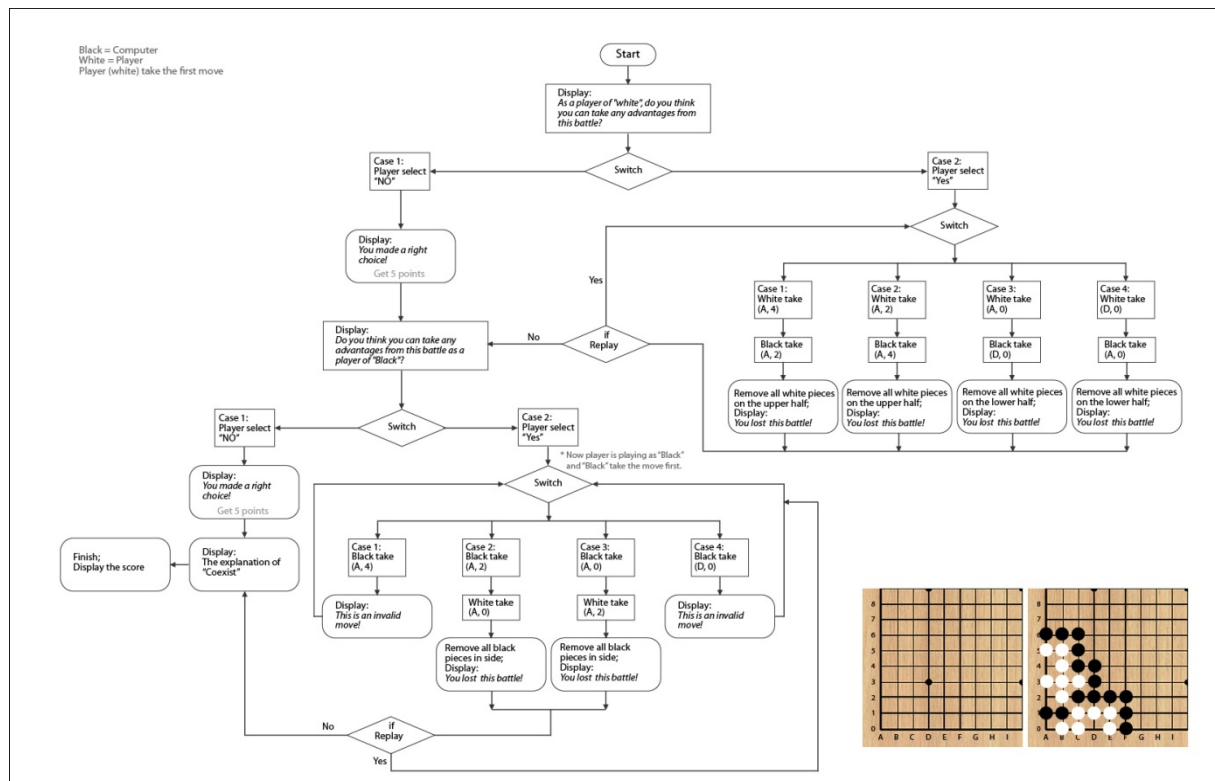
**Figure 23. A screen shot of the game play in the first battle**



**Figure 24. A screen shot of the game play in the first battle (“You win the battle!”)**

After the first battle (Figures 23-24), the player will begin the second battle which starts out similarly. However, the situation is more complicated (Figure 25). When the battle starts, the player will be asked if he/she can take any advantage of the battle by using the

White pieces. If the player chooses “Yes” the game will begin and the player will play with the White pieces again. During this battle the player will definitely lose the battle. The player will then be asked if he/she sees any advantage of playing with the Black pieces. If the player chooses “Yes,” the game starts and the player will use the Black pieces. The computer will again defeat the player within a few rounds. There will be an explanation on a popup which displays the secret of “Coexistence” in the Go game. If the player chooses “No” then the explanation of “Coexistence” will pop up and suggest that the player should try “Coexistence.” (Figures 26-29).



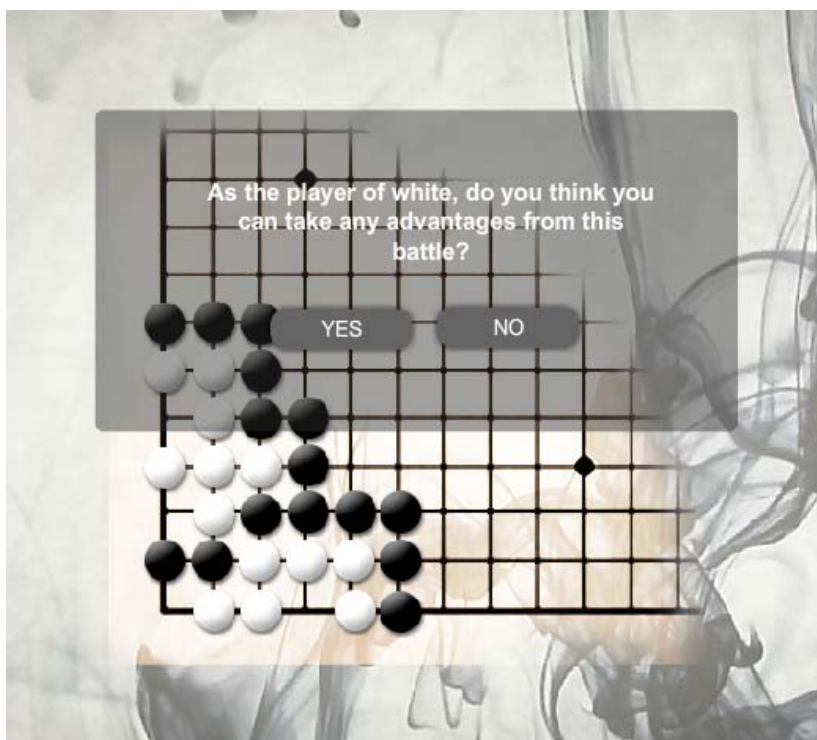


Figure 26. A screen shot of the game play in the second battle (cropped for legibility)

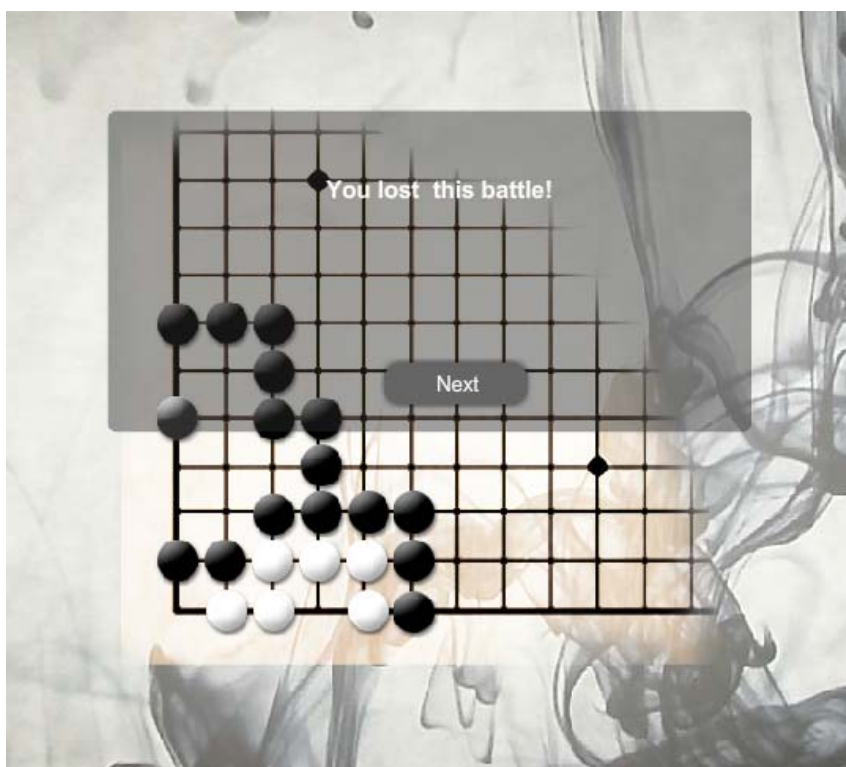


Figure 27. A screen shot of the game play in the second battle (cropped for legibility)

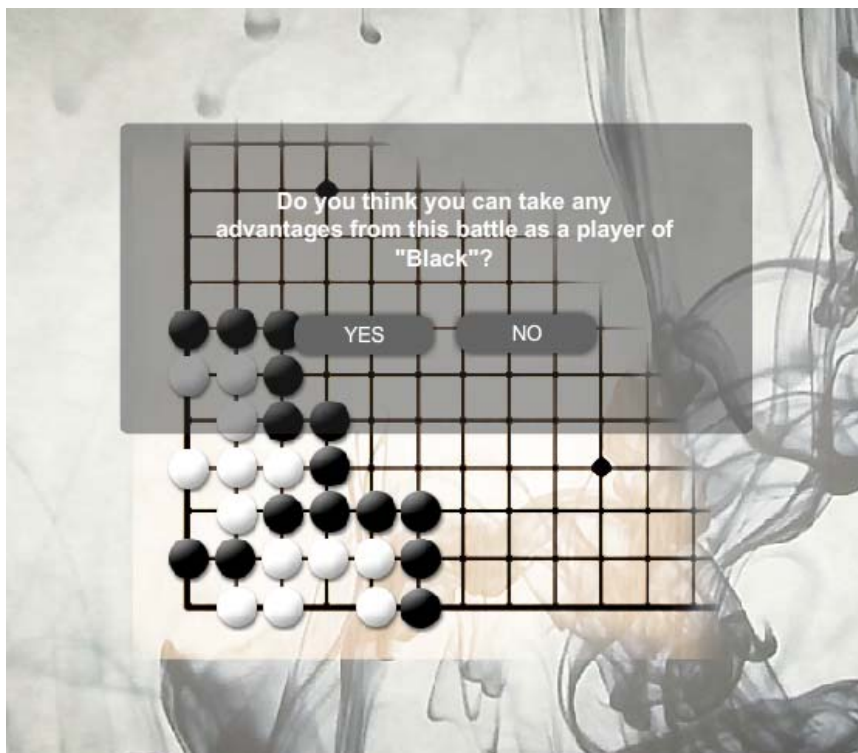


Figure 28. A screen shot of the game play in the second battle (cropped for legibility)

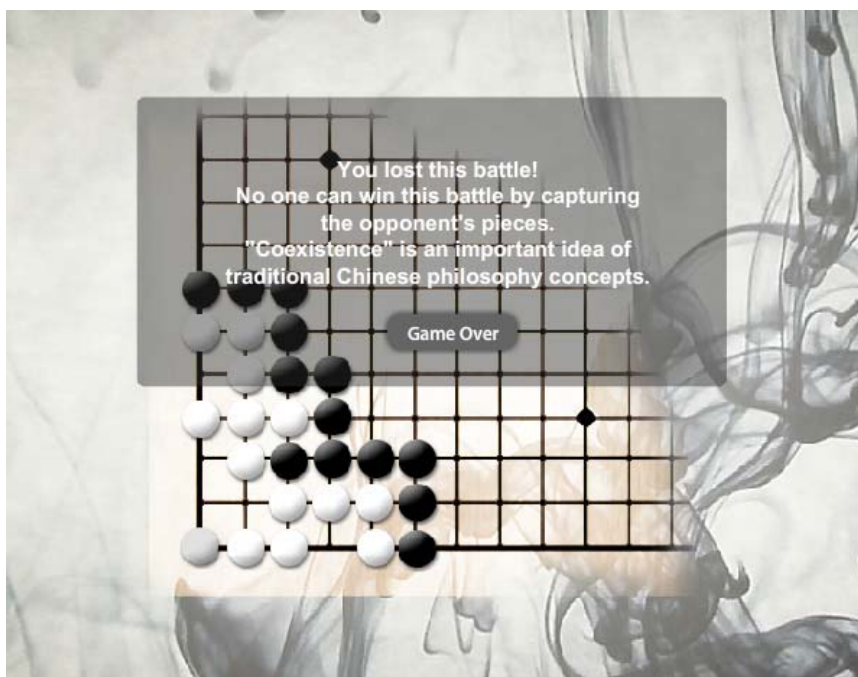


Figure 29. A screen shot of the game play in the second battle (cropped for legibility)

#### 4.7.3 The Game Design of “Shu” (Calligraphy)

At the start of this game, the player will recognize and trace the characters which are written in six styles. These six styles represent the course of the evolution of the Chinese writing system (Figures 30-39). Throughout the game, the player will witness the development of the Chinese character design. The player is expected to develop the concept that Chinese writing characters are determined by the limitation and abstraction of nature. The second step requires that the player should write a character. The program offers an animated illustration of how to write the letter that the player may choose prior to attempting to write it. The red “rich grid” is an important reference guide for the player learning to write Chinese characters.

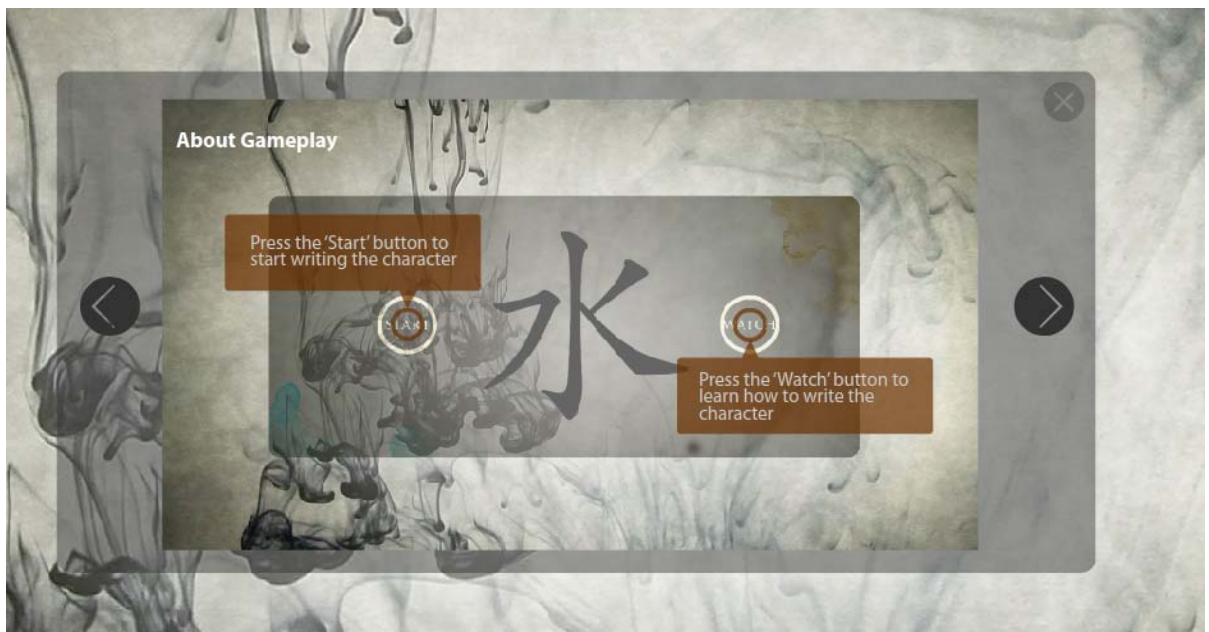


Figure 30. An instruction for game play in “Shu” (Calligraphy) (cropped for legibility)

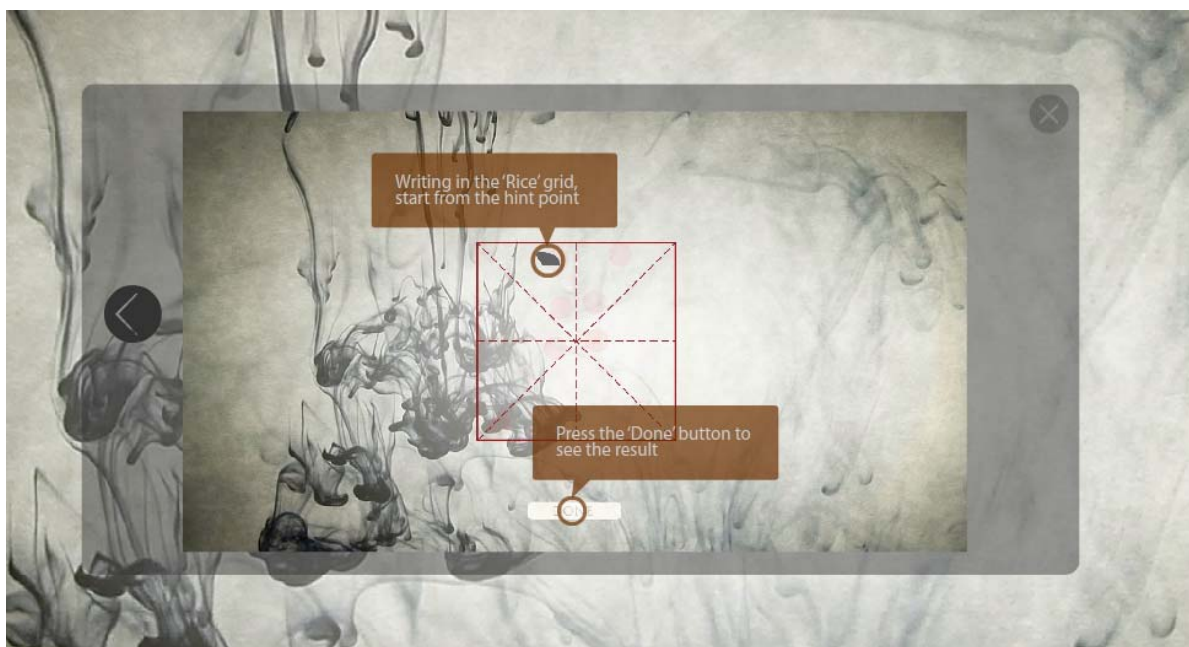


Figure 31. Instruction for game play in “Shu” (Calligraphy) (cropped for legibility)



Figure 32. “Shu” (Calligraphy) – at the beginning of the game



Figure 33. “Shu” (Calligraphy) – the player can choose the word he/she wants to learn about



Figure 34. “Shu” (Calligraphy) – the player needs to select the path of the evolution of the character, and to click the “DONE” button to see the result



Figure 35. “Shu” (Calligraphy) – the player can see the result, and click the “WRITE” button to write the character he/she has just learnt



Figure 36. “Shu” (Calligraphy) – the player needs to click the “WATCH” button to learn how to write the character from a short animation

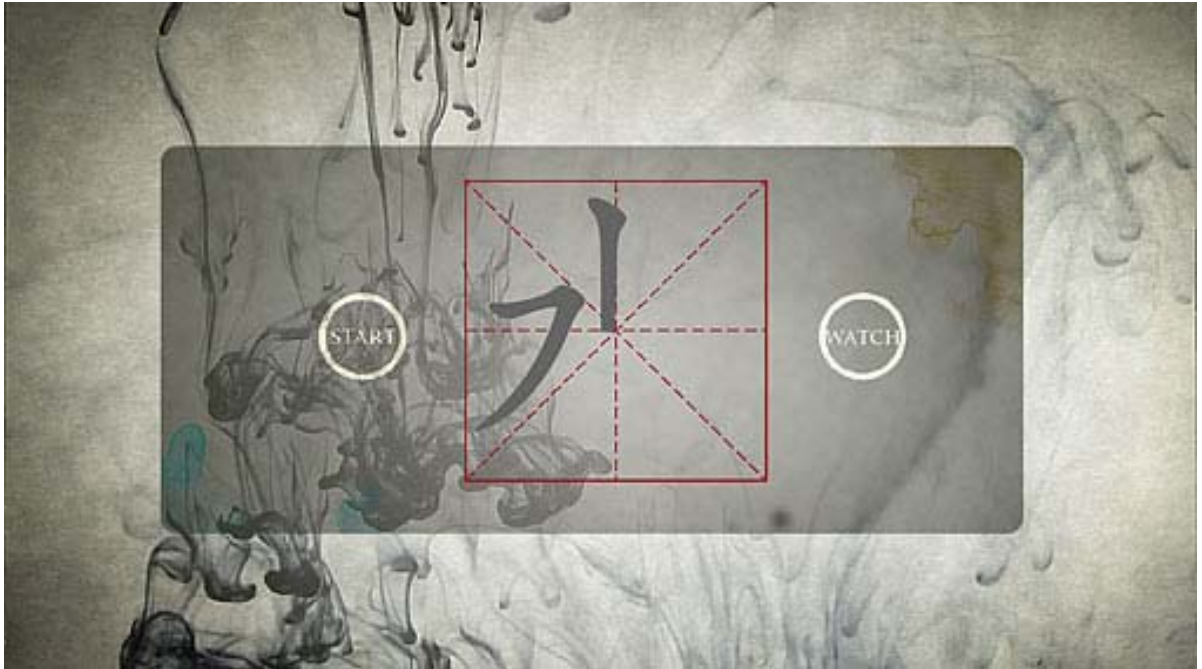


Figure 37. “Shu” (Calligraphy) – the animation shows the player how to write the character with the “rich grid”, and then he/she can press the “WATCH” button to learn again, or the “START” button to write the character on his/her own

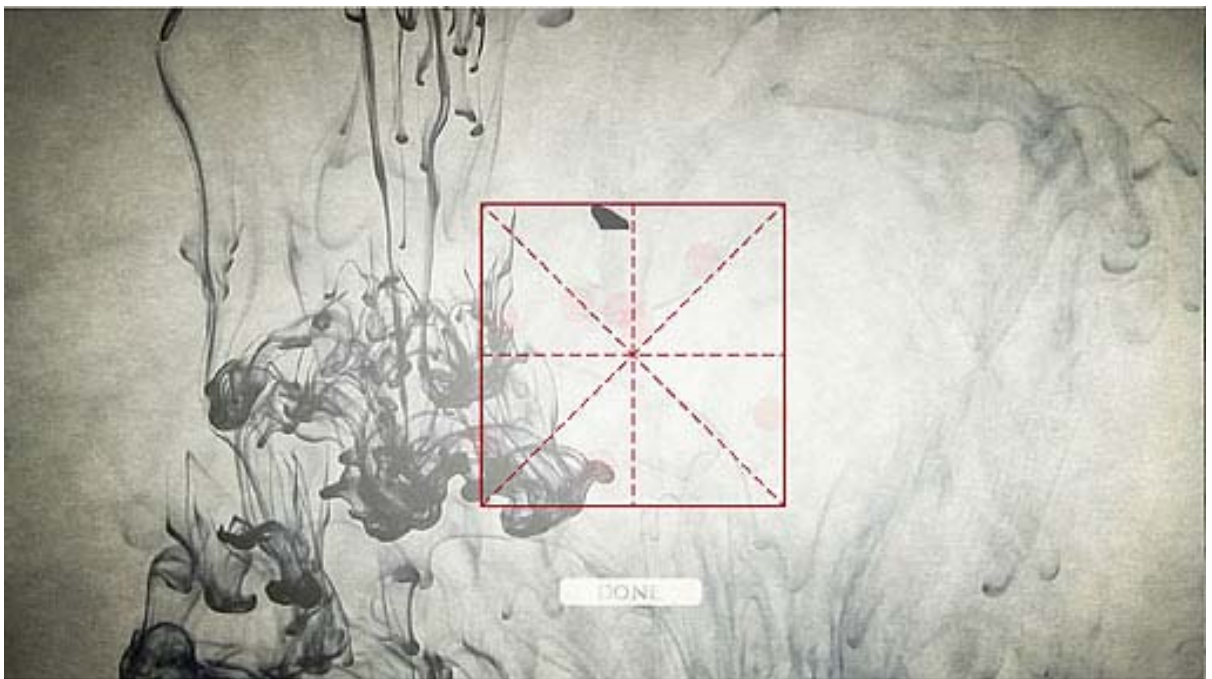
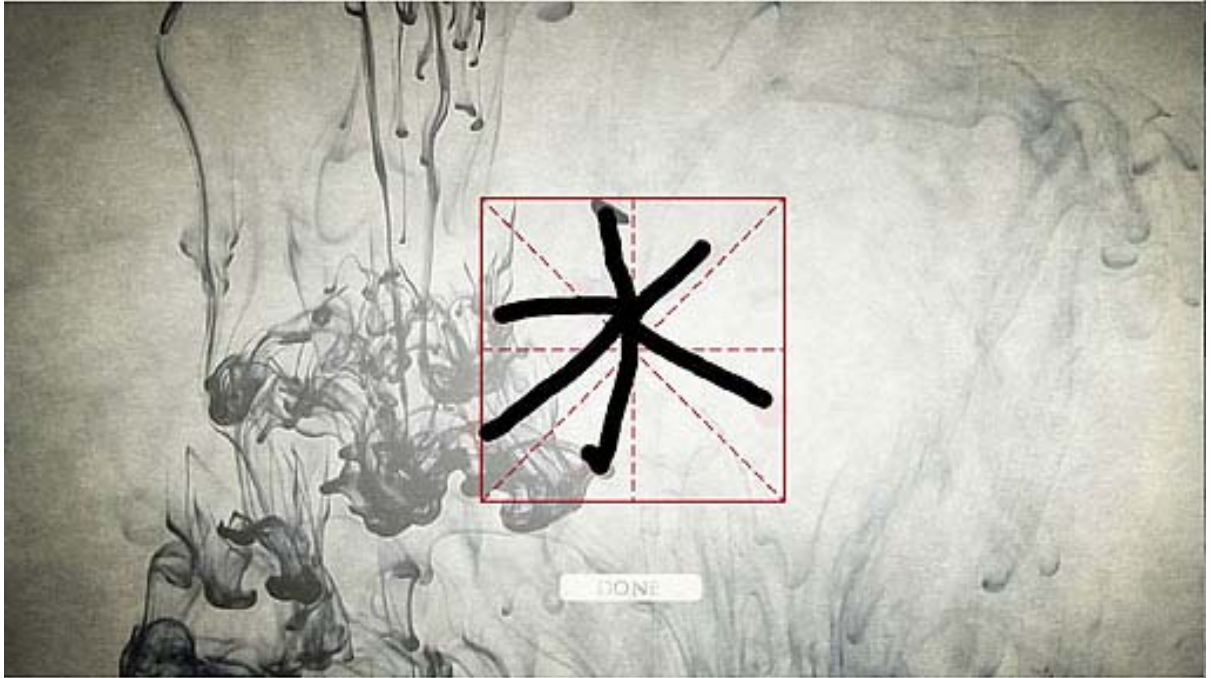


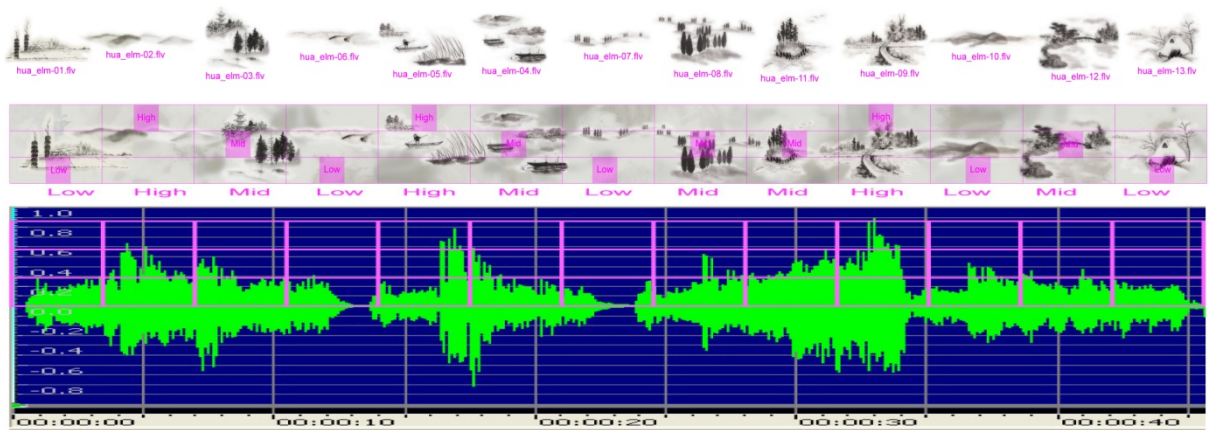
Figure 38 “Shu” (Calligraphy) – the player starts writing, and is given a clue where to start



**Figure 39. “Shu” (Calligraphy) – after finishing writing, the player can press the “DONE” button to see the result**

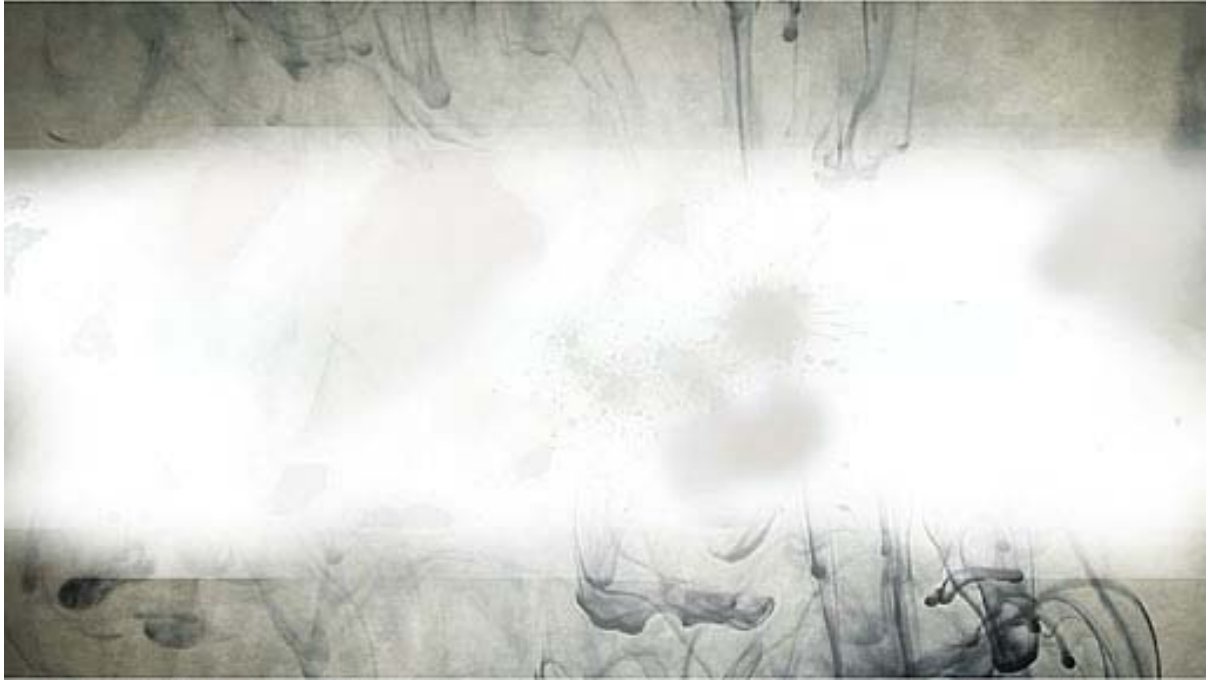
#### **4.7.4 The game design of “Hua” (Chinese Ink Painting)**

The key to the game “Hua” is to give the player a feeling as to what Chinese traditional ink brush looks like. The player also hopefully develops an idea of the ethos of traditional Chinese ink painting, which is not about imitation and precision. Traditional Chinese ink painting is about visualizing one’s own heart. The player needs to listen to the music in the background and draw following it (Figure 40). If the player’s expression matches the pitch of the music, pictures of ink painting will appear (Figures 41-42).

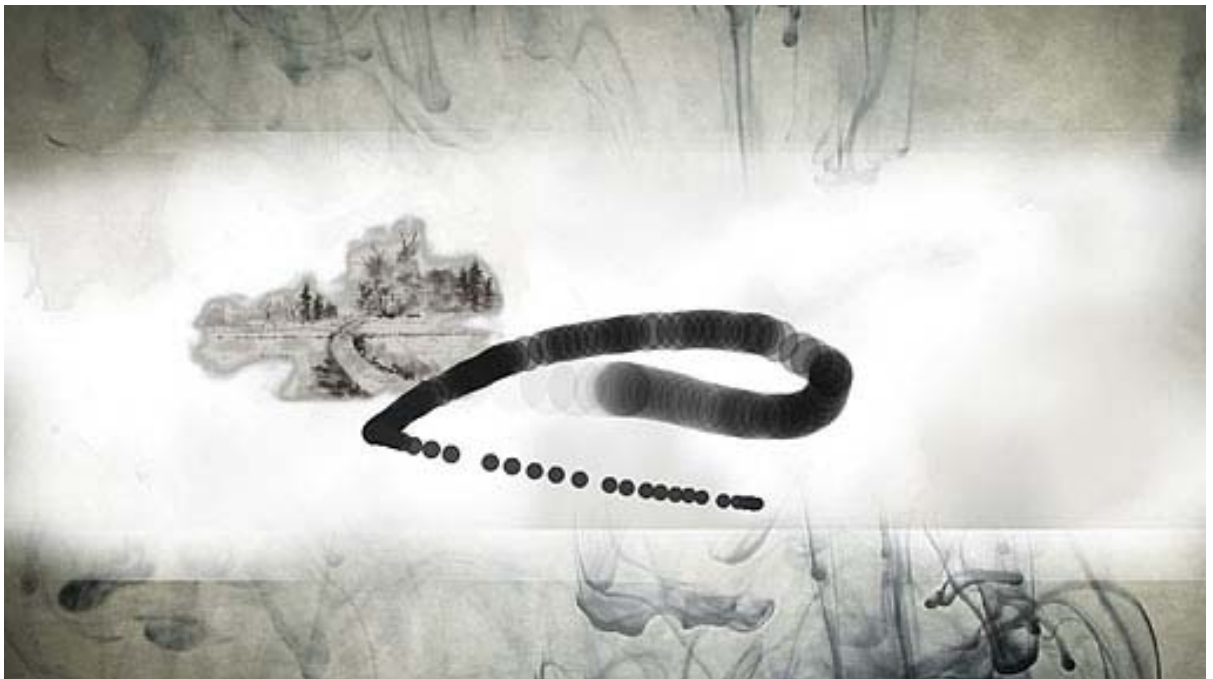


**Figure 40. The illustration of how the game has been constructed**

The image in the top part of the figure illustrates the 13 individual ink paintings. The image in the middle part of the figure illustrates the 13 ink paintings put together on the canvas as a whole image, and how the hot points have been placed on the canvas according to the sound wave/pitch of the background music. The image in the bottom part of the above figure illustrates the sound wave (pitch) of the background music, and is divided into three levels (low, mid, high) and into 13 parts equally, because there are 13 ink painting images about to be revealed.



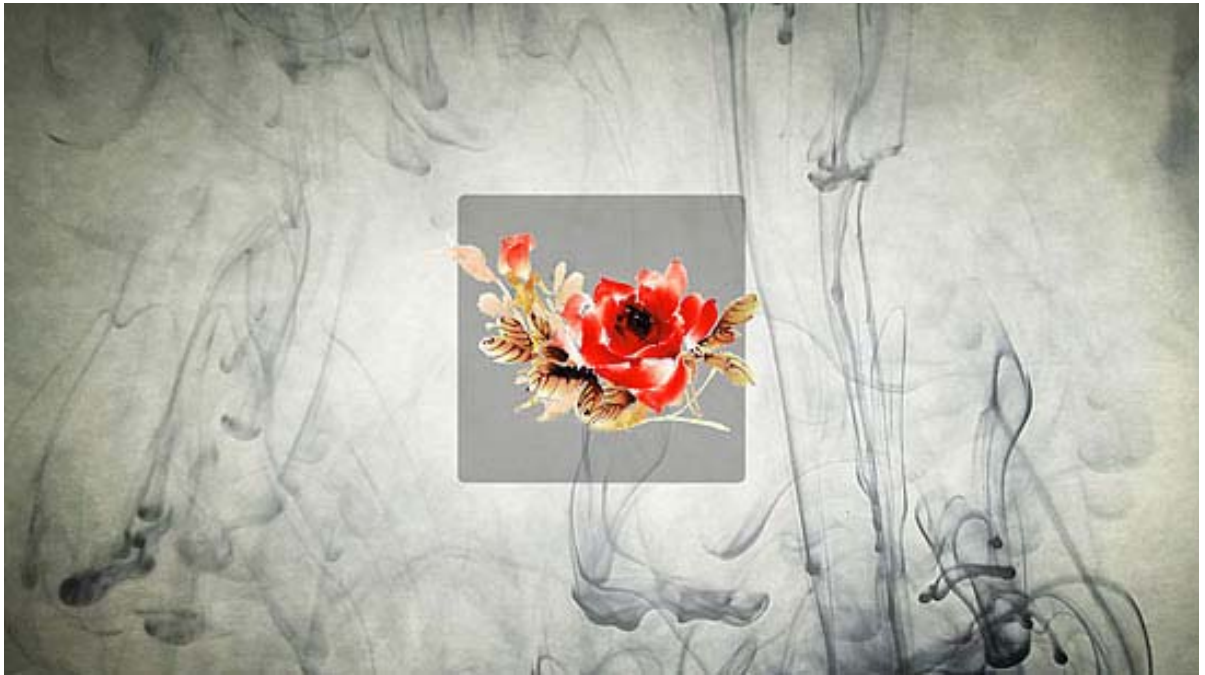
**Figure 41. A screen shot of the game play in “Hua” (Chinese ink painting) – when the game starts, the “canvas” will move from right to left**



**Figure 42. A screen shot of the game play in “Hua” (Chinese ink painting) – when the player waves the “brush” and is correctly following the music, the ink paint appears**

#### 4.7.5 The Game Result Page

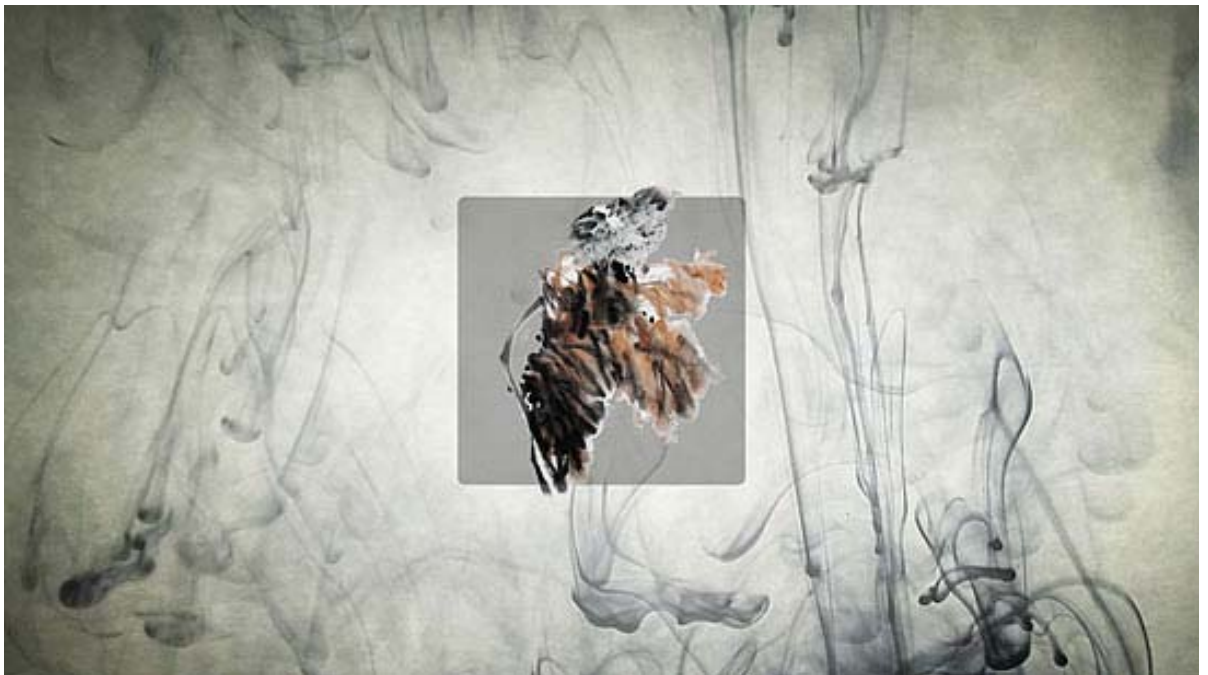
Each game has a similar tracking system to calculate the points accumulated by the player. The points are displayed at the end of the game. After careful consideration, the researcher has decided to use a simple and authentic symbol to present the scores, following the ancient Chinese phrase “flower blossom and fructification” which means that “hard work pays off”. In China, the peony is regarded as the flower of “riches and honor” (Bartholomew, 2009). In 1903, the Qing Dynasty declared the peony as the national flower or the floral emblem, which is why the researcher believes that this flower represents Chinese tradition appropriately. A peony in full blossom means excellent results (Figure 43), a peony bud means average results (Figure 44.), and a faded peony means that the player has performed poorly (Figure 45.). During the display of the result, a short tone of “Guzheng” is heard. Music can also be heard in sync with the peony display of the result. When the music is triumphant, a blooming peony appears; when the music is sorrowful, a fading peony appears.



**Figure 43. A blossomy peony indicates a good result**



**Figure 44. A bud of a peony indicates an average result**



**Figure 45. A bud of a peony indicates an average result**

## **5 User Test**

### **5.1 Purpose of the test**

To evaluate how effective the games are, a user test has been designed and conducted. The purpose of the test is to answer the following questions:

- How effective the games are in helping the users memorize some important features of the culture.
- How the users evaluate the games by giving ratings for each individual game based on four criteria (Enjoyment, Usability, Graphic, Cultural Authenticity).
- What the subjective response of the users to the games is.
- If the users who come from different cultural backgrounds give a different response to the games.

### **5.2 The test design**

The test needs be conducted in a quiet environment, free from interference, and requires a single participant to play all four games. The prototypes of the games run on a touch screen computer. In the beginning of the test, the participant is given a very brief introduction to the project; then the participant starts to play; after the participant has finished all four games they are required to complete a questionnaire and a rating form. The test is expected to take 35-45 minutes, which includes 5 minutes for the introduction, 15-20 minutes for the game play (all four mini-games), and 15-20 minutes for completing the questionnaire and the rating form.

The design of the questionnaire is based on the following aspects:

- General background of the participant.
- Participants' feedback on the usability aspect of the games.
- Their subjective response towards the games.
- Memory recall of the knowledge that has been presented in the games.

The rating form is designed to evaluative the following criteria of the game design:

- Enjoyment.
- Usability.
- Graphics (visual presentation).
- Cultural Authenticity.

NB The full questionnaire and rating form can be found in the Appendix; Low Level Ethics Clearance was applied for, and approved.

Twelve participants have taken the test and completed the evaluations. They can be divided into two groups, the people with Chinese cultural background and people with non-Chinese cultural backgrounds. The demographic details of the participants are in the following table (Table 1):

**Table 1. The demographic details of the participants**

	Age	Gender	Educational Background	Occupation	Native Language
User 01	54	Female	Master of Fine Art	Lecturer	English
User 02	43	Male	Bachelor Degree	Lecturer	German
User 03	38	Female	Master of Design	Senior Tutor	English
User 04	21	Female	Undergraduate	Student	English
User 05	20	Male	Undergraduate	Student	English
User 06	21	Male	Undergraduate	Student	English
User 07	50	Female	Not Given	Executive Assistant	Chinese
User 08	24	Female	Undergraduate	student	Chinese
User 09	23	Male	Undergraduate	Student	Chinese
User 10	24	Female	Undergraduate	Student	Chinese
User 11	33	Male	Bachelor Degree	Dentist	Chinese
User 12	9	Male	Primary School	Student	Chinese/English

### 5.3 Results

#### 5.3.1 Memory recall of the knowledge that has been presented in the games

To find out how effective the games are in helping the participants memorize the knowledge presented in the games, the following five questions were given to the participants. They were asked to answer in the questionnaire once they completed all four mini-games.

Question 1: What are the Five Elements in traditional Chinese culture?

Question 2: What are the Five Basic Tones in traditional Chinese music?

Question 3: What are the traditional Chinese philosophical concepts revealed by Go?

Question 4: Which one of the following features is the one of the main features of the Chinese character writing system?

☐ Cuneiform / ☐ Alphabet / ☐ Pictography / ☐ Phonology?

Question 5: What are the tools for Chinese traditional painting?

Table 2 below shows a summary of the participants' answers to the above five questions.

**Table 2. The participants' answers revealing the memory recall**

	Question 1	Question 2	Question 3	Question 4	Question 5
User 01	2	0	1	2	2
User 02	1	0	0	2	2
User 03	1	0	2	0	0
User 04	2	0	2	0	2
User 05	1	0	1	2	2
User 06	1	0	2	2	2
NCHSG	8	0	8	8	10
User 07	1	1	2	0	1

User 08	2	1	1	2	2
User 09	2	1	2	2	2
User 10	2	1	0	2	2
User 11	2	1	2	2	1
User 12	2	1	0	0	2
CHSG	11	6	7	8	10
Overall	19	6	15	16	20

\* CHSG represents the Chinese-Speaking Group, NCHSG represents the Non-Chinese - Speaking Group

The points “0” to “2” given in the table present how accurate the questions have been answered by each participant. “0” means the participant has not given the correct answer at all; “1” means the participant has given a partially correct answer; and “2” means the participant has given the completely correct answer.

Table 2 shows that seven out of twelve participants have given the completely correct answer to the first question, and the overall score for all the participants is 19 out of 24. To the second question, none of twelve answers are completely correct, and the overall score is 6 out of 24. There are six completely correct answers to the third question, and the overall score is 15 out of 24. Eight out of twelve participants have given the completely correct answer to the fourth question, and the overall score is 16 out of 24. The fifth question is answered correctly by nine out of twelve participants and the overall score for this question is 20 out of 24.

The results of the two groups (the Chinese speaking group and the Non-Chinese speaking group) are a little bit different. This difference was not unexpected because the participants from the Chinese-speaking group already have some background knowledge of traditional Chinese culture. Thus, some of the Chinese-speaking participants knew the answers to some the questions or they could deduce the right answers based on their knowledge.

With regards to the results of the Non-Chinese-speaking group, it is notable that none of the participants provided a completely correct or a partially correct answer to the second question;

The conversations with the participants indicate that the reason for such results is to do with memory recall constraints. As in the second question, the Five Basic Tones of traditional Chinese music are written in Chinese pinyin (the official system to transcribe Chinese written characters to Chinese mandarin pronunciations), it is very hard for the Non-Chinese-speaking participants to remember Non-English words in a short time. However, in the conversations with the Non-Chinese-speaking participants, most of them claimed that if they could play the games one or two more times more that then they could answer all the questions correctly.

Secondly, the overall performance of the participants in the memory recall section appears to be quite good. Except for the second question, for which the score is not over 12 (half of the full marks 24), the participants have achieved quite good scores for the rest of the questions.

### **5.3.2 Ratings of the games according to the four criteria**

The ratings are based on four criteria of the game design, which are: enjoyment of the game play; the usability of the game design; the graphic and the visual elements in the games; and the cultural authenticity of the games. The participants have given points from “1” to “5” for each criterion – “1” means poor work, while “5” means excellent work. The results of the ratings are summarized into five tables (Table 3 – 7).

The following table (Table 3) is the summary of the ratings of the “Enjoyment” of the game play given by the participants.

**Table 3. Ratings of the “Enjoyment” of the game play**

	Qin (Music)	Qi (Go)	Shu (Calligraphy)	Hua (Painting)
User 01	4	3	5	5
User 02	2	4	3	4

User 03	5	3	3	5
User 04	5	2	4	4
User 05	3	5	2	2
User 06	3	3	4	3
NCHSG	22	20	21	23
User 07	3	2	4	5
User 08	3	4	5	5
User 09	2	5	2	3
User 10	5	4	4	3
User 11	5	3	4	4
User 12	5	4	5	3
CHSG	23	22	24	23
Overall	45	42	45	46

\* CHSG represents the Chinese-Speaking Group, NCHSG represents the Non-Chinese - Speaking Group

Table 3 shows that the game “Hua” received the highest score over the four games in the “Enjoyment” aspect, which is 46 out of 60, whereas the “Qi” game was given the lowest score, 42 out of 60.

In this section, there is not much difference between the scores achieved by the two different language speaking groups. However, the scores indicate that the Chinese-speaking participants enjoy the “Shu” game most. Participants claimed that the “Shu” game is more meaningful than the other games. On the other hand, the Non-Chinese-speaking participants enjoyed the “Hua” game most, because - according to participants’ written comments - the “Hua” game provides more intuitive interaction and there were less language obstacles encountered in playing this game.

Table 4 is the summary of the ratings of the “Usability” of the game design given by the participants.

**Table 4. Ratings of the “Usability” of the game design**

	Qin (Music)	Qi (Go)	Shu (Calligraphy)	Hua (Painting)
User 01	4	3	5	5
User 02	1	4	5	3
User 03	3	4	3	5
User 04	5	5	5	5
User 05	3	4	3	3
User 06	2	4	5	4
NCHSG	18	24	26	25
User 07	4	3	4	5
User 08	3	5	5	5
User 09	4	5	5	2
User 10	5	4	4	3
User 11	3	2	4	5
User 12	5	5	4	2
CHSG	24	24	26	22
Overall	42	48	52	47

\* CHSG represents the Chinese-Speaking Group, NCHSG represents the Non-Chinese - Speaking Group

Table 4 shows that the game “Shu” received the highest score over the four games in the “Usability” aspect; that is, 52 out of 60, while the “Qin” game has been rated with the lowest score, (42 out of 60).

There is a notable difference between the scores achieved by the two different language speaking groups in relation to “Qin” game. The Chinese-speaking group scored 24, and the Non-Chinese-speaking group scored 18, which makes for a 6 point difference. The conversations with the participants after the game suggest that the Chinese-speaking participants can recognize the Chinese music notes for those notes are written in Chinese characters. Thus, it was not hard for them to match the music notes with the Characters on the string in the digital game. On the other hand, most of the Non-Chinese-speaking participants cannot recognize the music notes that written in Chinese characters and it was very hard for them to play the digital game smoothly.

Table 5 is the summary of the ratings of the “Graphics” of the game play given by the participants.

**Table 5. Ratings of the “Graphics” of the games**

	Qin (Music)	Qi (Go)	Shu (Calligraphy)	Hua (Painting)
User 01	5	4	5	5
User 02	5	4	4	5
User 03	4	4	4	5
User 04	4	4	5	5
User 05	3	3	4	3
User 06	4	3	3	5
NCHSG	25	22	25	28
User 07	5	4	5	4
User 08	5	5	5	5

User 09	5	4	4	5
User 10	5	4	4	3
User 11	4	4	5	5
User 12	3	3	2	5
CHSG	27	24	25	27
Overall	52	46	50	55

\* CHSG represents the Chinese-Speaking Group, NCHSG represents the Non-Chinese - Speaking Group

Table 5 shows that the game “Hua” received the highest score over the four games in the “Graphics” aspect, which is 55 out of 60, while the “Qin” game was rated the lowest score (46 out of 60).

In this section, there are nine points difference between the highest and lowest score. The conversations with the participants after the game suggest that the “Hua” game provided more appealing visual elements in the game (such as the stained canvas of the painting scroll and the Chinese ink painting samples which appeared during the game play). On the other hand, in the “Qi” game there is an identical Go game board in the centre of the screen with some black and white pieces, which was seen as less visually appealing to the participants, when compared to the other three games.

Table 6 is the summary of the ratings of the “Cultural Authenticity” of the games given by the participants.

**Table 6. Ratings of the “Cultural Authenticity” of the games**

	Qin (Music)	Qi (Go)	Shu (Calligraphy)	Hua (Painting)
User 01	5	5	5	5
User 02	5	4	4	4
User 03	4	4	4	4

User 04	5	5	5	5
User 05	3	4	3	2
User 06	3	4	5	3
NCHSG	25	26	26	23
User 07	4	4	5	4
User 08	5	5	5	5
User 09	3	4	3	3
User 10	5	4	4	3
User 11	5	5	5	5
User 12	4	5	3	4
CHSG	26	27	25	24
Overall	51	53	51	47

\* CHSG represents the Chinese-Speaking Group, NCHSG represents the Non-Chinese - Speaking Group

Table 6 shows that the game “Qi” has received the highest score over the four games in the “Cultural Authenticity” aspect; that is, 53 out of 60, whereas the “Hua” game has been given the lowest score, (47 out of 60).

There is not much difference between the scores achieved by the two different language speaking groups in this section.

Table 7 is the summary of the sum of the overall rating of each criterion for each game given by all the participants.

**Table 7. Overall rating of each criterion for each game given by all the participants**

	Enjoyment	Usability	Graphic	Cultural Authenticity	Overall
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Qin (Music)	45	42	52	51	190
Qi (Go)	42	48	46	53	189
Shu (Calligraphy)	45	52	50	51	198
Hua (Painting)	46	47	55	47	195
Overall	178	189	203	202	

From the tables (Table 3 – 7) above, it appears that, according to the four criteria, the “Graphic” aspect has received the highest score, which is 203 out of 240. The “Enjoyment” aspect has been given the lowest, 178 out of 240, score. Overall, the game “Shu” has received the highest score (198 out of 240), and the game “Qi” has been given the lowest score (189 out of 240).

The results show very little difference between the different language groups.

Table 8 is the summary of the sum of the overall rating of each criterion for each game given by the Non-Chinese-speaking group.

**Table 8. Overall rating of each criterion for each game given by the Non-Chinese-speaking group**

	Enjoyment	Usability	Graphic	Cultural Authenticity	Overall
Qin (Music)	22	18	25	25	90
Qi (Go)	20	24	22	26	92
Shu (Calligraphy)	21	26	25	26	98
Hua (Painting)	23	25	28	23	99
Overall	86	93	100	100	

Table 9 is the summary of the sum of the overall rating of each criterion for each game given by the Chinese-speaking group.

	Enjoyment	Usability	Graphic	Cultural Authenticity	Overall
Qin (Music)	23	24	27	26	100
Qi (Go)	22	24	24	27	97
Shu (Calligraphy)	24	26	25	25	100
Hua (Painting)	23	22	27	24	96
Overall	92	96	103	102	

According to the score achieved by the Non-Chinese-speaking group, the most successful game is “Hua”, and the most unsuccessful game is “Qi”, while the results of the Chinese-speaking group suggest that the “Shu” and “Qin” games are the best of the four games, and the “Hua” game is the most unsuccessful game.

### **5.3.3 Subjective responses from the participants**

Two methods have been used to get subjective responses from the participants. One way has been from summarizing written answers to from questions about the games. The other way has been to have a conversation with the participants after the test. The open-ended questions were:

Question 1: Would you like to play the games again?

Question 2: Do you think the games are more or less effective in helping you learn/understand traditional Chinese culture than other ways (such as books, lectures, or video materials)?

Question 3: Do you think the games are more or less engaging than reading a book, having a lecture or watching a video on traditional Chinese culture?

To the first question above, all the twelve participants gave positive answers. To the second and the third question above, most of the participants suggested that the games are more effective and engaging on helping people learn/understand traditional Chinese culture. Some of the participants suggested that reading books or taking lectures would be more effective in learning about traditional Chinese culture rather than through playing games. They have also offered valuable suggestions that can help improve the game design, such as adding more visual guides to the “Shu” game, and enhancing feedback to the “Qi” game.

The conversation between the tester and the participants shows more positive feedback by the participants. They all thought these new media games were more engaging and effective in learning Chinese culture than the conventional media. All of the participants showed great interest in spending more time to play the games again.

#### **5.4 Limitations**

Due to the constraints of the time frame of this project, there were many limitations in the user test, which has probably affected the test results. The first limitation is the quantity of the test; that is, there was not enough time to recruit a suitable number of participants to participate in the test, and even if there had been a good number of participants in the test, there would not have been enough time to process all the data and feedback. The second limitation is that the games used in the test are prototypes, and the flaws (such as coding bugs and usability issues) of the prototypes have diminished the results of the user experience. However, the results of the test can still yield many good suggestions for improving the design of the four games.

#### **5.5 Evaluation**

The data and feedback collected from the user test indicate that the concept of using new media games to promote traditional Chinese culture can be successful. The overall score of each game given by the participants who have taken the test was over 180, which means that all the games received over 75% of the maximum possible score.

The most successful game was “Shu” (Calligraphy) due to the following two aspects:

The pictographic nature of Chinese writing characters is quite different from the alphabetic western writing words. Chinese writing characters have a long and mystical history of evolution, and it is one of the elements frequently used in many cultural events that are well known to the public, such as the “Chinese dragon” and the “fire cracker”. Therefore, before the participants started playing the “Shu” game, they already knew it would be very Chinese and it would be an adventure to explore the mystery. It is probably the reason why the “Shu” game has received the highest rate in the aspect of “Cultural Authenticity”.

The three phases of the game play contain three different game mechanics that revolve around the same subject. Hence, the “Shu” game may have been seen by the participants to be more playful and more accessible than the other three games.

The results of the test suggest that the “Qi” game appears to be the most unsuccessful game. The probable reason for this is that the Go game itself is very sophisticated. The rules of this game are simple, but it usually takes months for learners to understand what an appropriate move is. The conversation with the participants of the test has revealed that none of them had had any experience in or knowledge of playing Go before. In the “Qi” game, even with guidance, players still could not understand why they won or lost. Thus, it dramatically diminished the players’ appreciation of the game. Furthermore, the feedback of the game interaction was not as appealing and exciting as that of the other three games, which is probably the reason why it did not create as a good impression as the other three games.

The “Graphics” section received the highest score (203 out of 240) of the four aspects. “Ink in water” was the inspiration behind the graphic design developed for this project. Ink is one of the most popular elements for Chinese traditional art forms. Calligraphy, ink painting, wood block print and other well known Chinese art forms require the use of ink, which is more than just a popular medium – ink is an iconic tool.

According to the ratings given by the participants, the “Enjoyment” aspect did not receive as good a score as the other three games (178 out of 240). As the games were not designed entirely for entertainment, the participants may have felt that they need to learn and practice more in order to understand the games and to achieve better results.

The game of “Hua” (Ink Painting) was quite controversial. Some participants found it to be quite smooth, intuitive, flowing and enjoyable. Yet, other participants could not understand the meaning of the game. Conversations with the participants suggest that the reason could be that the feedback of the game is ambiguous to a certain extent. This ambiguity may be perceived as interesting, or as frustrating. Future research could examine this ambiguity as an interesting virtue or as a vice.

There was a slight difference in feedback between the two different language speaking groups according to the test result. It suggests that differing cultural backgrounds can affect the result of the game play to some extent. However, this difference was not very dramatic. The conversations with the participants suggest that repeated play can diminish differences in the results of the memory recall test of the two groups.

Overall, the feedback obtained by means of the test is quite positive. The results indicate that the games can help people memorize the main features of traditional Chinese culture (although only short-term memory was tested), and it appears that traditional Chinese culture can be very engaging when presented as games to both Chinese and non-Chinese participants.

## **6 Conclusion**

This project has focused on exploring the possibilities of using digital media games to help users understand traditional Chinese culture through a short but immersive virtual experience.

This thesis introduced the concept of Daoism and Confucianism in order to present examples of traditional Chinese culture. The study indicates that these Chinese philosophies linked via an interactive game can help people experience and learn about Chinese culture. Furthermore, the potential of using computer games to promote culture in China has been examined. The most important ingredient of traditional Chinese culture seems to be the Four Arts which had a considerable impact on the education of people in the traditional art forms of China. This study revealed that a trend in modern China has been to increasingly promote Chinese culture through game-based learning.

This study shows that computer games provide assistance in learning and communicating culture. In addition, the thesis demonstrates that the interactive game is efficient for teaching especially in introducing Chinese culture. “The Four Arts” demonstrates that the application of touch screen interfaces is appropriate for the identified subject matter.

The study reveals that digital media has potential to introduce and engage learners to interact with Chinese culture. This idea was demonstrated through a prototype produced in Flash ActionScript 3.0. Furthermore, the project illustrates that a touch screen computer appeared to provide more natural approach, which is appropriate to the tactile and fluid nature of traditional Chinese arts.

For this reason four prototype games were designed. The games are not direct digital representations of the authentic practice, but reference the four Chinese Arts of Qin, Qi, Shu and Hua.

In order to evaluate the prototype, a qualitative method was applied to examine the result. The user test suggests that the four games can provide some assistance in learning and experiencing Chinese culture. Moreover, the study illustrated that one can engage

more efficient with Chinese culture when accessing and learning Chinese culture through games with touch screen interfaces.

## **7 Future Work**

The most demanding issue to be first addressed seems to be fixing the bugs that are still affecting the usability of the games, and to refine the graphics. An attempt to improve the usability of the game will be carried out, and efforts should be made to alter the program structure in order to transform the games into online media. Also, a different approach to the presentation of the games may be developed. For example, one possibility is to use a spatial installation to present the games. This approach could involve sculptures, HD projection on rice paper or liquid media, with 3D audio effects and ambient movies that project onto the background environment, and the ambient movie could change according to the player's physiological changes as detected by bio-sensors. In this way, users could achieve a more immersive experience which may also be more thematically appropriate to Daoist beliefs. It is also worth mentioning in passing that the Chinese government has expressed interest in these game prototypes. A project such as the one described here has the potential to be developed into an official gift to official visitors from foreign governments, as a friendly and engaging way of promoting traditional Chinese culture.

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