ATTRIBUTES OF NARRATIVE GAME AESTHETICS FOR PERCEIVED CULTURAL LEARNING

ABDUL SYAFIQ BIN BAHRIN

MASTER OF SCIENCE (MULTIMEDIA)
UNIVERSITI UTARA MALAYSIA
NOVEMBER 2017

Awang Had Salleh
Graduate School
of Arts And Sciences

Universiti Utara Malaysia

PERAKUAN KERJA TESIS / DISERTASI
(Certification of thesis / dissertation)

Kami, yang bertandatangan, memperakukan bahawa
(We, the undersigned, certify that)

ABDUL SYAFIQ BAHRIN

calon untuk Ijazah
(candidate for the degree of) MASTER OF SCIENCE (MULTIMEDIA STUDIES)

telah mengemukakan tesis / disertasi yang bertajuk:
(has presented his/her thesis / dissertation of the following title):

"ATTRIBUTES OF NARRATIVE GAME AESTHETICS FOR PERCEIVED CULTURAL LEARNING"

seperti yang tercatat di muka surat tajuk dan kulit tesis / disertasi.
(as it appears on the title page and front cover of the thesis / dissertation).

Bahawa tesis/disertasi tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan, sebagaimana yang ditunjukkan oleh calon dalam ujian lisan yang diadakan pada : *08 Februari, 2017.*
That the said thesis/dissertation is acceptable in form and content and displays a satisfactory knowledge of the field of study as demonstrated by the candidate through an oral examination held on:
February 08, 2017.

Pengerusi Viva: *(Chairman for VIVA)*	Assoc. Prof. Dr. Hassan Abu Bakar	Tandatangan *(Signature)*
Pemeriksa Luar: *(External Examiner)*	Assoc. Prof. Dr. Tan Wee Hoe	Tandatangan *(Signature)*
Pemeriksa Dalam: *(Internal Examiner)*	Dr. Syamsul Bahrin Zaibon	Tandatangan *(Signature)*
Nama Penyelia/Penyelia-penyelia: *(Name of Supervisor/Supervisors)*	Dr. Juliana Aida Abu Bakar	Tandatangan *(Signature)*
Nama Penyelia/Penyelia-penyelia: *(Name of Supervisor/Supervisors)*	Prof. Dr. Abd Razak Yaakub	Tandatangan *(Signature)*

Tarikh:
(Date) *February 08, 2017*

Permission to Use

In presenting this thesis in fulfillment of the requirements for a postgraduate degree from Universiti Utara Malaysia, I agree that the Universiti Library may make it freely available for inspection. I further agree that permission for the copying of this thesis in any manner, in whole or in part, for the scholarly purpose may be granted by my supervisor(s) or, in their absence, by the Dean of Awang Had Salleh Graduate School of Arts and Sciences. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my thesis.

Requests for permission to copy or to make other use of materials in this thesis, in whole or in part, should be addressed to:

Dean of Awang Had Salleh Graduate School of Arts and Sciences
UUM College of Arts and Sciences
Universiti Utara Malaysia
06010 UUM Sintok

Abstrak

Kajian terdahulu kebanyakannya mengambil berat kepada estetika permainan yang bukan holistik untuk pembelajaran dalam pelbagai platform media interaktif. Terdapat kekurangan kajian mengenai sifat-sifat permainan naratif estetika yang boleh menyumbang kepada pembelajaran budaya terlihat. Oleh itu, kajian ini bertujuan untuk mencadangkan satu model konsep estetika permainan naratif untuk pembelajaran budaya terlihat. Tiga objektif khusus telah dirumuskan: (i) untuk menentukan estetika permainan yang menyumbang kepada pembelajaran budaya terlihat dalam permainan naratif, (ii) untuk membangunkan permainan naratif berdasarkan estetika permainan yang telah ditentukan, dan (iii) untuk menghasilkan bukti empirikal mengenai sumbangan estetika permainan ke arah pembelajaran budaya terlihat. Metodologi kajian terdiri daripada tiga fasa utama: pembangunan model konseptual, pembangunan prototaip, dan penilaian pengguna. Untuk fasa pertama, model konseptual telah dibangunkan berdasarkan kesusasteraan terdahulu serta dikaji semula oleh enam pakar. Dalam fasa kedua, pembangunan prototaip kemudian dibangunkan berdasarkan model konseptual. Akhir sekali, penilaian pengguna telah diusahakan dengan menggunakan eksperimen kuasi yang melibatkan 43 peserta. Analisis data telah dijalankan dengan menggunakan analisis deskriptif, analisis korelasi, dan pemerhatian. Dapatan kajian menunjukkan bahawa enam daripada 10 sifat iaitu imej dan grafik; susun atur; rupa dan bentuk; tekstur; suara; dan muzik, mempunyai hubungan yang signifikan dengan pembelajaran budaya terlihat. Hasil pemerhatian juga menunjukkan bahawa sifat-sifat ini boleh menguatkan pengalaman permainan untuk pembelajaran budaya terlihat. Secara ringkasnya, kajian ini telah mengenal pasti sifat-sifat estetika permainan naratif untuk pembelajaran budaya terlihat. Ia juga memberikan bukti empirikal mengenai sumbangan sifat-sifat estetika permainan naratif kepada pembelajaran budaya terlihat. Hasil kajian ini akan menyediakan garis panduan bagi pereka dan pemaju permainan naratif yang berminat untuk memupuk pembelajaran budaya di dalam permainan mereka.

Kata kunci: Estetika permainan naratif, Reka bentuk permainan, Pembelajaran budaya terlihat

Abstract

Previous researches are mostly concerned on non-holistic game aesthetics for learning in various interactive media platforms. There is lack of studies on attributes of narrative games aesthetics which may contribute to perceived cultural learning. Therefore, this study aims to propose a conceptual model of narrative game aesthetics for perceived cultural learning. Three specific objectives were formulated: (i) to determine game aesthetics that contribute to perceived cultural learning in narrative games, (ii) to develop a narrative game based on the determined game aesthetics, and (iii) to produce empirical evidence on the contribution of game aesthetics towards perceived cultural learning. The research methodology comprises of three main phases: conceptual model development, prototype development, and user evaluation. For the first phase, the conceptual model was developed based on previous literature and reviewed by six experts. In the second phase, prototype development was then developed according to the conceptual model. Finally, user evaluation was employed using quasi experiment which involved 43 participants. Data analysis is conducted using descriptive analysis, correlation analysis, and observation. Findings indicate that six out of 10 attributes namely image and graphic; layout; shape and form; texture; voice; and music, are significantly correlated to perceived cultural learning. The observation results also indicate that these attributes can amplify game experience for perceived cultural learning. In a nutshell, this study has identified attributes of narrative game aesthetics for perceived cultural learning. It further provides empirical evidence on contributions of these attributes of narrative game aesthetics to perceived cultural learning. The outcome of this study will provide guidelines for narrative game designers and developers whom interested to inculcate cultural learning in their games.

Keywords: Narrative game aesthetics, Game design, Perceived cultural learning.

Acknowledgement

In the Name of Allah the Most Gracious the Most Merciful

Alhamdulillah, first and foremost all praise and thanks to Allah S.W.T. for giving me the opportunity and strength to go through this Master journey until it complete. I am extremely grateful for all those who have provided me with their help, encouragement, and assistance in many different ways in order to complete my thesis.

My sincere gratitude is expressed to my 1st supervisor Dr. Juliana Aida binti Abu Bakar, for her excellent guidance, caring, patience, and providing me with an excellent atmosphere for doing research. She also 'financially' supported my research by allowing me to become her Graduate Research Assistant with Fundamental Research Grant Scheme (12907), which funded by Ministry of Higher Education. I would like to thank to my 2nd advisor, Prof. Dr. Abdul Razak bin Yaakub, who actually suggested me to continue my Master studies in UUM, and let me experience the research of freshwater mussels in the field and practical issues beyond the textbooks, and patiently corrected my writing. This study also is partially funded by MyBrain15 Master Scholarships under the Ministry of Higher Education Malaysia.

Most importantly, my deepest appreciation and gratitude to my parents Bahrin Jusoh and Hamidah Abd Majid for believing in my ability, and supporting me spiritually throughout my life. Thank you so much for making my life so meaningful, bringing so much of joy in my life. I appreciate all of you very much. I pray to Allah that all of you will have a special place in the hereafter.

Special thanks to my beloved sibling Nur Izzati Bahrin and all friends and colleagues for their untiring support. They were always supporting me and encouraging me with their best wishes.

Abdul Syafiq Bahrin
Universiti Utara Malaysia
1 January 2017

Table of Contents

List of Appendix

List of Tables

List of Figures

List of Abbreviations

DST	Digital Story Telling
HCI	Human-Computer Interaction
PCL	Perceived Cultural Learning
UI	User Interface
UX	User Experience

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Cultural learning is critical because of cultural constructs society (Champion, 2006). Without culture, society may not be functioning in governing through its unique values and behavior (Champion, 2006). On the other hand, without societal influences, cultural may not preserve as well (Champion, 2006). As societal norms evolve, our culture is evolving as well. In order to preserve ones' culture, cultural learning must be exposed among youngsters.

According to "United Nations Educational, Scientific and Cultural Organization (UNESCO)," (2016), there are two types of cultural, which are tangible and intangible cultural. Both tangible and intangible cultural can be learned through a learning process. Learning process starts through interpretation and perception or perceiving of the differences between the environment and people (Bonini, 2008). Meanwhile, the process of feedback stimulates various and continuous levels of perceptive and cognitive interaction, as information or interpreted data converted into knowledge. Further explanation on how information of cultural learning perceived by players from game aesthetics are discussed in semiotics theory section (Section 2.4.2).

According to Costikyan (2000), players can learn from narrative games. Narrative games are played by most youngsters (Bryce & Rutter, 2001). In addition, games are the best computer medium for interactive engagement (Champion, 2003; Laird, 2001; Laird & van Lent, 2000). Moreover, according to Champion (2003), narrative game

are a suitable medium for academic evaluations that involved virtual environments, especially with a cultural focus. Previous studies of cultural learning in game design has been conducted such as on how cultural learning can be learnt from game design (Champion, 2003); sense of presence in cultural virtual environments of computer games (Champion & Dave, 2002); a theoretical instructional pervasive game model in order to construct a cultural-based pervasive game (Chen et al. 2014); and an evaluation of cultural learning in virtual environment of computer games (Champion, 2006). But what are the possible attributes that may contribute to players' perceived cultural learning in narrative games? Based on previous studies related to the cognitive theory of multimedia learning (Mayer, 2005, 2009; Mayer & Moreno, 2002), it can be concluded that story in interactive media may be delivered using voice, text, image, shape, and color. In addition, Huhtamo (2003) relates to semiotics theory that visual and aural attributes in interactive media may also be a part of communication perceived aspect, such as voice, text, and image. These attributes are defined as game aesthetics by Niedenthal (2009), as the cause of game appeal, that represent tangible look and sound of a narrative game in which they may contribute to perceived cultural learning.

Moreover, there are also previous studies on aesthetics attributes which may contribute to some degree of learning in various platform such as, color and shape on website design (Ahmad Affandi & Azizi, 2014); voice and color on 3D games (Jeong, Biocca, & Bohil, 2008); image on websites (Dhar, Ordonez, & Berg, 2011); and texture on human-computer interaction (HCI) (Cheng & Bischof, 2006). It is found that there is a lack of studies on attributes of game aesthetics and whether they contribute to learning.

Having good stories while playing games is one way to learn things (Costikyan, 2000). Nowadays, there are countless games that tell stories such as adventure and role-playing games, where both game and story are merged together. The combination of both created many interesting game styles. The narrative game is still being discussed among ludologists and narrativists on the degree of demand for the game as is and the story that shapes the game (Costikyan, 2000; Wardrip-Fruin & Harrigan, 2004). The narrative game may provide reasoning on players' behavior or to make-believe on players' personation in order to achieve specific goals (Costikyan, 2000).

This also tells that story may lead into a different kind of purpose or goal in allowing players to further engage with the game. One purpose of the narrative game is probably for players' perceived cultural learning in which playing game may subconsciously provide understanding on the content and context of the game (based on semiotics theory by (Barthes, 1968), in Section 2.4.2).

There are four major factors that may contribute to perceived cultural learning, such as the target audience (player) (Kiili, 2005; Sotamaa, 2007); the ability to relate stories (storyline) and gameplay (interaction) (Rollings & Morris, 1999; Van Eck, 2006); game aesthetics (El-Nasr & Smith, 2006); and the learning context of a game. This study focuses on game aesthetics due to reasons which are discussed in the following problem statement.

1.2 Statement of the Problem

Aesthetic in games are subjective as it has many definitions by scholars (Fullerton, 2008; Hunicke, LeBlanc, & Zubek, 2004; LeBlanc, 2004; Niedenthal, 2009; Wages, Grünvogel, & Grützmacher, 2004), where it does not only represent game appeal (e.g.

beauty, elegance, realism, art), but already covers most of the players' UX, like emotion; pleasure and satisfaction; forgiving; sociability; fun; gameplay; and etcetera (Hunicke et al., 2004; LeBlanc, 2004; Niedenthal, 2009). Previous studies focus on specific attributes of aesthetics which may contribute to the degree of learning in targeted interactive media, such as color and shape on website (Ahmad Affandi & Azizi, 2014); image on website (Dhar et al., 2011); texture on online multimedia applications (Cheng & Bischof, 2006); visual perspective on video games (Schneider, Lang, Shin, & Bradley, 2004); and music, sound effect and voice on applied media (Herbert, 2010). As one of the interactive media, it is anticipated that attributes of game aesthetics may contribute towards perceived cultural learning. However, there is a lack of studies considering attributes in game aesthetics for perceived cultural learning. Hence, this study attempts to determine attributes of game aesthetics for perceived cultural learning in narrative game.

In addition, previous studies reveal that cultural learning may be learned from games (Champion, 2003, 2006; Champion & Dave, 2002; Chen et al., 2014). Rather than game aesthetics, previous studies focus on other aspects of narrative games, such as artificial intelligence (Riedl, Thue, & Bulitko, 2011); Mechanics, Dynamics, and Aesthetics (MDA) methodology (Hunicke et al., 2004; Solarski, 2013); a theory of contemporary architecture, to create spatial narrative games (Jeon & Park, 2015); narrative time and space in narrative games (Wei, Bizzocchi, & Calvert, 2010); combining storytelling, game and learning context in narrative games (Göbel, Mehm, Radke, & Steinmetz, 2009); and also a guide to developing narrative games based on storytelling (Werner, Denner, Bliesner, & Rex, 2009). It is found that game aesthetics attributes such as color, shape, image, and text and their contributions to perceived cultural learning in game design are less studied. However, there is a lack of studies

on to what extent game aesthetics attributes may contribute to perceived cultural learning in narrative games. Hence, this study attempts to produce empirical evidence on the contribution of game aesthetics towards perceived cultural learning.

1.3 Research Questions

a) What is the required game aesthetics that contributes to perceived cultural learning in narrative games?

b) To what extent game aesthetics contribute to perceived cultural learning?

1.4 Research Objectives

a) To determine game aesthetics that contribute to perceived cultural learning in narrative games by experts.

b) To develop a narrative game based on the determined game aesthetics.

c) To produce empirical evidence on the contribution of game aesthetics towards perceived cultural learning.

1.5 Significant of the Study

The findings of this research would recommend the use of game aesthetics for perceived cultural learning. There are three main contributions in this study. Firstly, the conceptual model of game aesthetics for perceived cultural learning in narrative game. Secondly, an empirical evidence on the contribution of game aesthetics towards perceived cultural learning. Both findings may benefit to narrative game design and discussion among scholars and researchers who researching in cultural learning and narrative game design related fields.

Thirdly, this study also provides a narrative game development guideline. The findings may provide a guide and understanding to narrative game developers who are developing educational narrative games, especially with cultural learning content.

1.6 Scope of the Study

Most experts and participants engaged in this study are Malaysians. All experts for expert review on the conceptual model, questionnaire content validity, and prototype testing were chosen based on their expertise, in multimedia or instructional design or computer science related areas for at least five years. Meanwhile, the participants for the pilot study and quasi-experimental evaluation were youngsters ranging from 19 to 30 years old.

Learning content in this research is the cultural heritage of Dragon Boat Festival and Chinese traditional food (i.e. Zhong Zi). The players would experience a great game aesthetic values, game storyline, and gaming experience while learning the cultural heritage.

1.7 Operational Definition and Terminologies

The following sub-section clarifies the terminologies which are commonly used in this study.

1.7.1 Narrative Game

The narrative game is a type of game which uses narrative elements that contribute and act as the game flow for players to proceed from the start until the end of the game story. It also referring to a method of narrating a story in a game, which it is in the creation of developing a fiction world, where the narrative process happen while playing in order to create a game storyline, thus affect the game UX. It also can be a

domain for any digital type of narrative games in general, such as Massive Multiplayer Online Role Playing Game (MMORPG), Role Playing Game (RPG), and etcetera.

1.7.2 Game Aesthetics

Game aesthetics is defined as game *"attributes"* that represent tangible look and sound of the narrative game and contribute to some degree of learning. It also represents game assets such as 2D sprites, 3D models, audio, and etcetera.

The term "*attributes*" in this research represents visual and aural appearance that can be changed. Visual appearance is the look of the game such as text, image, and color. Aural appearance is the sound of the game such as music, sound effect, and voice.

1.7.3 Perceived Cultural Learning

Perceived cultural learning are defined as the player's perceptions or thoughts towards cultural learning content in the narrative game, such as ease of understanding or learning on each part of cultural learning content in the narrative game.

1.8 Research and Theoretical Framework

This study implemented semiotics theories, game theories and narrative elements in order to develop narrative games aesthetics for perceived cultural learning. There are three main phases as illustrated in Figure 1.1. The first phase is called 'Conceptual Model Verification', secondly is 'Prototype Development', and the third is 'Evaluation' phases. Further details were discussed in Chapter 2 and 3.

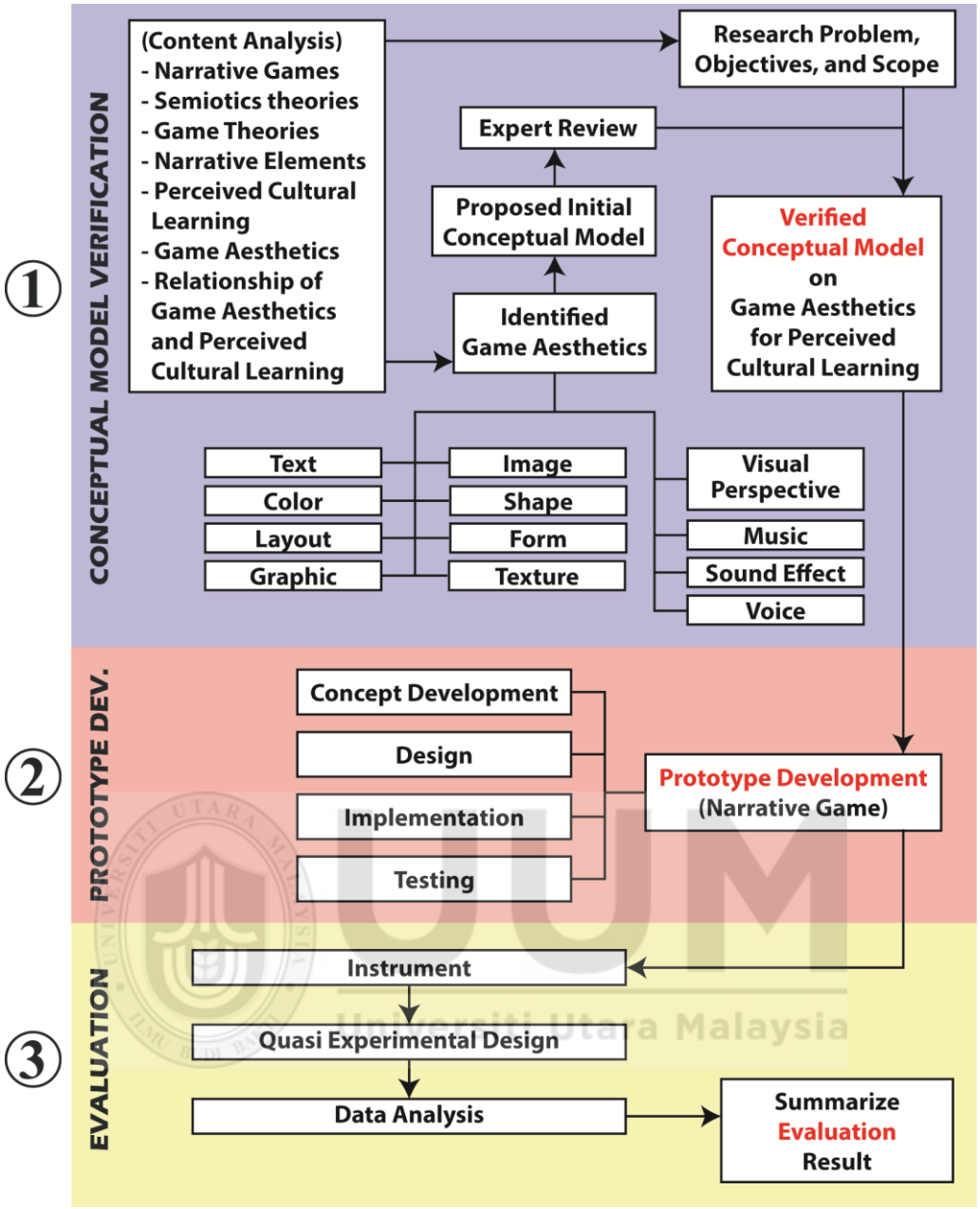


Figure 1.1. Research and Theoretical Framework

1.9 Structure of the Study

This study is organized systematically based on structure:

Chapter 1 indicates the statement of the problem; research objectives; research questions; significant of the study; scope of the study; operational definitions and terminologies; research and theoretical framework; and structure of the study.

Chapter 2 discussed any related issues to the study, such as game user experience and game aesthetics, narrative games, game aesthetics, perceived cultural learning and also the summary of the literature.

Chapter 3 explains the methodology that has been used in order to conduct the study in details, before the evaluation process.

Chapter 4 contains expert review process for validating identified game aesthetics for perceived cultural learning. This chapter also discussed the results and recommendations from the experts.

Chapter 5 is a prototype development where the narrative game was developed through three stages: Pre-production, production, post production.

Chapter 6 describes the evaluation processes where it covers questionnaire content validity, pilot test, quasi experimental design, and general observation.

Chapter 7 concludes the overall results from this study.

CHAPTER TWO

LITERATURE REVIEW

The literature review focuses on collecting information related to the development of narrative games for perceived cultural learning purpose with reviewed game aesthetics. It can be viewed as a literary collection of "evidence" which encompassed literature from other fields of research area including narrative games theories and narrative elements; game aesthetics and its detailed attributes discussion; and game aesthetics for perceived cultural learning relationship.

2.1 Game User Experience and Game Aesthetics

User Experience (UX) must be considered in designing or delivering almost all interactive media. Definition of UX terminology (Forlizzi & Battarbee, 2004), include hedonic, traditional usability into beauty, use of technology on experiential or affective aspects. However, game UX is slightly different from generic UX. According to Preece, Rogers, and Sharp, (2002), UX in-game experience can be defined as fun and entertaining; rewarding; enjoyable; motivating; aesthetically pleasing; satisfying; helpful; emotionally fulfilling; and supportive of creativity.

Meanwhile, Hassenzahl and Tractinsky (2006) elaborated that UX is a system which has a major contribution that exceeds the instrumental needs, in a form of situated, subjective, dynamic encounter and complex. Through their studies, they came out with a result as illustrated in Figure 2.1, and conclude that UX are generally caused from user's internal state (e.g. expectations, mood, predispositions, motivation, etcetera), the context or environment when occurring the interaction (e.g. voluntariness of use, benefited activity, organizational or social setting, etcetera), and

the elements in designed product (e.g. purpose, complexity, functionality, usability, etcetera).

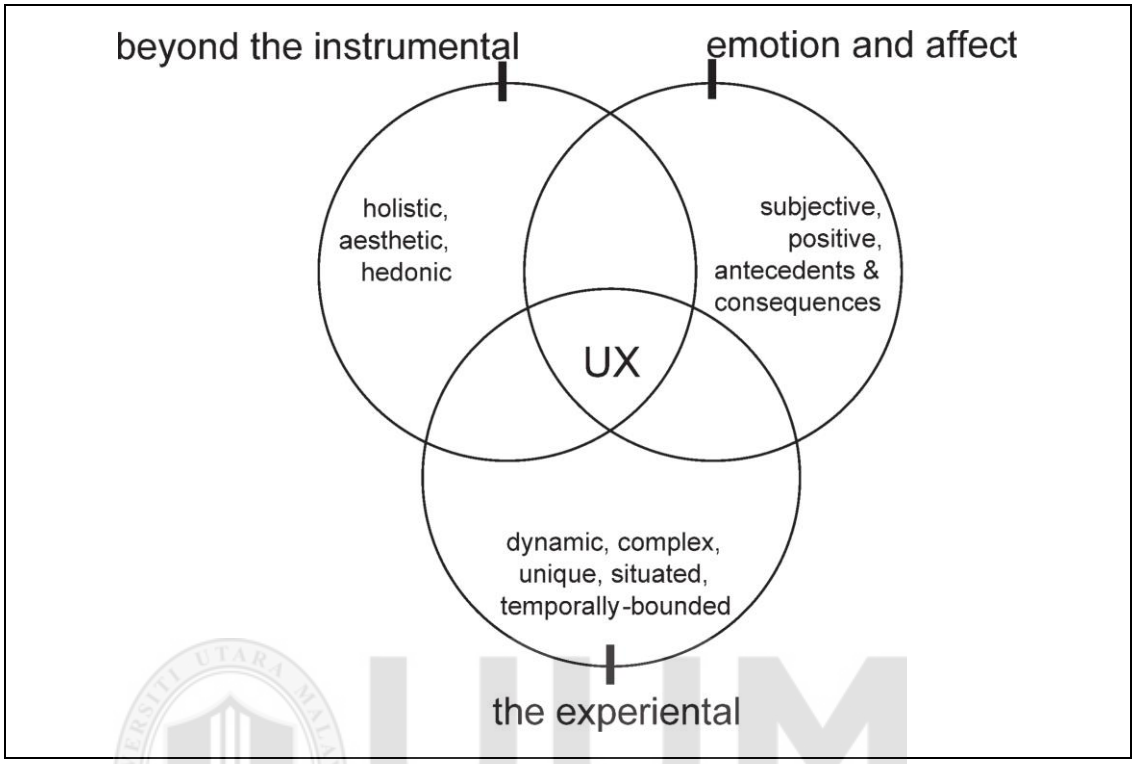


Figure 2.1. UX's facet (Hassenzahl & Tractinsky, 2006)

In addition, the gameplay or playability that contributes to game UX is important in order to determine whether the game design is accepted by the players or not. This is because good gameplay or playability may lead into good moment experience (Whiteside & Wixon, 1988). It means that the moment experience produced by good gameplay may cause players to keep playing or got bored and stop playing the game.

Even so, compared to the moment experience, the first impression towards any product should be heavily considered (Lindgaard, Fernandes, Dudek, & Brown, 2006). This impression also may appear in various contexts in interactive media such as exploring user's judgment or perceptions towards appeal and usability (Schenkman & Jönsson, 2000; Tractinsky, Katz, & Ikar, 2000), reliability (e.g. Basso, Goldberg,

Greenspan, & Weimer, 2001), trust (Karvonen, 2000), beauty, the relationship between hedonic attributes (e.g. identification, stimulation), and also goodness or satisfaction (Hassenzahl, 2004). Aesthetics or visual appeal factors may influence user's judgment on their next experience (Lindgaard & Dudek, 2002).

In addition, a successful game in the game industry may lead to higher (online) rating and recommendations from many players who loves to rate any newly released games through many platforms, such as youtube, blogs, magazines, and etcetera. They usually provided the view of the gameplay or playability of the game, which judged by the first impression among new players. When this happened, there should be no issue to get a good first impression among new players to start purchase and play the game.

In another word, good gameplay or playability may contribute to moment experiences (Whiteside & Wixon, 1988), such as fun and entertaining; rewarding; enjoyable; motivating; aesthetically pleasing; satisfying; helpful; emotionally fulfilling; and supportive of creativity (Preece et al., 2002). It also may contribute to players' first impression by first time playing the game or watching the advertisement like the game trailer.

In brief, this section shows that there is a connection between UX and aesthetics, where UX is a domain for many dimensions including aesthetics (Forlizzi & Battarbee, 2004; Hassenzahl & Tractinsky, 2006; Preece et al., 2002). This study, however, focuses on aesthetics in game UX, and on to what extent it may contribute to perceived cultural learning. Further discussion on aesthetics in games was discussed in the next subsection. Meanwhile, the details of the contribution of each attribute for game UX was discussed in Section 2.3.

2.1.1 Aesthetics and its Influence on Game User Experience

Numerous studies have been done by many researchers on aesthetics that influence game UX. Among of them are game aesthetic by Andersen, Liu, Snider, Szeto, and Popovi (2011), where sound effect and music were found to be less or no effect towards players' retention. However, both sound effect (Skalski & Whitbred, 2010) and music (Cassidy & Macdonald, 2010; Lipscomb & Zehnder, 2005) may able to increase the sense of presence, immersion, and enjoyment in game design.

There is also non-significant result where aesthetics to were not able to create believability (Wages et al., 2004). However, lack of realism contributes to this results. As technology keeps advancing, and not just virtual reality and augmented reality, but the holographic game also almost can be produced nowadays, realism inside game worlds almost become real. Furthermore, games are supposed to make the player to get immersed in the game world.

Moreover, aesthetics in HCI studies also may give the similar results to game aesthetics as discussed in the previous section. One particular example is a study by Suh and Chang (2006) in demonstrating the effects of a telepresence which lead by aesthetics in virtual reality in mediated environments. By focusing on content and user interface, the customer may be persuaded to buy the product. Their study shows that user interfaces of technology lead to greater experience towards the users. Although they did not study on any specific characteristics or attributes of the interface, this result proves that user interface in any interactive media is essential in determining the users' attention.

In brief, previous studies shows that aesthetics implication on interactive media may contribute to UX such as increased sense of presence, immersion, and enjoyment

(Cassidy & Macdonald, 2010; Lipscomb & Zehnder, 2005; Skalski & Whitbred, 2010); quick cognition process (Lindgaard et al., 2006); attention (Suh & Chang, 2006); and ease of use and persuasion (Lidwell, Holden, & Butler, 2010). Hence, as a part of interactive media, it is anticipated that game aesthetics may also contribute to game UX. Game aesthetics may be appealling to players which eventually will affect their experience. This appeal may produce pleasant experience in games. In contrary for horror games, the appeal may produce contradicting experience. Further discussion on game aesthetics is available in Section 2.3.

2.1.2 Aesthetics in Interactive Media and Other Design Principles

In 80's and 90's, aesthetics was forbidden to be emphasized in interactive media by most interactive and usability experts (Tractinsky, 2013). This is because they believed that usability and aesthetics cannot coexist in interactive media. This means any interactive media that emphasized with aesthetics may sacrifice usability by default. Even so, aesthetics nowadays are widely accepted, thanks to various research findings that positively proved the correlation between both aesthetics and usability (Cawthon & Moere, 2007; Lavie & Tractinsky, 2004; Sonderegger & Sauer, 2010; Tractinsky et al., 2000).

Furthermore, Tractinsky (2013) has argued that there is no conflict between aesthetic principles and usability in any usability guidelines. Another argument by Tractinsky (2005) that researchers and usability experts alike should not ignore aesthetic dimension of interactive media but accept it as a priority in interactive product design development, by providing four reasons which are:

a) Most of the time, aesthetics can be a main factor in differentiates between interactive media.

b) As conducted by Noam Tractinsky, (2005), 'visual' is his main environment evaluation (of interactive media) which are widely open for immediate aesthetic impressions and maintained.

c) Nowadays, human needs are getting often supplied by interactive media, but the basic human needs should be satisfied by aesthetics.

d) Thanks to information technology, consideration of aesthetic are becoming pervasive and important among society.

Most aesthetics research findings and arguments are meant for general design for interactive media. Thus, game aesthetics should be heavily considered in narrative game design along with playability (usability). Players might have difficulty to control and play or even understand the content of the game design, because of lack game aesthetics elements implication in game design, as mentioned earlier in Section 2.1.1 by Lidwell et al. (2010).

2.2 Narrative Games

According to Mitchell and McGee (2009), narrative games are defined as a part of the interactive media in the process of 'co-creating a story' based on the interaction or communication of player with another player, or with the system Non-Playing Character (NPC), thus it leads to a different game experience. 'Co-creating a story' means while playing the game, players feel like he narrating the game himself, as he chooses the path to propel the game. The game never ends unless the player ends the game himself.

In a game context, many researchers, game makers, and even players have a various game definition with their own preferences. Generally, the game is an activity in enjoyment circumstances. Many researchers had defined the term of games in their

study context, such as an organized play which provides pleasure and enjoyment for players (Prensky, 2001). Meanwhile, the game is defined by Dempsey (1996) as a set of activities involved by players, which has goals, pay off, constraints, consequences, guided by rules, and also competition aspect if there are more than one player. A game also could let the players get the visualization of the imaginary world of the game and get immersed in it (Fabricatore, 2000). Furthermore, while immersing in the game, they can be motivated by challenges, curiosity, and fantasy (Randel, Morris, Wetzel, & Whitehill, 1992). In addition, according to Costikyan (1994), a game is a form of art, where participants make their own decisions in order to manage resources through game tokens in the goal pursuit. In other words, achieving the goals of the game require the player(s) to make their own decisions in order to manage the game resources through provided options.

However, it is argued that there is no specific meaning of game that covers all type of games because the game itself are too subjective or abstract. This is because some of the game only have a few of so-called principle or theory of games. For example, the goal of the game does not necessarily to have a winning condition, such as Tetris. The main and only goal in Tetris is to play as long as the player can in order to beat their previous game record. Compared to Dr. Mario game who has similar gameplay with Tetris, the game able to achieve a winning condition when it runs with two players (either with computer player or human player). In this case, the winner of the game is the player who can manage to keep the game on track, while the loser is vice versa.

Another example is, some games require additional element/theory/term which is rarely used by many researchers such as ‘luck’. Generally, the function of luck in the game are essential for a particular game in order to proceed the game story a lot faster

by luckily getting various handicap like rare equipment in a game like most current online games have (e.g. MMORPG, and etcetera), and an even offline game like The Binding of Issaac. Not only that, Tetris also require different kind of luck, which is to get the right block-shape for the player to 'stay life'. In addition, most online games is using 'luck' system because it is a part of their strategy where the 'unlucky player' has to pay to guaranteed get the rare equipment to compete with the 'lucky player' who luckily got the rare equipment in the game reward.

Meanwhile, some games do not require to have a good or bad luck in the game all the time, especially when it comes to a dialogue in some narrative games (e.g. Visual Novel) and choose the dialogue option given. Some dialogue also might lead to a good or bad storyline for some narrative games (e.g. Visual Novel). This means that one of the main goals of narrative games also could be to win in the narrative term (Mitchell & McGee, 2009).

Game design considerations are different than other software like HCI products like websites, mobile apps, courseware and etcetera (Barr, Noble, & Biddle, 2007; Johnson & Jones, 1999; Jørgensen, 2004; Pinelle, Wong, & Stach, 2008). Compared to HCI, the narrative game has its own theories and elements. Among the theories and elements that may exclude game design from HCI are such as rules, challenge, goal, reward and even competition among players (Costikyan, 1994). Refer to section 2.3 for further details on game theories and elements.

The narrative game does not only focuses on gameplay mechanism but also the storyline. A story is linear (Adams, 2010; Costikyan, 2000; Maiorano, 2014; Wei et al., 2010) while a game in non-linear. This is because players can already know the same (linear) story when they play the same game for the second time, exactly like re-

watching movies. Meanwhile, they cannot predict what may happen during the gameplay (non-linear) because they are able to control the gameplay themselves like jump, run and probably using different features or skills whenever they like, or even die while playing. However, it is argued that a story in the game also can be non-linear when it is structured with story branches (Lebowitz & Klug, 2011; Maiorano, 2014; Riedl et al., 2011). Story branches allow the players to control multiple option or decision in order to 'create' or 'structured' the game story by themselves. It is similar to the concept of "Choose Your Own Adventure" book where the reader faces multiple decision points that may lead them into a different story line. The reader must make a choice in order to continue the story (Rubin & Dehon, 2011; Vicary & Fraley, 2007). This is another reason the game is defined as an "art" or "abstract" and it applies to the various context of games.

Both game designer and programmer contributes to the game development. For narrative games, there are three types of game developer, which are:

a) Game designer contributes to aesthetics values.

b) Game programmer contributes to overall game development, including usability (playability), aesthetics and game UX.

c) Game narrator contributes to the game story, which can upgrade the aesthetic values and player's UX including any good knowledge for educational purpose.

The term narrative games are rarely used even though it is directly defined as a game with the implementation of storytelling as the game flow. Besides, it may be distinguished with any other term that sounds much similar to Digital 'Storytelling',

like a word ‘storytelling’ games as used by Mitchell and McGee (2009). There are various studies among researchers that use the term narrative games or similar to it as listed in Table 2.1.

Table 2.1

Related previous studies of narrative games

Years	Author/s	Research Tittles
2015	Jeon and Park	Contemporary Architecture Theory and Game Storytelling
2011	Riedl, Thue, and Bulitko	Game AI as Storytelling
2010	Wei, Bizzocchi, and Calvert	Time and space in digital game storytelling
2009	Göbel, Mehm, Radke, and Steinmetz	80Days: Adaptive digital storytelling for digital educational games
2009	Mitchell and McGee	Designing storytelling games that encourage narrative play
2009	Werner, Denner, Bliesner, and Rex	Can Middle-Schoolers use Storytelling Alice to Make Games? Results of a Pilot Study
2003	Champion	Applying game design theory to virtual heritage environments
2002	Champion and Dave	Where is this place?

Previous studies were focusing on other than game aesthetics in narrative games, such as a theory of contemporary architecture, to create spatial narrative games (Jeon & Park, 2015); artificial intelligence (Riedl et al., 2011); narrative time and space (Wei et al., 2010), combining storytelling, game and learning context to build exciting, adaptive and intelligent learning environments (Göbel et al., 2009), a guide (i.e. for middle-schoolers) to develop narrative games based on existing storytelling (i.e. Alice) (Werner et al., 2009), and also how cultural learning can be learned from game

design (Champion, 2003; Champion & Dave, 2002). None of the list in table 2.1 used the term of a narrative game.

The term narrative game should be commercialized more as it can be differentiated with Digital Storytelling (DST). It also may clear the confusion between narrative games and DST expert. This is because some of the product might have relatively similar to each other like narrative games (e.g. Visual Novel) and any type of DST. Furthermore, DST is a part of HCI product; and as mentioned earlier, there is difference between game design and HCI products. Otherwise, narrative games may be assumed as a part of 'interactive' of interactive DST as have been done by the previous researcher as listed in Table 2.2.

Table 2.2

Previous studies of interactive DST which are related to narrative games

Years	**Author/s**	**Research Tittles**
2012	Alofs, Theune, and Swartjes	A tabletop board game interface for multi-user interaction with a storytelling system
2010	Bostan and Marsh	The 'interactive' of interactive storytelling: Customizing the gaming experience
2010	Shen and Mazalek	Puzzle tale: A tangible puzzle game for interactive storytelling

There are studies on DST which are related to the narrative game such as a tabletop board game with a storytelling (Alofs et al., 2012), the 'interactive' of interactive storytelling (Bostan & Marsh, 2010), and an interactive storytelling puzzle game (Shen & Mazalek, 2010).

2.2.1 Narrative Games Theories and Narrative Game Design Principles

Theory of games and narrative elements along with narrative game design principles are essential in this research and has to be elaborated purposely for narrative games development in this study. Generally, the importance of game theories in every game design is to provide a particular situation through rules, which lead to particular strategy through strategic decision by rational players in choosing the right decisions for game achievement (outcomes, succeed) (Ross, 2009; Zaibon, 2011). The particular situation could be in any case, like how the gameplay works, based on type or genre of the game, or also a competition among players, if the game does require more than one player. Meanwhile, a strategy is defined as a predetermined outcome that allows the players to take actions based on any possible response (Zaibon, 2011). On top of that, the players are considered rational when they are able to assess the game outcomes, calculate paths to game outcomes, and also decide any actions that give their most desired and preferred outcomes (Ross, 2009; Zaibon, 2011).

In other words, game theories contribute to narrative games through player, outcomes, choice and 'play'. The player is a learner that able to expect the general outcomes or significance before playing the narrative games and gain predetermined outcomes afterward. Outcomes are the narrative games' goal or learning objective, where it is required to be achieved by the player in order to proceed to the next stage and continue the game story. The choice is a decision, made by the player through choosing provided an option within the game environment or depend on the situation or storyline, and it is also a part of the game strategy in strategize to achieve the narrative games' goal. 'Play' program is the rules of the game, where player have to follow through.

Narrative theory or elements also should be considered in shaping the idea of developing the narrative games. A previous study by Wei et al. (2010) in measuring on how time and space affecting the game UX were using order, frequency, and speed as their narrative theories. However, these so-called theories do not suitable for this study because this study does not focus on time and space, but game aesthetics instead. Meanwhile, there is previous study by Ibrahim (2006), which aimed to define the problems and challenges the local film industry are facing when creating the content for the audience. Although the research mainly discusses about the film industry, narrative games and films are not far off when it comes to narrative content with a major difference that in narrative games, audiences get to interact and manipulate the outcome of the events in the story. Moreover, as discussed by Rollings and Morris (1999), there are five narrative game elements suggested based on the common model of dramas and films, such as genre, plot, character, setting, and theme. These suggested elements do reflect well on narrative games development in general, thus with the prototype in this study as well.

In addition, when it comes to narrating, it is essential to include a dramatic tension. According to Adams (2013), dramatic tension is the incompleteness sense in a story because it makes the player curious, hooked and wants to know what is going on and "what is going happen next?". Furthermore, dramatic tension can be in in a various situation such as rising action, climax, falling action, and also the conclusion, and this means that it does not necessarily have to involve any kind of risk (Adams, 2013). In addition, it also could be in a form of conflict engaged in the story, which usually among the characters in the narrative game.

In other words, the narrative elements are described in the terms:

a) **The genre** is a style of the game, where it can be identified by the game developer's goal. In addition, each game can have more than one genre. For example, Final Fantasy game is primarily an adventure game which merges with elements of fantasy, expression, challenge, discovery, narrative, and submission game (Hunicke et al., 2004).

b) **Plot** is a game's events or game storyline 'authored' by the player, not the game maker. The game act as a tool for the player to create stories.

c) **Character** is a medium (person in the game) to enhance the story process. This includes the player's own characters and NPC.

d) **Setting** is a formalized universe (game world) controlled by game rules. (Similar meaning with game theory: play)

e) **Theme** is the way of player thinks about the game genre they have chosen, and so it shapes the way they feel about the game.

f) **Dramatic tension** is an incompleteness sense in a story because it makes the player felt curious, hooked and wants to know "what is going on" and "what is going happen next".

"Story" and "plot" are main "ingredients" for any kind of narrative, understood as a succession of events (Egenfeldt-Nielsen, Smith, & Tosca, 2013). However, in narrative games context, the main 'ingredients' are a game storyline and also gameplay. Thus, this may lead to the creation of a fictional world, in which the procession of the narrative goes through to create a storyline. In brief, the content of the game can affect the player's game UX.

This research which aims for game aesthetics in narrative games with educational content can use these theories and elements to keep the player engaged while learning the content through game UX.

Based on Costikyan (1994), it can be concluded that the narrative game design principles in this study are as listed in Table 2.3.

Table 2.3

Narrative Games Design Principles

Specification	Explanation
Decision making	**Game:** What kind of decision do player make in narrative games? **Narrative:** What are the cause for the player to make a decision?
Goals	**Game:** What are the player's goal? What other things that exist for players to achieve their various goals? **Narrative:** What leads the player to achieve the game goal?
Opposition	**Game:** What provides opposition? What makes the game a competitive, thus make it struggle? **Narrative:** What are the player's opposition in the beginning of the game? Does different opposition make the player feels like their character is getting matured along with the story?
Game tokens	**Game:** What are the players' token? What are the token's abilities? **Narrative:** What make that particular token interesting?
Information	**Game:** What information do the players need to know in order to continue to the next stage? Is there any learning content to deliver? Do the narrative games provide sufficient information when needed? Will reasonable players able to figure out what information they need, and how to find it? **Narrative:** How to deliver the information to the players in order to continue the game story or to gain knowledge?
Variety of encounter	**Game and Narrative:** What things will the players encounter during the 'exploration' in narrative games?
Socializing	**Game and Narrative:** How can the game encourage socialization among players or/and NPCs?
Narrative tension	**Game and Narrative:** What can be done to make the game tense and exciting? Where is the climax?

The prototype of this study was also developed based on these 8 narrative game specifications as in Table 2.3. Each specification determines the form of the narrative game that has been made, which is in developers' perspective. Further discussion on

how these design principle has been applied to the developed narrative game has been discussed in Section 5.3.

2.2.2 Narrative Game Structures

There are six types of structures in narrative games: (a) linear story and gameplay; (b) linear story and non-linear gameplay; (c) user-generated story and linear gameplay; (d) branching story and gameplay; (e) controlled branching; (f) and parallel story and gameplay (Maiorano, 2014). Narrative games are abstract because it is not necessary to develop narrative games according to this structure completely as it can be combined together into any section. For example, narrative games can be developed with structure (a) and (d) in the middle of the storyline, and also structure (f) towards the end of the storyline.

The first three structures (a, b, and c) are a straightforward story, where the player have to stick to the designed storyline from start until the end of the game. Structure (a) is the structure of the most basic narrative game where both storyline and gameplay are linear. Structure (b) is a situation where the player are given multiple choice to choose which kind of gameplay they want, even though the structure only have one storyline branch (e.g. Street Fighter X Tekken). Structure (c) allow the player(s) to have a different kind of conversation with the system or NPC, but any selected decision point may always lead back to the same (one) designated main storyline and gameplay.

On the other hand, the other three structures (d, e, and f) are a type of branching story, which allows the players to choose the provided decision points which may lead to different goals and storyline (conversation between player-player and player-NPC; and ending of the game story). Structure (d) has multiple storyline and gameplay, but the ending of the game could be different or random. Structure (e) has the same as structure (d), but much complex where the player are able to decide both storyline and gameplay within more pervasive way. This structure is almost like the player can control the parallel story. Structure (f) has parallel story and gameplay where the players can only decide the 'path' once and the ending of the game will be decided (or probably have another parallel in parallel, depend on how narrative games developed). Further explanation regarding story branches was discussed by many other researchers such as Lebowitz and Klug (2011); and Riedl et al. (2011).

Narrative games in this study do not actually apply story branches because most of the prototype structure is referring to structure (b) (linear storyline, nonlinear gameplay) while having a little of branches structure (f) on the very last stage where it has two different type of ending. Good ending if the player wins the last match and bad ending if the player lost the last match.

These two types of ending do have a different type of conversation with the NPC's before the game ends. There are pros and cons in using linear storyline. However, it is chosen is because it can contribute more on emotional impact from the players (indirectly learning impact as well), thus strengthen more the game storyline (Adams, 2010; Wei et al., 2010). Even though linear storyline may limit the nonlinear gameplay (Adams, 2010; Wei et al., 2010), the prototype were be made in 3D which cover the nonlinear gameplay limitation because 3D in narrative games may allow the

players to move around any available environment as they like (between 'story checkpoints'); which it can still be considered as 'nonlinear' gameplay. The operational game structure of the prototype of the narrative game in this study was discussed in Section 5.2.

2.2.3 Aesthetic in Narrative Games

Narrative games are considered as arts in which a part of the game design itself is aesthetics. Games are not necessarily must be beautiful like paintings or any other arts, but it must be designed with artistic skill and created with a sense of style (Adams, 2010). A game with a muddy soundtrack or audio, clumsy animation, trite dialogue, misspelled or wrong text, color, and other attributes may ruin the player's judgment towards the game and may leave them in despair.

Aesthetics must exist and expand beyond games. A remarkable experience can be achieved in each game through the inclusion of game aesthetics such as graphics, fonts, and text (Adams, 2010). In addition, game aesthetics also can automatically be judged through the way the game responds to the player when they hit the button inside of the game features.

In providing a product alternative through aesthetics approach in game design, Niedenthal (2009) has suggested three core meaning in game aesthetics, as detailed in Table 2.4.

Table 2.4

Three core meaning of game aesthetics (Niedenthal, 2009)

Definition of Game Aesthetics	**Further Explanations**
Definition I: It is a sensory phenomenon, that encountered by a player in the game (visual, haptic, aural, embodied).	Aesthetics refers to how a game looks, sounds, and proposed/presents/describes itself to the player. This meaning is for an understanding of game aesthetics, which referred from a Greek word *aesthesis* for 'sense/sensation' and 'perception'.
Definition II: It is a digital game aspect, that merged with other art forms (which lead to the general meaning of art)	Games do not only share certain content, aims, themes, forms and design practices but also with other art form and medias. This is where it can be compared and generalized.
Definition III: It is a game expression, that experienced as emotion, pleasure, forgiving, sociability, and etcetera (which refers to aesthetics user experience)	Games is an artifact with the potential to rise aesthetics user experience (through game expression).

The definition I in Table 2.4 has a similar definition with aesthetics in games suggested by Fullerton (2008) where games are divided into four distinct area of studies which are aesthetics, game mechanics, technology, and kinesthetic. However, the players' feel or emotion about a game is not considered as aesthetics in Definition III. This definition also has similar meaning with "Mechanics" from a proposed Mechanics, Dynamics, and Aesthetics (MDA) methodology by Hunicke et al. (2004). The MDA methodology is a tool to help researchers, scholars, and game makers to understand better in term of a formal approach to game research and game design, where the aesthetics should be implemented along with the process proposed.

Definition II in Table 2.4 has a similar definition with a study to evaluate the investment in aesthetics, by adding a content with 'artistic depth' and 'style' for

player experience (Andersen et al., 2011). Meanwhile, Wages et al. (2004) are proposing the approach in considering aesthetics to 'reproduce realism' in games. However, the result was insignificant, because realism works for user immersion and presence into the game world. Although there is no specific definition of aesthetics provided in the study, it is through art that creates the realistic of realism.

Definition III in Table 2.4 has a similar definition with the element of "fun" (Hunicke et al., 2004; LeBlanc, 2004). It also has similar meaning with "Aesthetics" in the MDA methodology (Hunicke et al., 2004). The aesthetics in MDA methodology is defined as the responses of desirable emotional which evoked in.

Games are normally developed by a team of game developers which consist of designers, developers, or narrator. Game makers should have a good perspective, where the Mechanics (game aesthetics) give rise to Dynamic system behavior (game storyline and gameplay), which in turn leads to particular aesthetics (game UX), while it is vice versa in player's perspective where the "aesthetics set the tone, which is born out in observable dynamics and eventually, operable mechanics". Figure 2.2 depicts the difference perspective between game developer and player.

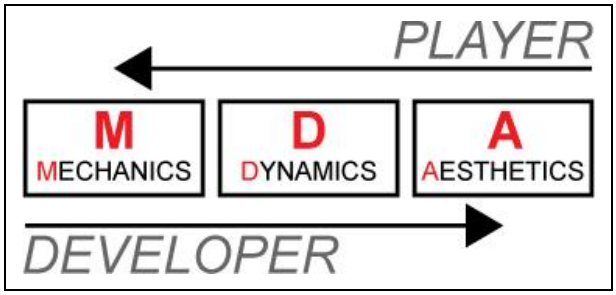


Figure 2.2. Difference of perspective between game developer and player (Hunicke et al., 2004)

Aesthetics in games are also defined as a genre or type of a game (Hunicke et al., 2004; LeBlanc, 2004). For example, a game of Final Fantasy does have genres of fantasy, expression, narrative, submission, challenge, and discovery, while other games might have a different of genres. It also tells why and how different players are appealed based on different games, or to the same players but in different situations or times. On the other hand, Andersen et al. (2011) define that aesthetics is a game asset that can be used to develop a sense of theme or genre.

In addition, to make sure narrative games are developed well as a game and not became digital storytelling, Rollings and Morris (1999) stressed that narrative games can be a failure when the game developer focuses on storytelling rather than action. A game would follow a linear path and monotonous action as player scrolls through never-ending cutscene dialogues waiting for the game action.

Thus, aesthetics in games is anticipated to provide responses from player's desirable emotion which evoked into them while playing a game. It also can be translated into a form of game genre for each different game that may appeal to players and makes them feel pleasant about the game.

2.3 Game Aesthetics

What are the game aesthetics that contributes to perceived cultural learning in narrative games, and its impact towards the player? Is it only color or text or image or other attributes? According to Tractinsky (2013), there is difficulty to produce universal aesthetic guidelines in interactive computer design because there are a variety of products of application design, with so many purposes and use contexts. It is broad to provide one guideline with the exact game aesthetics for narrative games because there are many types of them with a huge different variety of features with each other. For example, some narrative games might need to focus more on text attribute like Visual Novel (Agos Jr et al., 2013; Salazar, Nakajima, & Alexandrova, 2013), but some games focus on very less on text attribute (e.g. The Binding of Isaac series).

As mentioned in Chapter 1, the purpose of this research is to develop and evaluate narrative games based on the inclusion of recommended game aesthetics. This section is the beginning step for answering the research objective 1, which is to identify game aesthetics in narrative games and do the expert review for the next step. It listed to any identified game aesthetics which defined or used in any kind of interactive media by scholars in their studies (refer to Table 2.5); thus, discussed each of the attributes along with its relationship towards learning capability afterward.

Table 2.5

Identified aesthetics attributes in interactive media and development

No.	Authors	Aesthetics attributes											
		Text	Image	Visual Perspective	Image	Sound Effect	Voice	Color	Graphic	Layout	Shape	Form	Texture
1	(Ahmad Affandi & Azizi, 2014)							√			√		
2	(Anderson & Bushman, 2001)			√									
3	(Cook, 2006)		√										
4	(Dhar et al., 2011)		√										
5	(Gentle, Hardle, & Mori, 2004)	√					√	√			√	√	√
6	(Hassenzahl, 2004)							√		√		√	
7	(Hedegaard & Simonsen, 2013)				√	√	√	√	√				
8	Helen C. Purchase (Hassenzahl, Lindgaard, Platz, & Tractinsky, 2008)	√						√		√	√		
9	(Herbert, 2010)		√		√	√	√						
10	(Hsu & Sosnick, 2009)				√								
11	(Lidwell et al., 2010)							√					
12	Nass and Lee (2001)						√						
13	Ngo, Samsudin, & Abdullah, (2000)									√			
14	(Pajusalu, 2012)	√						√	√	√			
15	(Rusnida, Abdul Razak, Juliana Aida, & Abdul Syafiq, 2014)					√							
16	(Schneider et al., 2004)			√									
17	(Schnotz, 2002)	√	√						√				
18	(Tamborini, Eastin, Skalski, & Lachlan, 2004)			√									
19	(Wanderley & Orio, 2002)				√								
20	(Kozma, 2003)								√				
	TOTAL	4	4	3	4	3	4	7	4	4	3	2	1

Table 2.5 shows that color is the most recommended by scholars, while the texture is the lowest. As the highest recommendation, color may provide major contribution in term of attraction from the user to the product, thus enhance the user's learning process even from "irrelevant" to "relevant" learning (or acknowledgment) of the product, since long time ago by Deutschmann Bar-row and McMillan in 1961 (as cited by Katzman & Nyenhuis, 1972). Not to mention that color also may change the users' perception and emotion (Anderson & Bushman, 2001), where it is essential for every interactive product to be marketable.

The lowest recommendation by scholars is texture. The function of texture are not only told the looks or feels of a surface of any substance ("Texture," 2015), but also provide the realism experience towards the user. For example, the realistic of 3D realism could be achieved by not only imitating the objects from the real world through details, shape, motion, or color only but also texture, without concerning the relevance of the features on the object identity (Juliana et al., 2014). There are various texture studies in 3D development, however, it is very less in other than that (e.g. 2D). It is probably considered as less important to be concerned by the user. Even so, the texture could be seen in a quite huge domain itself. This is because texture can be in many forms of studies (surface) such as texture on any 2D surface like photograph image, digital illustration or any other photorealistic, and not to mention that it also can be in a form of 2D map that applied on 3D model, which also may affect the final rendered 3D model. Moreover, the higher resolution of the image, the better quality of texture can be produced (Newsam & Kamath, 2004). This shows that there is still need for other texture studies, especially in 2D form.

Further explanation on each identified game aesthetics in this section is discussed in details, starting from next subsection. There is major literature on each identified game aesthetics (studied by scholars separately), which it may be the limitation of this study as it cannot afford to be discussed in detail on each of them. However, this study focuses more on its relationship that contributing to learning aspect, while discussing the definition and type of each game aesthetics in brief.

2.3.1 Text

Text, or commonly described as a typography or typeface are represented any kind of written communication ("What is Communication? ", 2015), or readable attribute that obviously used to deliver a message or any kind of knowledge. Generally, text is important for game UX in many things include interactive and non- interactive media (e.g. brochures design, posters design, etcetera), but interactive product like a web design (for example) can provide more accurate ideas or information to its viewer rather than just images alone ("Images or Text?", n.d.), which also similar in game context. In addition, the text also can provide better search engine in any interactive media which may contribute to learning (Ferrari & Zisserman, 2008), including narrative games that have text-searching features. This is because the computer can recognize/understand the text better than other visual/perceived attributes (e.g. images). In other words, anything that player read are not the same with anything that player see in term of game UX through delivering information.

Most narrative games are using text in order to narrate the story. Meanwhile, in narrative games, players may achieve the educational goals through playing and reading the game story. Many previous studies that are related to learning in (written-text) narrative shows that text may contribute to a few factors, such as emotion (Alm,

Roth, & Sproat, 2005); connecting ideas in text, differentiate an important and unimportant content (Sáenz & Fuchs, 2002); provide instructions before reading, and awareness during reading (Abadiano, 2002), before analyzing the meaning of the content as a whole.

There are also previous text studies on the problem caused by an automated text aesthetics prediction by Ganguly, Leveling, and Jones in 2014. The studies explored on text domain in Flickr site and classified the text into six classifications (i.e. word polarity, word length, semantic distances, part of speech; and topic generality and diversity). Based on this classification with employed mapping converge algorithm, best results have been achieved on recall, precision and accuracy values with 54%, 42%, and 74% respectively. These results provide more evidence on the importance of text in many things, including learning in narrative games.

In addition, there is a specific type of appearance of text which called font. The font is a type of style in written text. According to Beal (n.d.), the font is a set of characters through a combination of characters (typeface) and other features like spacing, pitch, and size. For example, Times New Roman is one type of font which represents form/shape of each its character (means the word A to Z). Nevertheless, as illustrated in Figure 2.3, there is also another specific type of fonts within the font itself such as different sizes, bold, italic, and etcetera (Beal, n.d.). All these difference may affect people's thought as it may have renowned different meaning in a certain of reading formats such as in thesis, a novel book, newspaper, and etcetera. This can be the same way as the interactive media of narrative games development.

There are also many types of the font which are categorized according to its theme ("dafont.com," n.d.), which it can be synchronized with the theme of the developed

narrative games. For example a “Halloween” of font theme for any information/narrative game with the element of horror (refer Figure 2.4), and “Kids” of font theme for any information/narrative game with the element of kids (refer Figure 2.5). In other words, the theme of selected font should be synchronized with the situation within the narrative game. This can enhance the quality/effectiveness of game UX, as the player read the information (game story/game task) along with the appropriate font theme similar with the developed narrative game theme.

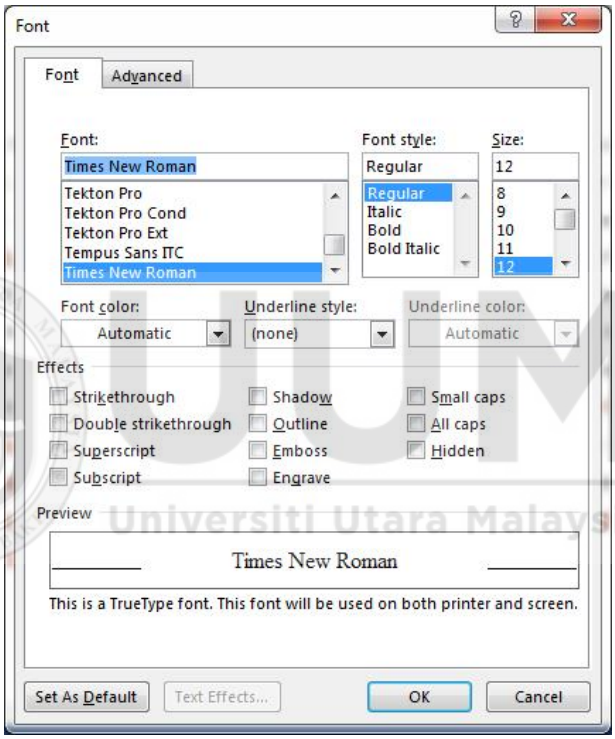


Figure 2.3. List of font details in Microsoft Word 2013

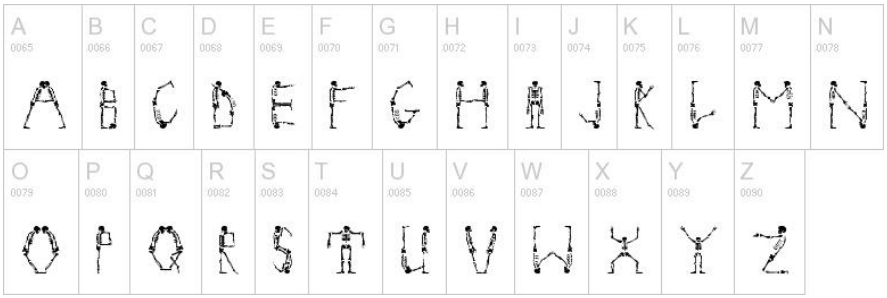


Figure 2.4. Font theme - Horror/Halloween (Klein, 2005)

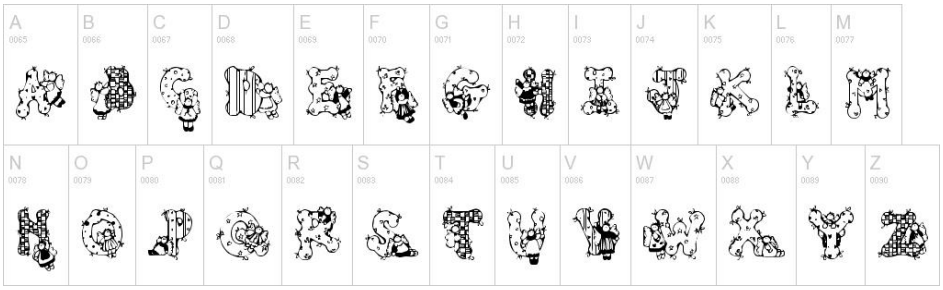


Figure 2.5. Font theme - Kids (Chloe5972, 2004)

In brief, text may contribute to learning as discussed earlier in this section (Abadiano, 2002; Alm et al., 2005; Sáenz & Fuchs, 2002). In addition, it also discussed that font on each text are not only differentiate the word A to Z as for people to be able to read, but also in many kinds of styles and also themes. The variation of the font in text also plays an important role in order to enhance game UX and learning interest, as it may affect the players' attention and interest towards the content of information by using appropriate font selection.

2.3.2 Image

Images are popular game aesthetics that are commonly used by game makers in most game design. Generally, image is defined as an external form (produced by artist, camera, and etcetera) of person, view, or thing in art ("Image," 2015a, "Image," 2015b). In other words, the image is a form of art (picture) which can be perceived as visual of anything like a photograph (through the camera), painting/illustration (through artist), and etcetera.

There is various types of image files which can be adapt into a particular (supported) design, such as JPEG PNG, GIF, etcetera ("The Ren'Py Visual Novel Engine," n.d.). This is because not all software can support any kind of image types unless the particular software's company made an updated version, etcetera.

Much previous works has been done in order to measure the quality of images where mostly the research are not particularly direct on the game, but other interaction design. Even so, most of them are reflect well in game context as the contribution to UX are almost similar. Among of them are studies on methodology to measure the difference between captured photo by professional and amateur photographers (Datta, Joshi, Li, & Wang, 2006; Ke, Tang, & Jing, n.d.; Luo & Tang, 2008; Sun, Yao, Ji, & Liu, 2009; Tong, Li, Zhang, Zhang, et al., 2005; Tong, Li, Zhang, He, & Zhang, 2005), which actually can be inserted in narrative game development. Another example is a research on predicting the aesthetic value of images attributes and its interestingness by user/viewer through a multimedia platform (i.e. web: Flickr photo site) by Dhar, Ordonez, and Berg (2011); where three predictors (which they called *high-level describable attributes*) were suggested, namely:

a) Compositional Attributes – An elements related to image layout which indicates the flow of image towards composition in photographic rules.

b) Content Attributes – An elements related to the existence of particular categories or objects including presence of animals, faces, portraits, and scene types.

c) Sky-Illumination Attributes – Natural illumination's elements in a photograph like (i.e. cloud sky, clear sky, sunset sky)

This image prediction study also shows that it can measure the level of interestingness of a person towards the content of the picture, which indirectly relates to learning interest. Figure 2.6 illustrate the framework to measure interestingness of image by Dhar et al. (2011).

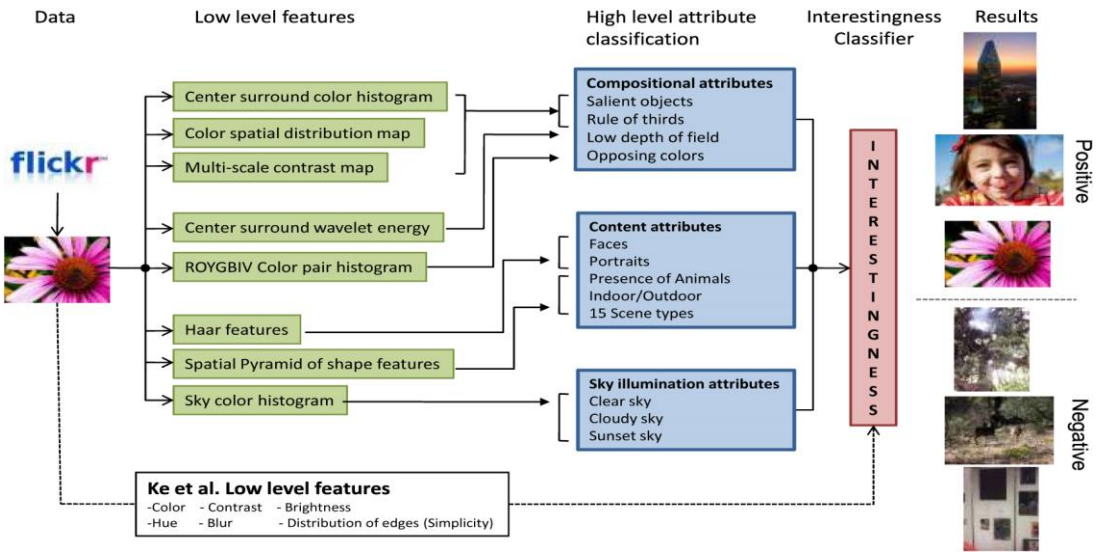


Figure 2.6. Example of research framework by Dhar et al. (2011) for interestingness measurement process

In addition, all image has its own level of realism. This is where Janko and Knecht (2013) suggested that there is three level of abstractness for images, namely (a) realistic, (b) partially realistic, and (c) unrealistic (abstract). However, based on the suggestion, it is argued that the level of image abstractness in general (not just in narrative games) are as illustrated in Table 2.6. This is because the description by Janko and Knecht (2013) on (c) unrealistic are the opposite of the definition of graphic (refer to graphic section).

Table 2.6

Level of image abstractness

Quality		Description
a)	Realistic	Photograph picture
b)	Photorealistic	Realistic drawing picture
c)	Unrealistic/ Non-Photorealistic	Abstract picture of the photograph (e.g. blurry or over-expose image) and drawing that does not look realistic (e.g. doodle). While other than that (as described by Janko & Knecht, 2013) are considered as a graphic picture, which further discussed in graphic section.

Even so, there is no huge difference between these levels of image abstractness towards the user's perception in the process of delivering the message. This is because the results from previous studies already show that the different levels of abstractness do not always support the increment of learning for each of the increment of realism (Worley, 1999). However, all these levels are essential for any type of images for ease of delivering the message, because it may be determined by the objective of the message and not by the realism level alone. Narrative games development in this study applied all the level of abstractness by having a realistic 3D game mode, along with the combination of photograph images, photorealistic and non-photorealistic images.

2.3.3 Visual Perspective

On previous research in learning visual aesthetics (i.e. on a website), (Ferrari & Zisserman, 2008) has stated that visual can be in any kind of appearance, form, or the layout combination of segments inside the pattern. In a game context, visual or perceived game aesthetics in narrative games are also included with visual perspective, as it can visualize the gameplay from different players' point of view, in order to play the game.

In written narrative, there are four types of perspective (point of view), namely first-person narrative, second-person narrative, third person narrative and alternating person (between third-person) where the reader will 'imagine' the view of the story based on these type of perspective ("Narration," n.d.). However, in (digital) game development (including narrative games), there are only two types of single visual/perceived attribute called visual perspectives, where the player can visually

view the story with their own eyes, either through first-person perspective or/and third-person perspective.

The first-person perspective is a view where the real (for augmented reality game version) or the game world is experienced and perceived from the viewpoint of the controlled body. Meanwhile, third-person perspective is a view where the real (for augmented reality and holographic game version) or the game world is experienced and perceived from the viewpoint of avatar body that unnaturally hovers over (out of the body) which represents the player in the real or virtual environment.

There are numerous studies have proven that the first-person game perspective can greatly increase players' arousal compared to a third-person game perspective (Anderson & Bushman, 2001; Schneider et al., 2004; Tamborini et al., 2004). This also tells that visual perspective (first-person versus third-person) has greatly contributed to the successfulness of learning process in games; because the player will pay more attention to the game when they were aroused/interested, and probably do whatever it takes in order to proceed in the game stages (for example, the player will find English dictionary to know what are the task are given in English version of game).

2.3.4 Music

Music is a part of sound/audio, which are highly essential and recommended by many developers and researchers for interactive media development (Hedegaard & Simonsen, 2013; Herbert, 2010; Hsu & Sosnick, 2009; Wanderley & Orio, 2002). This is because based on Ariza (2009)'s study on interactive music systems evaluation in interactive media; in general UX point of view, music can also determine either audience (user) loves to continue to listen until the end of the results

or not, based on her proposed terms called a "musical judgment". For example, the use of suspense background music in horror narrative games may excite the user to keep playing (or reading the storyline) to know what might happen to the protagonist in the following story, even though they are might be scared of it. It does not just provide the tense and interest to players, but the music also provides almost actual horror experience, thus indirectly improve the players' perceived cultural learning towards the narrative games.

Besides that, Wanderley and Orio (2002) has suggested four essential features that should be the main concern in musical task development, which are learnability, employability, feature controllability, and timing controllability. Based on that, there is good relationship between developed music and the player for their game UX (especially in learnability context). This is because a good and appropriate selection of music aesthetic in game development may be enhanced for greater game UX in experiencing the type of genres in narrative games as discussed previously (the horror music example).

Upon lack of research regarding music in interactive media before this, another previous study has been done by Hsu and Sosnick (2009) in proposing a comparative evaluations framework for improvisation of currently proposed methodology for music. The research is still an ongoing process, and their preliminary study was focused more on music developers' (musician's) point of view. Even so, it still can be concluded that music plays an important role for UX in interactive media development as many other researchers studied on it.

In addition, music, sound effect, and voice are in the same category of sound/audio. The use and timing of audio incorrectly may cause the delivered message to be

disrupted, making the listener (user) can hear the sound but unable to understand the delivered message completely, probably because of some audio confusion. According to Herbert, (2010), there are five factors of aesthetic sounds in aiding the (audio) continuity for the visual narrative (i.e. film, movie), which are environment; dialogue; rhythm; perspective and presence; and dynamic. These factors are reflected well with narrative games for educational purpose as it also can contribute to learning (refer to Table 2.7). The only difference between film/movie and narrative games is where the sounds are manually added into narrative games, while film/movie are based on both recorded sound and manually added sound (e.g. background music). The contribution of audio continuity towards learning is to shorten the (moment) delivered message which makes it much easier to understand. Thus, it also may increase the level of presence towards the player(s) to experience and learn in the moment of delivering the message.

Table 2.7

Sound factors for continuity of delivering message in narrative games context

Factors	Descriptions
Environment (sound effects)	Environmental sounds (i.e. sound effects) should be continuing, as long the player is still within the fixed area, or the cause for the environmental sound still exists and active within the fixed area.
Dialogue (voice)	Relative energy is the most contribution of dialogue (i.e. voice) continuity by story narrator or NPC in narrative games. The energy should be synchronized with the (current and forthcoming) signal to the audience.
Rhythm (music)	A particular beat of the music track (i.e. music) can maintain and reinforce the rhythm. A different sound rhythm also could be used in order to change from current scene or place (environment) to another.
Perspective and Presence (voice, music, sound effect)	The sound presence in narrative games (i.e. voice, music, sound effect) should be changed as the perspective of the video changed. This is because having the same (volume) sound presence from near to far location or vice versa may be as disruptive to the gameplay and learning process.
Dynamics (voice, music, sound effect)	High-energy (sound volume) are able to maintain or change from high energy into lower energy in a scene or situation within the environment of the game world, example like from long shot to close-up (i.e. sound effects), angry to calm (i.e. voice), or fast to slow (i.e. music). It is vice versa for low-energy as well. In addition, having a silence at this moment may cause an interruption towards visual continuity (for the story scene), unless the high/low-energy are controlled by the player itself.

2.3.5 Sound Effect

Sound effect is part of sound/audio which are able to enhance learning and game aesthetics in a certain way (Refer to Table 2.7). To noted, there is difference between sound effect and music or voice aesthetics. According to "Sound Effect" (2015), the sound effect is a type of sound/audio which created other than music and speech (voice), usually included in games, films, etcetera. An example for sound effect are

like a glass bowl fell on the floor, a noise from motorcycle engine, a door opened by someone, and etcetera. As mentioned in the music section, the selection and timing of sound effect may distract the user/listener if it wrongly inserted. For example, the use of sound effect such as the noise from the motorcycle when someone opening the door may distract the user/listener from receiving the actual message which is supposed they received.

In addition, animal sound also is a part of sound effect which can be found in many downloaded sites such as in "Free Animal Sound Effects" (n.d.), and much more. This is to reveal the fact that there is difference between human voice and animal sound effect. Further discussion about human voice is discussed in next section. In brief, sound effect is essential for UX in interactive media as it can affect user's judgment and (learning) perception while experiencing it.

2.3.6 Voice

Voice are also a part of sound/audio which refers only to a human, not to other living things like animal, insect, etcetera. According to "Voice" (2015a) and "Voice" (2015b), the voice is a sound produced by human's mouth through their larynx. This has clearly told that human can produce voice by making any clear verbal communication of sound as long it produced by their mouth, like talking, singing, giving a speech, etcetera.

Voice are not commonly used by many interactive media developers. However, some particular interactive media, like in game development (narrative games) does require voice attribute like The Binding of Isaac, etcetera. Based on findings studied by Nass and Lee (2001), the correlation between human personality and their voice is not so high. Even so, the personality can be judged through human's voice, especially when

there were no other clues else to support. This shows that voice also plays an important role in the development of interactive media.

In the previous study of the game, voice are found to be affecting the learning process; where (blood color and) screaming sound of pain in 3D violent games does affect players' experience (recognition memory) directly, regardless of players' presence and arousal (Jeong et al., 2008). Voice also may affect learning and game UX in various condition as elaborated in Table 2.7.

2.3.7 Color

Color has a major contribution in term of attraction from the players to the narrative games. For example, the difference of color in the text may ease the players to know that the 'highlighted' particular term or name probably are the main objective of the game, or they can pay more attention to the highlighted term/name, thus improve learning. It is essential to acknowledge user's perspective and their understanding on something they are interacted with. For example, Karsvall (2002) studied on interface design in the website by evaluating three prototypes of interactive televisions. Based on his result, a user who has personality group for extrovert are much comfortable with brighter color, while the opposite personality group (introvert) are more comfortable with darker color. This example shows that the understanding of visual design adaptation for user's need is crucial for better development skills.

There are three main components in color which are hue, saturation, and brightness (Gentle et al., 2004; Hampson, Gürel, & Conlan, 2011). All these three components may lead to user's view and their perception towards what they see. In order to show the contribution of color, result studies by Dhar et al. (2011) has shown that not only blur, hue, contrast, brightness and distribution of edges (simplicity) on an images can

determine the viewer's interest either positive or negative, but also color (refer back to Figure 2.6).

The use/impact of color have been proved and widely accepted that it may influence, thus enhance the learning process even from "irrelevant" to "relevant" learning, since long time ago by Deutschmann, Barrow, and McMillan in 1961 (as cited by Katzman & Nyenhuis, 1972). Even so, this related research keep continues by various researchers afterwards, such as similar researches by Worley and Moore (2001); and Worley (1999) on experimenting the effect of highlighted color on objects for instance recall in a different learning style, where the research demonstrated that colors act as an image (visual) characteristic which it may enhance human's recognition memory, thus improve the learning process.

In addition, the previous study by Olsen (2010) in measuring the effects of colors on conscious and unconscious learning process has been done. Although the first test shows non-significant results, the second experiment was found to be significant through the process of dissociation, which is by separating conscious memory from unconscious memory.

As mention in voice section, color also are found (in the previous study) to be affecting the learning process; where not just screaming sound (voice) of pain, but also blood color in 3D violent games does affect players' emotion and experience (recognition memory) directly, regardless of players' presence and arousal (Jeong et al., 2008). Moreover, the relationship between color and learning also can be clearly perceived through a previous study performed by Engelbrecht (2003) in studying the color impact on learning.

In conclusion to the study, a functional color scheme for better learning process should meet these following goals:

a) Support the function of the (layout) design, and the carried task in it
b) Avoid under-stimulation and over stimulation
c) Develop positive physiological and emotional effects

2.3.8 Graphic

This section is not discussing on how beautiful or high quality of graphic which made by a graphic designer, but what is graphic as game aesthetics? According to "Graphic" (2015), the graphic is any kind of pictorial/visual representation of an item (i.e. pictures, words, shapes) that perceived and/or described in a very clear way. It has a different meaning than the image as defined specifically in Table 2.5. This difference shows that the level of graphic abstractness is not as 'realistic' as unrealistic/non-photorealistic of an image, which can unconsciously perceive as an image, but much more abstract than that. In other word, graphic can be in a form of image or text or both (for example in games, like player(s)' life bar, the game's map, and even button), where it does not represent a picture of something 'real' (e.g. image of animals, flowers, humans), but something 'abstract' but still meaningful instead. Although there is a lack of studies on the relationship on game aesthetics of graphic with learning, all these examples are obviously contributed to game UX and also learning (as indirectly defined by "Graphic" (2015)), and all these also could be implemented in narrative games.

In the narrative game, normally graphic can be produced in a form of (i) graphic image, or (ii) vector, where there are pros and cons within both forms. The pro of (i) graphic image are like having detailed texture and image which are much easier to

produced, but the cons are it might be heavier than vector form. Meanwhile, (ii) vector are pro in term of scalability: main function of zooming feature, where it is an additional advantage in interaction and usability of simulation and animation process (in Adobe Flash) (Holzinger & Ebner, 2003), while the cons is it require rigorous computer coding skills to develop the graphic. Graphic attribute in this prototype was developed in (i) graphic image form because there is no need for zooming features on the graphic attribute in the game. In addition, the game engine in this prototype development does require rigorous computer coding skills (i.e. Unity 3D), which may slow down the development process if (ii) vector were chosen.

In brief, graphic play an important role in interactive media as a part of game aesthetics, including with learning contribution, as it may fit well (along with image and text) with the layout in UI.

2.3.9 Layout

Text, image, and graphic are the main items in layout design any aesthetic of interactive media (Helen C. Purchase, as cited in Hassenzahl et al., 2008; Hassenzahl, 2004; Pajusalu, 2012). This is because layout determines the placement of text and other visual/perceived attribute which later create a complete UI (when all the interaction script is inserted, including sound/audio, if necessary). There are many components that needs to be a concern on the layout. Ngo, Samsudin, & Abdullah, (2000) define the following aesthetic measures for graphical interface layout, which are balance, density, symmetry, economy, equilibrium, cohesion, sequence, order and complexity, unity, proportion, simplicity, homogeneity, regularity, and rhythm. All these fourteen components are essential in producing a good layout for (general) UX. Nevertheless, among this fourteen component, only six of them are suggested by

Salimun, Purchase, Simmons, and Brewster (2010) in their previous study to measure the level of layout aesthetic, which also reflect well in narrative game development, such as:

a) Cohesion: How far screen components existed with similar aspect ratio.

b) Economy: How far the components consistently have the same size.

c) Regularity: How far consistently spaced between alignment points.

d) Sequence: How far the displayed information is structured and synchronized/corresponded with the intended reading sequence.

e) Symmetry: How far the symmetrical screen is, in three dimensions (i.e. horizontal, vertical, and diagonal).

f) Unity: How far can visual/perceived attributes (text, image, graphic, color, and etcetera) can be combined and synchronized with each other.

The finding in their study has proved that the higher level of layout aesthetic, the better the game UX in term of respond time in a task of visual search. This means that users' learning performance may decrease when they are experiencing a low level of layout aesthetic in a particular interactive media. In brief, layout may plays an important role for game UX not only in a form of good appearance and ease of use but also for greater users' learning performance.

Apart from game design, aesthetics normally is covered in interactive media. There are two types of aesthetics in interactive media, namely classical aesthetics and expressive aesthetics (Lavie & Tractinsky, 2004; Salimun et al., 2010). Classical aesthetics is an appearance of the design with good proportions and a sense of order, while expressive aesthetics are defined as creativity and originality aspect of the design (Lavie & Tractinsky, 2004). In other words, this two classification of

appearance is categorized in order to differentiate the appearance between classical and expressive design.

Sutcliffe (as cited in Hassenzahl et al., 2008) stressed that aesthetic is very important at an early stage of any interactive media encounter because the quality judgments or perceptions by people towards interactive media are judgment criteria. However, this criteria may always keep changing from time to time through a process of decision-making within the game world.

According to Fallman (2008), aesthetics is something that is harmonic, beautiful and fitting in computer generated, through the synthetic process in the holistic method, along with complex issues that contributed to UX (Coyne, 1995; Fallman, 2008; Manovich, 2001). For example, representation; experience; infringement; genre; conformance; materiality; sense perception; and tradition and culture. In addition, aesthetics in interactive media are not only on how something feels and looks because it also concerned the whole interaction including how interaction flows, how the design works, how elegantly the design is made, and also how smooth the content fits in (Fallman, 2008).

In short, game aesthetics can be developed with one or both classical and expressive aesthetics based on the purpose of the game. For example, most fantasy game genre are often used expressive aesthetic design. However, there is a need for classical aesthetics design if the expressive aesthetic design is hard to use by players.

2.3.10 Shape

The shape also can be in a form of text and image and graphic, as it also can be sighted. Generally, the shape is renown and defined as a figure of geometric such as triangle, rectangle, square, and etcetera (Julita, 2011; “Shape,” 2015a). Nevertheless, as a part of aesthetic, Freifeld (2005) has defined the shape as one of art element in a distinct space, in a form of 2 dimensions (2D), measured with length and width, and it is "created when a line reconnects with itself". This tells that shape also may represent something that can easily be recognized, without having to see the real picture, for example. The combination of shape and other visual/perceived attribute, such as color and/or text and/or image are often to be called as graphic (e.g. icon or logo or button). For example, based on one of narrative games game (i.e. visual novel) as illustrated in Figure 2.7, the size of each five button in rectangular shape on the main page are made equal, was aligned nicely and good for game UX because the player can play by easily click on desired action button without having any error or any other difficulty. In addition, the shape button also was designed by following five of suggested layout ‘rules’ by Ngo et al. (2000); and Salimun et al. (2010), which are cohesion, economy, regularity, symmetry, and unity (refer to Layout section). In addition, even if the size of each button (shape) are made different or each button have a different shape, there is one important thing that has to be considered which is the restrictions of polygons (Rusnida et al., 2014), as discussed in interaction section before.

Figure 2.7. Example of visual novel's main page in Ren'Py's demo

Other resources like ("Shape," 2015b) has defined shape into a quite wide meaning which is a something that has been given a particular shape or form to work with (as a material) in order to create something from it. This means that any sighted object can be seen in a shape or form of anything. In other words, the existence of shape or form is supposed to make people much easier to recognize something. In advance, shape and form might share the same function, but both has difference type of appeal. Further explanation on the form is discussed in the next section as one of game aesthetics in this study.

Shape and form can contribute to perceived cultural learning because it can easily provide shape/form recognition of something without having people to read the label on it. This has been proved from the previous study by Ward, Becker, Duffin Hass, and Vela (1991), which use young children as their respondents, and the results shows that there is no bias in determining the intended message; either shape/form with or without the label on it. This also have been implemented in much other interactive media s such as a shape/form of (button) "home" in phone, website, or any other application device which known as a button to "main menu/page", while a

shape/form of (button) “gear” also known as a button to “settings”. Furthermore, similar results also have been done by Hummel and Biederman (1992) where a human can easily recognize an object from a ‘different view’, as long it still preserve the parts (shape/form) from the original view.

This tells that in narrative games (or even in most interactive media), shape and form may ease and speed up the learning process where there is less written information to be read, as long the shape are ‘readable’. Meanwhile, the existed of shape and form also may visualize most of the visual/perceived/visible attribute, which tells that it is a part of the essential attribute that should be a concern in developing narrative games.

2.3.11 Form

Based on shape definition mentioned by “Shape” (2015b) in shape section, it can be concluded that there is difference in term of appearance between shape and form even though both has the same function. As mentioned earlier, shape is created in a form of 2D (have length and width) with the line reconnected to each other (Freifeld, 2005), but form is in 3 Dimension (3D) (have height, length, and width) which equivalents of shape (Julita, 2011). However, the 2D form also can be recognized if it appealed in realistic form. For example, if the shape is a square, means that form can be in appearance of a cube (there will be three merged distorted-square shapes to visualize a 2D cube, while form are included the whole side of the 3D cube)

There aren’t much literatures researched on form attributes but rather on shape instead. Both form and shape might have a different of appearance, but the relationship between form, game UX and learning are as the same as shape and game UX, as mentioned in previous (shape) section.

2.3.12 Texture

What is texture and what does it do? In term of a real object like a food, Szczesniak (2002) has stated that it is the sensory and functional mechanical, surface properties and structure of thing (i.e. food), which detected through the sense of touch, vision, hearing and also kinesthetics. Although there is no specific terminology in interactive media literature, it can be concluded that texture is the sensory of the mechanical, structural, and surface properties of an object which can be perceived by the user through their vision sense (for visual/perceived attributes). Furthermore, according to "Texture" (2015), generally, texture is the consistency, appearance (aesthetics), and feel of a substance or a surface. This means that texture can be applied in any (perceived) object's surface (even in narrative games), such as in 3D narrative game terrain, 2D 'material' (i.e. photograph, drawing) for 3D model in narrative game, 2D texture in 2D narrative game, and even a texture on different texts (fonts).

There are three main components in texture, namely: granularity (grain), pattern, and also orientation, but all these components are still not good enough in representing the real object to the viewer/user (Gentle et al., 2004). Even so, these texture's component may provide greater appearance in term of realism if it combined with another attribute such as color, which also affecting players' recognition memory (Jeong et al., 2008), and perhaps with more attributes such as shape, form, and etcetera.

Researcher highly stressed that there is a lack or might be no universal texture study in any scholar of interactive media literature (including narrative games). This is because as mentioned by Gentle et al. (2004) earlier, texture alone is still not sufficient for a realism semblance. In addition, other previous studies on texture are

more focusing on a specific condition in interactive media, such as a study of terrain-texture in 3D design and its resolution which may affect the quality of the appearance and its texture (Cheng & Bischof, 2006). Texture study also can be in a different point of view if the interactive media is compared to other than 3D forms, such as the use of texture on different fonts, the details on digital drawing/illustration for the 2D game for example, and much more.

In brief, the texture may provide game UX and learn (in narrative games) in term realism by providing a visual to the user on how the object may look like (like shape and form), and how the surface may feel (as like if it can be really touched). The better the texture (combining with other attributes), the more realistic it can be to be experienced by the user.

2.4 Perceived Cultural Learning

There are numerous type of learning in learning context such as enjoyable informal learning (Ulka Chandini, Zaibon, & Juliana Aida, 2014); learning activities through mobile environment (Zaibon, 2011); learning process and outcome (Khalifa & Lam, 2002); and even learning to handle something like learn how to play a game. However, this research is focusing on perceived cultural learning context from the developed narrative game in this study. Thus it is essential to know how game aesthetics can express cultural value and how that value is perceived by the player.

Perceived cultural learning in this study is not the learning how to play or learning the content of the game or learning outcome. It is defined in operational definition section as the player's perceptions or thoughts towards learning content (i.e. cultural content) in the game, such as ease of understanding or learning in each part of the game, like "can you understand the whole story?", "Is it easy or not to understand this or that?",

"Can you feel or get the picture of the historical environment within the game?". In game design, the differences between those learnings are:

a) **Perceived cultural learning** is the player's perception towards the cultural learning content within the narrative game.

b) **Learning how to play** is a process to know how the gameplay game works. Literally, the story may lead the players' on how to play the narrative game, like where should they go or what should they do. Many games already provide a tutorial or a controlled setting to solve this issue and nowadays similar gameplay were embedded in many narrative games, making video tutorials are unnecessary. However, it is recommended to provide a simple guide on how to play the game as the target players' for this research might be a newbie for playing video games.

c) **Learning content** is the message that intended to be delivered to the players which are through both story and gameplay. In this case, it is cultural learning content.

d) **Learning outcome** is the learning goal. It is derived from learning objective of a particular game.

Next subsections discussed on cultural learning and explain on how game aesthetics may be perceived by players, according to proposed initial conceptual model of game aesthetics for perceived cultural learning.

2.4.1 Cultural Learning

Cultural and heritage cannot be separated as they are similar in many contexts. According to "United Nations Educational, Scientific and Cultural Organization (UNESCO)," (2016), there are two types of cultural heritage, which are tangible and intangible cultural heritage. The tangible cultural heritage represents monuments and artifacts. On the other hand, the intangible cultural heritage consist of living expressions or traditions inherited from our ancestors and passed on to our current descendants, such as social practices, rituals, oral traditions, knowledge, and skills on creating traditional crafts, festive events, myths, legends, folktales, and etcetera. The selected cultural learning in this study covered both tangible and intangible cultural heritage. The tangible cultural heritage is the cultural environment within the narrative game. The intangible cultural heritage is cultural traditions for Dragon Boat Festival as a case study and the legend history behind it (Appendix B and E).

Learning is a process that starts through interpretation and perception or perceiving of the differences between the environment and people (Bonini, 2008). Meanwhile, the process of feedback stimulates various and continuous levels of perceptive and cognitive interaction, as information or interpreted data converted into knowledge. Further explanation on how information of cultural learning perceived by a player from game aesthetics are discussed in semiotics theory section (Section 2.4.2).

"Technology benefiting humanity - Technologists love to solve problems; it's what they do best" (Fruchterman, 2004). However, many literatures has argued that games are the best computer medium for interactive engagement (Champion, 2003; Laird, 2001; Laird & van Lent, 2000). In addition, game medium is suitable for academic

evaluations that involved virtual environments, especially with a cultural focus (Champion, 2003).

Among the best example from the previous study that has been conducted is by Champion (2003) on how cultural learning can be learned from game design through certain techniques to increase engagement in game design. There was also the previous study which focused on the sense of presence in cultural virtual environments of computer games (Champion & Dave, 2002). The players in the project explore the historic site reconstruction, where the objectives are to aid spatial and cultural navigation and increase knowledge of the cultural setting. Previous studies of cultural learning in game design also has been done by Chen et al. (2014). The study employed a theoretical instructional pervasive game model in order to construct a cultural-based pervasive game. Evaluation of cultural learning in a virtual environment of computer games also have been done in a previous study (Champion, 2006) where its objective is to evaluate cultural understanding, subjective preference and also task performance of a virtual heritage site.

2.4.1.1 Semiotics Theory

Semiotics derived from a Greek word “semeion”, which mean signs. These signs are the perceived aspect of communication (Huhtamo, 2003), such as text, image, visual perspective, music, sound effect, voice, color, graphic, layout, shape, form, and texture. Aesthetics attributes are representing the iconic sign of the semiotic theory as shown in Figure 2.8.

There are two founders of semiotics theory: Ferdinand de Saussure (a Swiss linguist who died in 1913) and Charles Sandres Peirce (an American philosopher who died in

1914). However, compared to Saussure, Peirce's work provides an even broader contribution in many contexts.

Based on Peirce, the theory of semiotics is the study of signs and codes, where signs called signifier are used in producing, delivering, and interpreting codes into messages (Moriarty, 2004). In this study, the sign (signifier) is a representation of game aesthetics where it is interpreted by the mental idea in order to express the object (signified) which in a form of perceived cultural learning. The mental idea is the idea evoked in a person's mind by the sign. Figure 2.8 illustrate the Peirce' semiotics theory which adapted in this study.

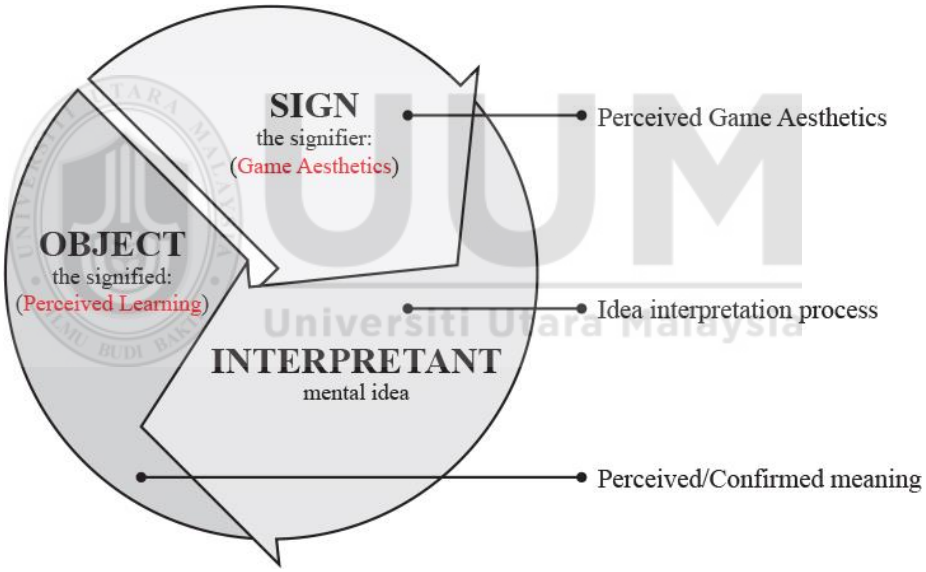


Figure 2.8. Adapted Peirce's model of sign

There are three types of sign relationships according to Peirce in *The Collected Papers* (Peirce, Weiss, Hartshorne, & Burks, 1994) namely iconic, indexical and symbolic (Moriarty, 2004):

a) **Iconic** sign is resembled and mimetic the object. For example, the sign of image resembles a photograph; the sign of voice heard resembles an old man speaking; the sign of sound of door opening tells that there is a door.

b) **The indexical** sign is an indicator of the existence of something. In another word, by noticing the sign and object, the user also will notice something else. For example, the sign of smoke tells that there might or should be a fire; the old man's voice of coughing tells that he might not feel well; a sound of door opening tells that the situation should be in a building or transportation.

c) **Symbolic** sign is where the "stand for" is understood through the convention. In another word, the sign is "stand for" something else. For example, the sign of flag and the national anthem is "stand for" a country.

These three facets of sign relationships are essential in explaining on how sign (visual and aural) operates in semiotics theory. In addition, it also important to note that a sign can have one, two or three facets altogether. For example as in Figure 2.9, a poster of Dato' Lee Chong Wei is playing (smashing) a badminton shows that it is iconic because it featured the person; it is indexical because there should be someone else (the opponent) is playing with him at that moment; it is symbolic because he is a renowned Malaysian professional badminton player.

Figure 2.9. Poster Sample on Sign Relationships

Moreover, the relationship between denotation and connotation are also reflected well with semiotics theory. Based on semiologist Barthes (1968), it can be concluded that denotation has a similar definition to iconic sign relationship where what you see or hear is literally meant that thing. Meanwhile, connotation is vice versa to iconic, where it has a similar definition to symbolic sign relationship where what you see or hear is meant something else. This symbolic and connotation also has a similar concept with perceived cultural learning where the player perceived the meaning of something else by perceiving the game aesthetics.

Based on Peirce's theory, Barthes has produced his own extended theory where there is a first and second level of meaning. The first level is denotation, followed by connotation as the second level. The idea from Barthes' theory is where the signification process from Peirce's theory occur once in order to operate iconic sign relationship at denotation level. After that, the same signification process from Peirce's theory occurs once again in order to operate symbolic sign relationship at connotation level.

As semiotic theory implicates, it is argued that the denotation level occurs once the players identify each of the object within the game environment (e.g. village, dragon boat, bamboo tree, etc.) based on each of sign. After that on the connotation level, they will identify the overall meaning behind of all the denotation processes through finishing the narrative game. This is where the perceived cultural learning occurs in this study.

In brief, perceived cultural learning concerns the signification process where the initiation (signifier; game aesthetics), construction (interpretation; mental idea) and confirmation (signified; perceived cultural learning) of meaningful learning outcomes achieved from playing the narrative game. If a meaningful and deep learning outcome is the goal of the cultural learning experience, then an understanding of perceived cultural learning is a priority.

2.4.2 Game Aesthetics and Perceived Cultural Learning

In the previous discussion, it is concluded that aesthetics in narrative game development defined into various aspects such as feel, emotion, appeal, interactions flows, design function, and relevance of content.

According to Anderson and Bushman (2001), the process of aesthetics is mainly based on the learning, activation, and also human's memory and experience. This means that aesthetics could be perceived by the player through their prior knowledge, by recalling their other past memories of what they experienced before. This does not matter with or without player's experience, as long they can recall any previous situation which similar to the current situation they are having, they may perceive aesthetics differently.

On the other hand, the previous study has been done by David and Glore (2010) on defining the role of aesthetics in UI and visual content and exploring the importance and relationship of aesthetics and visual content towards learning. As the results, it has been proved that by applying aesthetics in UI and visual content during online course development, a huge improvement not only on the course content and visual appearance could be achieved, but it also greatly improve the process of how students interact and react to those courses. In addition, the same result also achieved from another similar previous study on a different platform, by Glore and David (2012) on defining the role of aesthetics in UI and visual elements while exploring the importance of developed application in a web-based learning environment. This research shows a good relationship between aesthetics of UI with the learning context. In other words, the term UI mentioned are covered all the game aesthetics in this research, such as color, image, layout, and etcetera (but in a situation where all the game aesthetics have been set up by computer scripting/coding, thus create interaction), which may affect or related with learning context.

Thus, there is a good relationship between aesthetics and also learning in various different perspectives, while both are contributing to each other. Nevertheless, this study focuses only on major contributions which are the ‘one-way contribution’ of game aesthetics towards learning context (i.e. perceived cultural learning).

Based on literature findings, the relationship of all identified game aesthetics (i.e. text, image, visual perspective, music, sound effect, voice, color, graphic, layout, shape, form, texture) towards perceived cultural learning are illustrated in Figure 2.10 (refer to Table 2.4 for all identified game aesthetics). This relationship is referred from a proposed conceptual model of meaningful 3D realism by Juliana et al. (2014),

as it is reflected well with the relationship of game aesthetics (e.g. actual conceptual model: 3D realism) towards perceived cultural learning (e.g. actual conceptual model: meaning making) in this study. Further discussion on the relationship of each identified game aesthetics with learning context was discussed in Section 2.3.

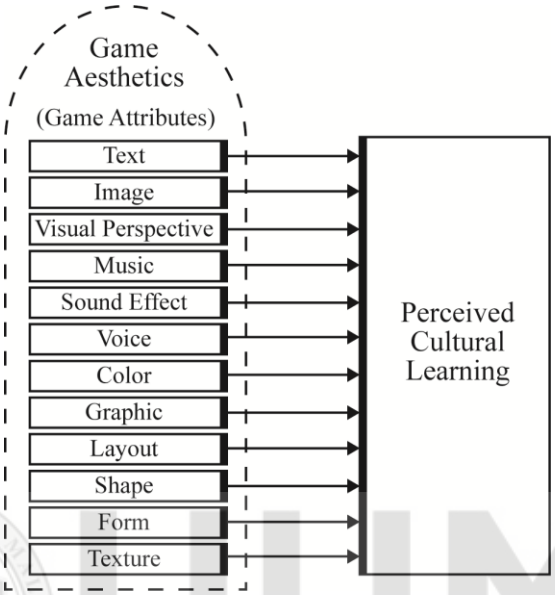


Figure 2.10. Initial Proposed Conceptual Model of Relationship Game Aesthetics with Perceived Cultural Learning

2.5 Summary

This chapter reviewed on narrative games and game aesthetics, which contributes to learning context. As an extended version of 'game' literature, narrative games does not only require an expertise from game designers and developers but also a good game narrators as a part of team game makers, in order to narrate an interesting game storyline. This is because story acts as the game flow for players to proceed from the start until the end of the game story; the narrative game is a game in the process of co-creating a story by the player through the interaction between person-to-person within the game itself (for further explanation, refer to narrative games in operational definition section). In another word, narrative games development require the

combination of game theories and narrative elements, along with the implementation of game aesthetics in order to provide better perceived cultural learning among players.

The literature in this study has structured, identified and compiled the focus of this study, where it is essential to plan the prototype development, thus develop and evaluate it afterward in order to get the study results. The literature structure, which represents this chapter are explained as illustrated in Figure 2.11.

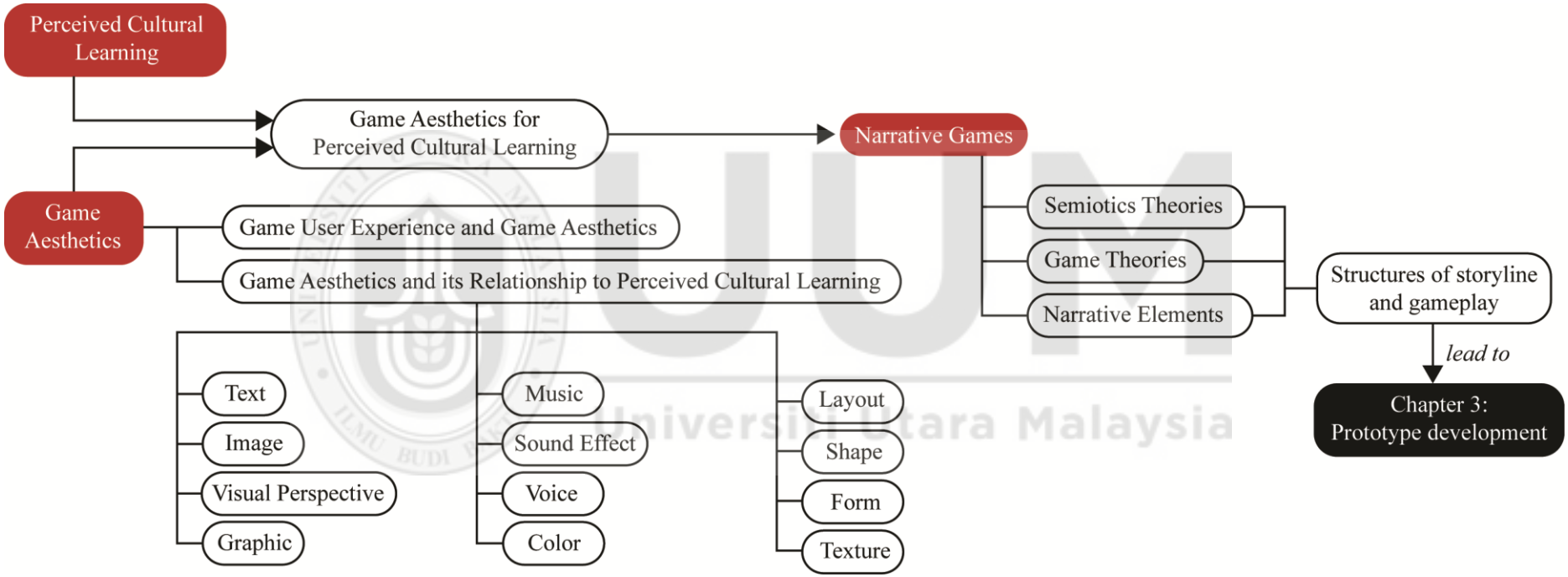


Figure 2.11. Overview of Literature Study

CHAPTER THREE

RESEARCH DESIGN

This chapter discusses on how to answer all research questions in this study through three research objectives (Refer to Figure 3.1). It discusses on a specific methodology that consists of three main phases for each research objectives, such as verifying conceptual model development on game aesthetics for perceived cultural learning, prototype development, and also user evaluation. The first phase is where all game aesthetics attributes were determined and structured into a conceptual model for narrative game development. It has been discussed further in details in Chapter Four. The second phase is where the narrative game has been developed based on the inclusion of all game aesthetics in the conceptual model. It has been discussed further in details in Chapter Five. The third phase is where the developed narrative game has been evaluated through quasi-experimental design, while the findings results were analyzed and discussed in Chapter Six. It is important to construct the methodology in order to get the research process well structured. Further general discussion on each main phases was discussed in the following subsections.

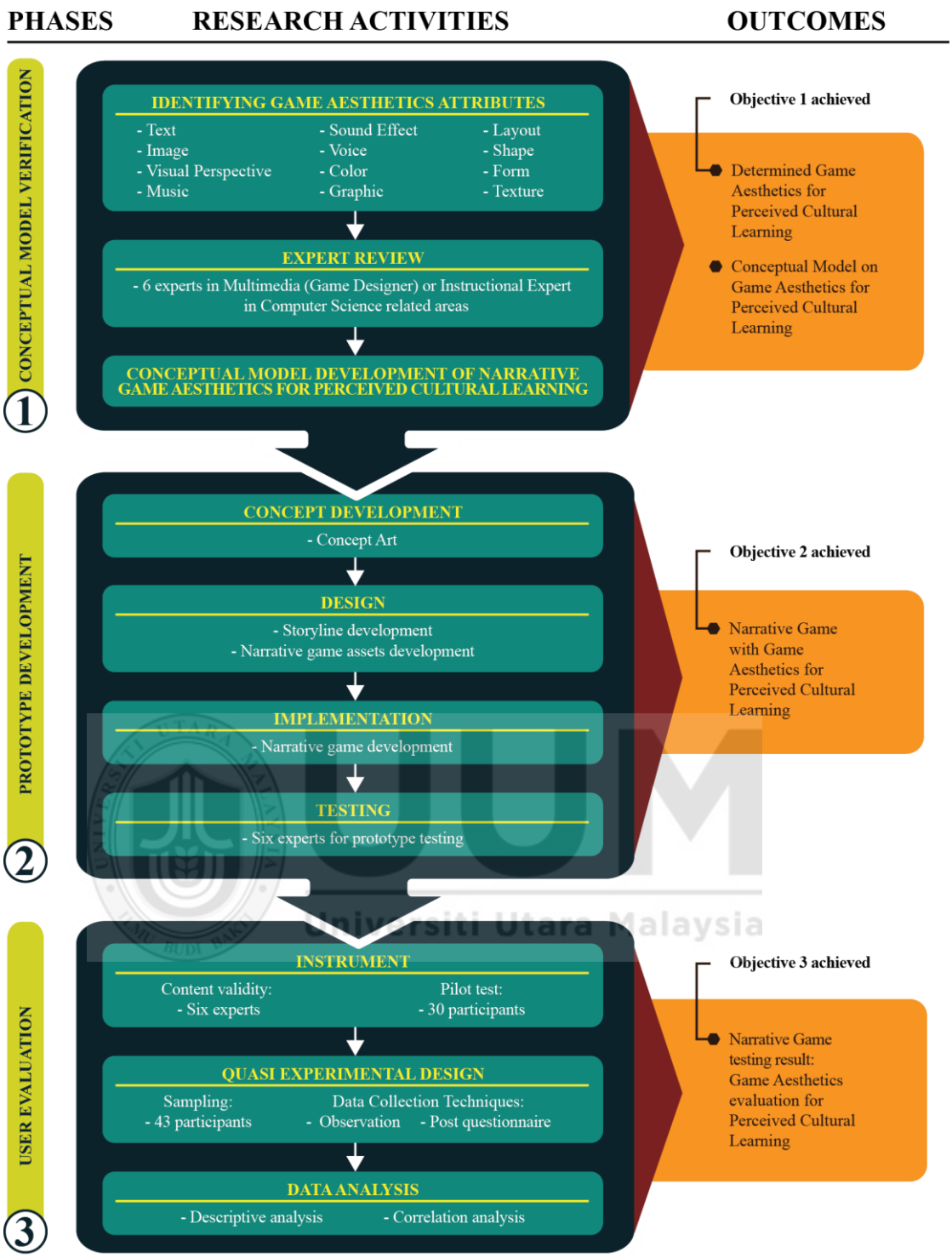


Figure 3.1. Research Methodology Phases

3.1 Verifying Conceptual Model Development on Game Aesthetics for Perceived Cultural Learning

This section discussed the process to determine the conceptual model of game aesthetics for perceived cultural learning. This process is important in order to develop the narrative game with game aesthetics for perceived cultural learning. The process starts with identifying game aesthetics attributes and reviewed it by experts in order to get the final conceptual model on game aesthetics for perceived cultural learning. Further discussion was discussed in the next subsections.

3.1.1 Identifying Game Aesthetics Attributes

Game aesthetics attributes have been identified through literature study in Table 2.4, which are text, image, visual perspective, music, sound effect, voice, color, graphic, layout, shape, form, and texture. After that, an initial proposed conceptual model of relationship game aesthetics with perceived cultural learning was proposed as illustrated in Figure 2.10. The initial proposed conceptual model suggested that all the identified game aesthetics may have a relationship with perceived cultural learning. In order to verify the initial proposed conceptual model, an expert review has been conducted which discussed in the next subsection.

3.1.2 Expert Review

The objective of the expert review is to verify the proposed conceptual model of game aesthetics for perceived cultural learning in narrative game design. Six Malaysian experts were chosen based on their experience working in the related field (especially game designer expert) such as multimedia, or instructional expert in computer science related, or have been studying/teaching/researching in that related field for at least five years. The selection of experts who are from the mentioned fields or areas contributes to the improvement of a conceptual model of game

aesthetics. It is recommended for the conceptual model in multimedia studies to get reviewed from different perspectives as in this combination of experts (Nurul Nadwan, 2015). The review instrument is added in Appendix A for reference, and the results were discussed in Chapter 4.

Thus, the analyzed results from the expert review were implemented in narrative game development for user testing. Further discussion for prototype development is discussed in the next section and also in Chapter 5.

3.2 Prototype Development

There are three main phases in narrative game development methodology, namely pre-production, production and post-production (Helppi, 2015; Miércoles, 2015). This phase has been used by many game developers to develop their games. Figure 3.2 shows the process of narrative game development in details. Further discussion on each phase was discussed in the following subsections.

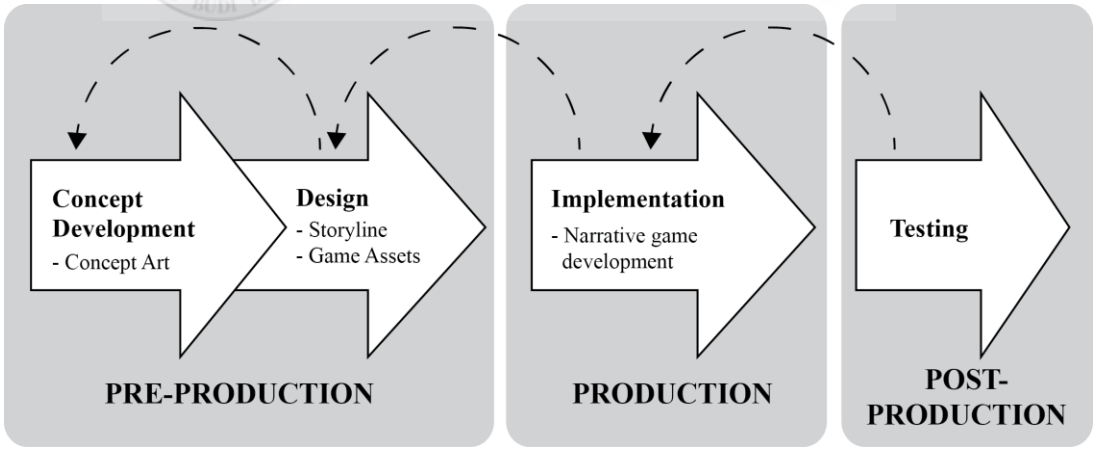


Figure 3.2. Narrative game development methodology

3.2.1 Concept Development

The concept development phase works as game outline proposal. Generally, it covers brainstorming for concept art of the narrative game. The concept art should give a vision on what kind of storyline and gameplay were made by game developers such as genre, theme, platform, characters, and plot of the narrative game. When the concept art is confirmed, the process will move into design phase which discussed in the next subsections.

3.2.2 Design

The design phase is where game storyline produced by game narrator, and all the game assets were produced by artist or designer based on the concept development phase. The aim of the design phase is to produce game "material" that can be given to programmer team to turn it into a working game.

3.2.2.1 Storyline Development

The storyline is the backbone to the narrative game development. The storyline was developed with the awareness of gameplay or game mechanics capabilities, which consist genre, theme, characters, and plot. Storyline tells the situation of the game environment. It tells who are the player and people around him. It also tells the main objectives of the game and reason in achieving the main objective. Last but not least, the storyline can make the learning content much interesting, thus increase the perceived cultural learning level.

3.2.2.2 Game Assets Development

Game assets were developed once the storyline is determined. Game aesthetics were formed in this stage because game assets indirectly represent game aesthetics, such as in a form of 3D models, 2D graphics, and audios. The storyline in the narrative game in this study is adapting Chinese cultural content. For example, game assets such as 3D Chinese environment and characters for player and NPCs were developed by having game aesthetics such as shape and form, color, texture, and image. There are also Chinese background music, villagers voices and sound effect embedded in the narrative game.

The prototype was developed by using 3ds Max for 3D modeller and export the developed model into the Unity3D game engine for the gameplay setting and platform which discussed in the next subsection.

3.2.3 Implementation

The implementation phase requires programming skills in the game engine. This phase is where the developed storyline and game assets or game aesthetics is implemented (Section 5.3). The development of the narrative game in this study is in 3D of virtual reality.

The design phase was updated upon the continuous game asset requirements in the implementation phase until the game is complete. Testing phase was later conducted after the narrative game is developed which discussed in next subsection.

3.2.4 Testing

The testing phase is the crucial part in the narrative game development process. The aim for the testing phase is to check for problems such as programming bugs, inconsistencies in narrative structure, consistency of artwork, and gameplay. Three experts were chosen based on their experience working in the related field (especially game designer expert) such as multimedia, or instructional expert in computer science related, or have been studying/teaching/researching in that related field for at least five years. The results were discussed in Section 5.4. Implementation phases were updated upon any of the problems occur from the expert results.

3.3 User Evaluation

The last stage is an evaluation. This process is very important in order to determine either the evaluation is a success or not. The process of evaluation was conducted once the narrative game's development is complete. The evaluated prototype afterward are sorted and compiled in Chapter 7.

3.3.1 Instrument Validation

This research adapted from previously converted instrument (Khanana, 2016; Khanana & Law, 2013) from a GameFlow model (Sweetser & Wyeth, 2005). There are seven selected elements in the instrument which are concentration, challenge, player skills, control, clear goals, feedback, and immersion (Khanana, 2016). However, concentration is an essential element as it asked about the game aesthetics. Meanwhile, the other elements could be measured for determined the player motivation, skills, and gameplay of the narrative game.

On the other hand, the perceived cultural learning in the instrument was added by adding the questions which related to the cultural content of the developed narrative game (Dragon Boat Festival). This adapted instrument was used in order to support the evaluation process (refer to Appendix C).

There are five sections within the questionnaire (Refer to Appendix C). Section A is a demographic section. Section B were intended to measure the game aesthetics, usability, and user experience. Section C provide the perceived cultural learning in the narrative game. Section D asked about player preference in the narrative game. Section E asked about player preference in other narrative game. Three experts in multimedia and computer science have been chosen for validating the adapted questionnaire (Refer to Table 3.1). Meanwhile, at the same time, they also were asked to be a part of the game tester in order to see the game problem as discussed in the testing phase in Section 5.4.

Table 3.1

List of Experts and Their Demographic Profiles for Instrument Validation

Expert (E)	Expertise	Affiliation	Experiences (Years)	Age	Gender	Highest Education Level
E1	Multimedia (Game Design)	Senior Lecturer	20	54	Male	Ph.D.
E2	Multimedia (Game Design)	Senior Lecturer	15	42	Male	Ph.D.
E3	Computer Science	Senior Lecturer	12	38	Female	Ph.D.

Note. Ph.D. = Doctor of Philosophy

Table 3.1 shows the list of three experts and their demographic profiles for the instrument validation. Both male experts come from multimedia expertise, while the

other one female expert is in the computer science related field. All of them has Ph.D. as their highest education level and work as a senior lecturer in the particular local university. Table 3.2 shows the feedback by the experts on each section in the questionnaire.

Table 3.2

Content validity of questionnaire by experts

		Feedback	
Section	**Expert 1**	**Expert 2**	**Expert 3**
A	-	-	Provide specific info for "money spent for games" like yearly/monthly (Question 4).
B	Spelling and grammar corrections.	Use third person sentences. Divide into subsections based on elements.	Simplify the sentences and use easier words for better understanding.
C	Spelling correction.	Use third person sentences. The section focuses on specific not general cultural learning.	Remove Question 3 because it does not relate to the cultural content of the narrative game. Avoid the use of "I have learned ***a bit***" for Likert scale. Give a full name for "the festival".
D	Spelling and grammar corrections.	-	Simplify the sentences and use easier words for better understanding.
E	Remove this section. Focus on the prototype only.	Remove this section. Focus on the prototype only.	Simplify the sentences and use easier words for better understanding.

The content of the questionnaire has been revised according to comments by reviewers based on Table 3.2. However, the section E was not removed because this is an opportunity to identify the player preferences on other narrative game in general. Some words were simplified in order to ease participants' reading during the evaluation process.

3.3.2 Pilot test

A pilot test was conducted to test the validity and reliability of the questionnaire. It also aims to predict what will happen during the real user evaluation. Pilot test also run the testing phase to see if there is any other problem with the narrative game for the second time. Table 3.3 shows the dataset gathered in the pilot test.

Table 3.3

Participants Demographic Background for Pilot Test

	Gender		**Age**		**Gaming skills**			**Money spent for games monthly**			**Know the learning content before play**	
	Male	**Female**	**19-24 years old**	**25-30 years old**	**Beginner**	**Intermediate**	**Advance**	**RM0 = No cost**	**RM1-500**	**RM501-RM1000**	**No**	**Yes**
Male	22	-	10	12	1	13	8	7	10	5	22	-
Female	-	8	5	3	4	3	1	5	2	1	8	-
Total	22	8	15	15	5	16	9	12	12	6	30	-
Grand Total	30		30		30			30			30	

The pilot test was conducted by 30 participants who can play computer games. This number of 30 participants is adequate to obtain reliable results in statistical test

(Sekaran, 2003). The amended questionnaire from experts result in the previous section were used for the pilot test. Around 10 to 15 minutes were taken for all participants to end the narrative game. Meanwhile, they took around 5 to 10 minutes to fill up the questionnaire.

The value of Cronbach's alpha coefficient was computed to get the reliability result with at least alpha $\alpha > 0.7$ to be accepted as reliable (Ahmad Affandi, 2014; Nunnally, Bernstein, & Berge, 1967; Sekaran, 2003; Zaibon, 2011). The only focused elements in the instrument for this study are concentration on game aesthetics and perceived cultural learning. Therefore only this elements were tested for reliability validation. Mean value was measured for other elements in user testing phase. The results demonstrate that the instrument was found to be significant (Refer to Table 3.4). Therefore this instrument was used for user evaluation of this study.

Table 3.4

Reliability Test

Elements	**Cronbach's Alpha**	**N on Items**
Concentration on Game Aesthetics	0.833	10
Perceived Cultural Learning	0.858	7

3.3.3 Quasi-Experimental Design

According to Offermann et al. (2009), experimental research is a way to evaluate prototype either in real world setting or laboratory experiments. The quasi-experiment is conducted in the laboratory because the evaluation process requires computers as a platform to run the prototype. Since it is not possible to select participants, demographics of participants cannot be controlled which resulting in the criteria for

true experiment is violated. Therefore, this study opted for quasi-experiment as it is not possible to perform the experiment in ideal condition.

3.3.3.1 Data Collection

The participants for quasi-experiment were taking Diploma in Computer and Mathematical Sciences in one local university in Malaysia. The evaluation was conducted in two days for two different sessions due to the limitation of space. The first session is conducted with 23 participants while the remaining 20 is in the second session. Further details were discussed in Section 6.1.2. The evaluation process was conducted with help of three assistants.

Before quasi-experiment took place, the narrative game has been installed on the computer laboratory or participants' personal laptop. At the same time, all the participants were briefed with the procedure. Participants were asked whether they have prior knowledge about Dragon Boat Festival. In advance, all participants were not been told about how long estimation the game will be finished.

During the evaluation, all assistants observed the time on how long does it take for each participant to complete the stages and end the game. Even so, all participants were allowed to stop the game at their own will. This is where the process that they went through, including the time spent to accomplish the game goal, and perceived cultural learning were examined and compared. The experiment ended approximately in an hour.

At the end of each of their test, all the participants were given questionnaire (refer to Appendix C). All data were collected based on the observation and answered the questionnaire. The participants' perceived cultural learning from game aesthetics of

the developed narrative games were recorded in the questionnaire and from the observation, thus analyzed.

3.3.3.2 Data Analysis

Data analysis are the last part of this research. The results data in this research were descriptively analyzed by utilizing statistical analysis. This process is important in providing the evidence from each of research findings. The analyzed results were summarized for the conclusion of the study.

3.4 Sampling

Sampling is the process of selecting sufficient numbers of participants from the entire focused population by means to generalize the characteristics or properties of that population (Sekaran, 2003). The selection of participants should match with the purpose of the prototype (Siti Mahfuzah, 2011). There were a few sampling for different purposes as described in Table 3.5.

Table 3.5

Sampling of Experts and Participants

Process	Sampling Details
a) Expert review	• Six Malaysian experts were engaged during the expert review. • The pool of experts was selected based on their public profiles. • The outlined criteria are those who have working experience in related fields such as multimedia, or interactive media, or computer science related for at least five years. • Further details were discussed in Section 4.2.
b) Prototype testing	• The same three Malaysian experts were engaged during prototype testing and questionnaire content validity. • The experts was selected based on their public profiles. • The outlined criteria are those who have working experience in related fields such as multimedia, or interactive media, or computer science related for at least five years.
c) Content validity	• Prototype testing details were discussed in Section 5.4. • Content validity details were discussed in Section 3.3.1.
d) Pilot study	• 30 Malaysian youngsters (age 19-30) were engaged as participants during the pilot study. • Minimum sample size of thirty is sufficient for this study (Roscoe, 1975; Sekaran, 2003). • Further details were discussed in Section 3.3.2.
e) Quasi-experimental	• 43 Malaysian youngsters (age 19-30) were engaged as participants during quasi-experimental in user evaluation process. • A sample size of 43 is sufficient for this study (Roscoe, 1975; Sekaran, 2003). • Further details were discussed in Section 6.1.

All Malaysian experts and participants were engaged in this study. Six experts have been engaged during the expert review, and three experts engaged for both prototype testing and content validity process. Meanwhile, thirty participants engaged during the pilot study, and 43 participants engaged for the quasi-experiment.

3.5 Summary

In brief, the research design process in this study consists three main phases which are verifying the conceptual model, prototype development, and user evaluation. It was implemented accordingly to ensure expected outcomes in order to answer all the research questions in the study. The first phase aims to verify the conceptual model development on game aesthetics for perceived cultural learning. The second phase proposed the process of narrative games development based on verified conceptual model in phase one. During the last phase, laboratory test of experimental design was conducted in order to evaluate and analyze the developed narrative games.

CHAPTER FOUR

GAME AESTHETICS FOR PERCEIVED CULTURAL LEARNING

This chapter discusses results from expert reviews on game aesthetics toward perceived cultural learning in general. Expert review was conducted in order to validate the identified game aesthetics and also review the proposed consolidated model.

4.1 Methods and Instruments

The pool of experts is selected based on their public profiles. The outlined criteria are those who have working experience in related field such as multimedia, or interactive media, or computer science related; those who have been teaching and/or researching in a related field for at least five years. Six individual experts have agreed to be interviewed.

The interview was conducted either face-to-face or by teleconference. There are three sections dedicated for one session (refer to Appendix A). Section A is intended to determine the degree of importance of each identified game aesthetics for perceived cultural learning; Section B is to seek experts' opinion on the operational definitions used; and Section C is to seek experts' recommendation on our proposed conceptual model along with additional comments or other recommendations. All interview were then transcribed and transferred into quantitative data. These data were analyzed using descriptive analysis.

4.2 Expert Review Findings

There were six experts involved in this study, as listed in Table 4.1. Their qualifications are in domain of multimedia related, especially in game design and/or computer science related

Table 4.1

List of Experts and Their Demographic Profiles for Expert Review

Expert (E)	Expertise	Affiliation	Experiences (Years)	Age	Gender	Highest Education Level
E1	Multimedia (Game Design)	Lecturer	7	36	Male	Bachelor
E2	Multimedia (Game Design)	Lecturer, Game Art Director	15	45	Male	Bachelor
E3	Computer Science	Senior Lecturer	10	37	Male	Ph.D.
E4	Multimedia (Game Design)	Senior Lecturer	10	37	Male	Ph.D.
E5	Interactive Media	Senior Lecturer	10	46	Male	Ph.D.
E6	Interactive Media	Senior Lecturer	27	49	Female	Ph.D.

Note. E = Expert, Ph.D. = Doctor of Philosophy

One expert has 27 years of experience in related field, four have 10 to 15 years of experience, and one is below 10 years. All of them is affiliated with teaching institution except for one who also active in game production. In addition, two of the experts are Chinese (E1 and E2) and they were also engaged in validating the Chinese cultural learning content of the prototype (Dragon Boat Festival).

Table 4.2 lists game aesthetics according to its degree of importance. From Table 4.2, the image has the highest recommendation for having very important contribution to perceived cultural learning. This is because the process of interpreting image for perceived cultural learning is not arbitrary, but more into a simple structure that makes sense to the learner (Mayer, 2005). Meanwhile, there were at least one experts suggested on each voice, music, shape, form and texture as a not very important contribution to perceived cultural learning. It means that they may contribute less towards perceived cultural learning in games, as suggested by the experts.

Table 4.2

Frequency of Responses on Degree of Importance of Game Aesthetics for Perceived Cultural Learning in Narrative Games

Item	Mean	Std. Deviation	Median	Mode
Image	4.0000	0.00000	4.0000	4.00
Text	3.8333	0.40825	4.0000	4.00
Visual Perspective	3.8333	0.40825	4.0000	4.00
Color	3.8333	0.40825	4.0000	4.00
Graphic	3.8333	0.40825	4.0000	4.00
Layout	3.8333	0.40825	4.0000	4.00
Sound Effect	3.5000	0.54772	3.5000	3.00[a]
Music	3.3333	0.81650	3.5000	4.00
Voice	3.5000	0.83666	4.0000	4.00
Shape	3.3333	0.81650	3.5000	4.00
Form	3.3333	0.81650	3.5000	4.00
Texture	3.3333	0.81650	3.5000	4.00

Note. a = Multiple modes exist. The smallest value is shown

4.2.1 Game Aesthetics and their Degree of Importance

From Table 4.2, game aesthetics which were mentioned 'somewhat important' and 'not very important' by the experts does not necessarily do not have relationship towards perceived cultural learning. This is because, based on reason provided by majority experts, they agreed that it depends on what kind of narrative game design is made, such as learning objective, learning content, learning the outcome, target audience, game theme, genre, and how the game should be played (gameplay). For example, E6 disagreed that music and voice are important for perceived cultural learning, "unless music/voice is part of the cultural content than music may not be very important features. If music/voice is part of the cultural content, then it will become a very important feature. If it is provided, allow users to be able to turn the music/voice on/off". Based on Appendix A, Table 4.3 shows the reasons provided by all six experts on each of game aesthetics attributes. The transcription of reasons given by experts were included in Appendix D.

On the other hand, both E1 and E2 has agreed that attributes of game aesthetics are important in contributing to perceived cultural learning because "it can make players 'invested' in their time and effort for the game, thus affect their perceived cultural learning. However, this does not mean that perceived cultural learning are included in their 'investment'".

In brief, the capability of game aesthetics in having a relationship with perceived cultural learning in narrative games may depend on other factors. Recommendations from experts on these factors are available in next subsection.

Table 4.3

Degree of Importance of Game Aesthetics for Perceived Cultural Learning in Narrative Games

E1	E2	E3	E4	E5	E6
• Exposure level of designer to Fine Arts of Performing Arts. • Skilled designer. • Players can find ways to each visual or aural elements to provide storytelling.	• Players' motivation to play game. • Players must have illusion of choice/ control.	-	-	• Game design. • Gameplay. • Target user or special need.	• Introducing new terms/ words. • Provide memorable learning content. • Control of the features.

4.2.2 Recommendations

Based on experts' opinion, the biggest reason the player does not want to learn is because they do not have the illusion of choice, which is 'control' and 'exploration'. 'Control' means the players' ability in controlling their character. Meanwhile, 'exploration' is the players' ability to explore things and trigger any event system in the game world. Although those two factors may not relate to game aesthetics and perceived cultural learning directly, they may enrich players' game experience.

During the interview, E3, E4, and E6 suggested further clarification must be stated in the operational definition of game aesthetics, especially on graphic, shape, and form as the terms are quite confusing or somewhat overlappingg to each other. To overcome such confusion, as suggested by E6, a visual example of each would provide clarity.

Apart from that, the operational definition of each game aesthetics must be added in the consolidated model. The list should then be simplified by dividing game aesthetics into two categories, Primary and Secondary game aesthetics. Primary game

aesthetics includes text, image, and visual perspective which can be considered as basic needs of game aesthetics while Secondary is a combination of Primary game aesthetics. Secondary game aesthetics includes shape, form, and texture.

Aside from game aesthetics, there are also three factors suggested by both E2 and E4 where there are other conditions that may affect the contribution of game aesthetics for perceived cultural learning, such as:

a) **Player's motivation** – It is what motivates the player to play the game, such as player's emotion, first impression, perception, past experience, etc.

b) **Learning content** – It the content of learning within the narrative game. This also includes the theme of the narrative game.

c) **Gameplay** – It is the specific way of interaction style in which of the player interact with the narrative game, which also can be assumed as a part of game rules and game features.

4.2.3 Revised Conceptual Model

Based on the findings, it can be concluded that game aesthetics may have a relationship with perceived cultural learning. However, as similar to the findings of Tractinsky (2013), there are difficulties to conclude that listed attributes of game aesthetics are equally have relationship with perceived cultural learning in narrative games, due to varied purpose and use contexts especially of types or genre of games, different target player, aesthetics, theme, and content. Figure 4.1 illustrates the revised conceptual model by the experts.

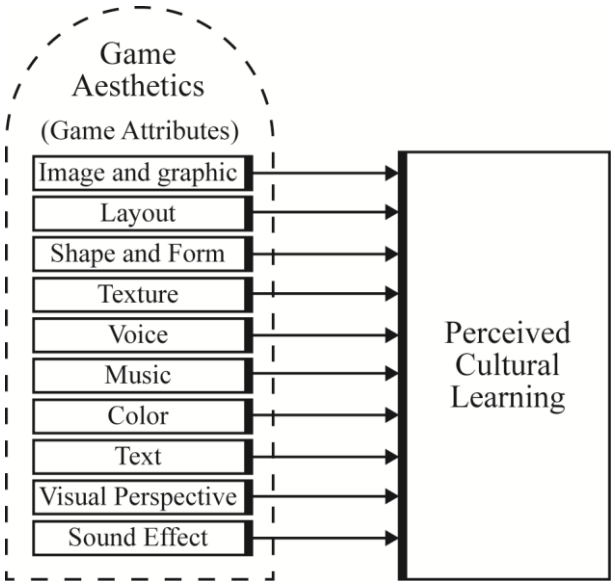


Figure 4.1. Revised Conceptual Model of Game Aesthetics and Perceived Cultural Learning

There is ten game aesthetics attributes namely image and graphic; layout; shape and form; texture; voice; music; color; text; visual perspective; and sound effect. Each of these attributes was suggested to have a relationship with perceived cultural learning by the experts.

This conceptual model could be used in game design for the narrative game. This is because the difference of narrative game is narrative elements, which does not have a correlation with game aesthetics towards perceived cultural learning. Thus, all experts agreed that the contribution for the proposed initial conceptual model is sound logical.

Meanwhile, most of the experts agreed that the contribution for the proposed initial conceptual model is understandable, except for E2. E2 decline it is understandable because of certain dependencies of the developed game as mentioned in previous subsection. Nevertheless, this study would test all listed game aesthetics for perceived cultural learning. Meanwhile, other factors would also be taken care of.

The conceptual model was verified once again by the same experts. Most of them satisfied with the revised conceptual model results for the purpose of this study. However, they also stressed that there is a need for further work on this element. In addition, the experts also acknowledged the other three factors that may contribute to perceived cultural learning, which are players' motivation, learning content, and gameplay.

4.3 Discussions from Expert Review

From the results, the determined game aesthetics are image and graphic; layout; color; text; shape and form; visual perspective; texture; music; sound effect; and voice. There are other factors mentioned by experts such as player motivation, gameplay, and learning content. These factors also are not only essential in narrative game development, but it also applies to all kind of digital interactive media.

Based on the results, the narrative game was developed, and justification was provided on each selected game aesthetics for perceived cultural learning based on expert's comments. Further discussion on narrative game development was discussed in the next chapter.

CHAPTER FIVE

PROTOTYPE DEVELOPMENT

This chapter discusses on narrative game development. Narrative games consist of five narrative elements namely (a) genre, (b) theme, (c) characters, (d) plot (storyline), and (e) setting. Four of them (a, b, c, d) are discussed in-game storyline section. The (e) is more on the game mechanic, which are discussed and merge together with game theories along with other game mechanics in the narrative games development section. The narrative game in this study was developed based on illustrated methodology in Figure 3.2. Next section discussed in details on how the narrative game was developed for this study.

5.1 Concept Development

This phase is the beginning process of developing the narrative game. It covers all information and strategies for developing the intended narrative game such as genre, theme, platform, characters, and plot which discussed:

The genre of the game is adventure and fantasy. This gameplay style is where the player controls a character and unconsciously be the real person and explores a fictitious world.

The theme for this prototype is traditional Chinese cultural and historical of Dragon Boat Festival. This tells that the environment in the game world also is a Chinese environment.

There are many platforms for digital narrative games. However, the game platform in this study is for computers only. One of the reasons why computer game are selected

rather than mobile and other platform is because of the compatibility issue. In addition, the computer also has a larger screen and louder speakers for game aesthetics to be much appealed to the player(s).

Table 5.1 describes the player and NPCs' role during the gameplay. This provided information may enhance better understanding in developing the plot (storyline).

Table 5.1

Characters' description for Dragon Boat Festival's narrative games

Player / NPC	**Name**	**Role**
Player	Aaron Tao Khee Feng (IGN: Aaron)	Main Character of the Narrative Game. He is a cheerful kid in the village. He has a little sister name Chew.
NPC1	Alfred Julio (IGN: Alfred)	Alfred likes Chew. But he felt envy with Aaron because Chew always treated her brother too much. In order to get Chew's attention, he challenged Aaron into a competition during Dragon Boat Festival.
NPC2	Chew Chee Wan (IGN: Chew)	Chew is an innocent little girl who loves his brother so much. She always supports anything that his brother do. Chew has no feeling for Alfred.
NPC3	Leong Chee Siong (IGN: Elder Leong)	Elder Leong is the mayor of the village. He also leads the festival as a judge and referees himself.

Note. IGN refers to In-Game Name

The main objective in prototype development of this study is to develop narrative games with the reviewed game aesthetics for perceived cultural learning. This section discussed in brief on the learning content and goals, where it can be achieved through narrating the game storyline and gameplay. Table 5.2 shows the learning content and goals, along with the gameplay for the developed narrative game. Further details on narrative narrating the game storyline are discussed in Section 5.2.1 and Appendix B.

Table 5.2

Implementing Cultural Content (Dragon Boat Festival) into Narrative Games

Game Levels	Educational Content	Educational Goals	Gameplay
X	• Short scene of Chinese village environment and Dragon Boat Festival introduction	• To introduce the Dragon Boat Festival.	• Task: Watch the short scene in the starting game, and proceed with the gameplay afterward.
1	• Chinese village environment. • The ingredients of Chinese traditional food. • History of Qu Yuan and Dragon Boat festival	• To experience being inside of Chinese village environment. • To learn the right ingredients for Zhong Zi traditional food.	• Task: To collect all the required ingredients for Zhong Zi. • Challenge: Explore and find the Zhong Zi ingredients hidden in the village • Reward: Win the bet that made in a game with another NPC, and proceeds to the next stage.
X	• Short scene for Dragon Boat race	• To learn the history behind Dragon Boat race	• Task: Watch the short scene before proceeding with the gameplay
2	• Main event of Dragon Boat Festival	• To experience the Dragon Boat's racing match	• Task: Move the Dragon Boat faster by moving the Dragon Boat toward Zhong Zi that floats on the water and reach the finishing goal line. • Challenge: Compete with another NPC's Dragon Boat. • Reward: Win the bet made in starting the game with another NPC (good ending story).

Note. X refers to other than 'playing' situation

5.2 Design

The design phase is where game dialogues and stories produced by the researcher as game narrator; and all the game assets (game aesthetics) were produced by the researcher as an artist or designer based on the concept development phase. The aim of this phase is to produce game "material" that can be used by the researcher as a game programmer in order to turn it into a working game. Next subsections discussed on both game script and assets development.

5.2.1 Game Storyline Development

The game storyline was developed with the awareness of gameplay capabilities based on literature section, which consists genre, theme, characters, plot and etcetera. The game storyline and also gameplay were developed as in Appendix B. The operational game structure of the prototype of the narrative game in this study were depicted in Figure 5.1.

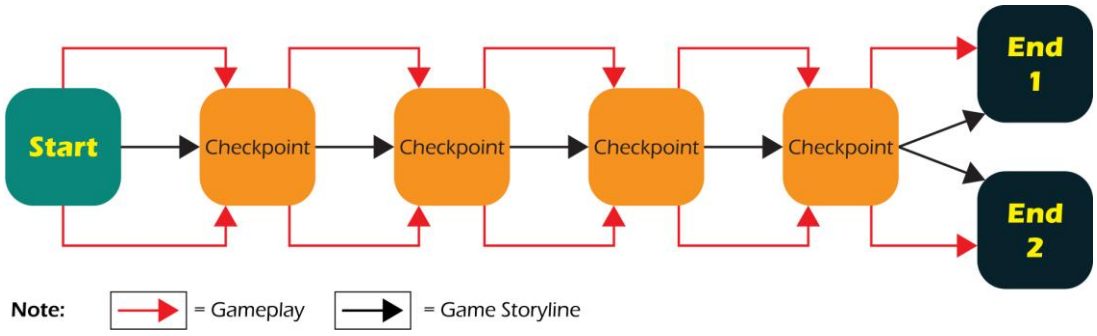


Figure 5.1. Operational game structure: game storyline and gameplay

There are six type of structures in narrative games: (a) linear story and gameplay; (b) linear story and non-linear gameplay; (c) user-generated story and linear gameplay; (d) branching story and gameplay; (e) controlled branching; (f) and parallel story and gameplay (Maiorano, 2014). Narrative games structure as in Figure 5.1 employed structure (b) linear storyline, non-linear gameplay, and structure (f) on the final stage where it has two different types of ending. Good ending if the player wins the last match and bad ending if the player lost the last match.

The learning content of the narrative game in this study is Chinese cultural heritage of Dragon Boat Festival. All related information are essential as it has been reproduced into a storyline and be a part of the learning content in narrative games. This cultural learning content is intended to introduce traditional food Zhong Zi and Dragon Boat competition to the general public to helps them understand and learn the background

story and messages of Dragon Boat festival. In addition, this learning content also may indirectly help preserve the traditional culture of Dragon Boat festival. However, the learning content about the Dragon Boat festival is not the main focus and contribution in this study. The focus of the study is the contribution of game aesthetics toward players' perceived cultural learning on Dragon Boat festival learning content. Dragon Boat Festival was chosen in this case study based on a few factors:

a) Malaysian culture is mixed with three major races which are Malay, Chinese and Indian influences, where Dragon Boat Festival are celebrated by one of the races every year which are Chinese.

b) By choosing Chinese cultural content, the prototype can be tested on non-Chinese who has lesser knowledge about the content such as Malays and Indians. Thus, this may reveal on how far Malays and Indians are willing to know the information about other than their own cultural; and how far they can achieve perceived cultural learning.

c) In addition, Dragon Boat Festival are not only celebrated by Chinese in Malaysia but whole Chinese in the world, such as in Singapore, Indonesia, Thailand, China, and etcetera. This shows that the prototype may easily be acceptable (to be marketable) in many other countries as it is appreciated by many Chinese people in the world.

d) Moreover, compared to other two major races (i.e. Malay and Indian), Chinese asset for game development can be easily found online. This may ease and fasten the prototype development process as there are no major editing and modeling from scratch but only modify the identified online asset.

In another word, learning content in this study may determine what kind of perceived cultural learning were be perceived by players during user evaluation. It also important for measuring players' perceived cultural learning in the evaluation process, however, it is not the focus of the study. Further information regarding this case study is embedded in Appendix E.

5.2.2 Game Assets Development

This is one of the essential process in this study because game aesthetics has been developed and obtained from existing sources. It contributes directly to the next implementation process because the environment setup including lighting and interaction were arranged in that process. Some of the 3D models were developed by researcher like buildings and transportations as in Figure 5.2.

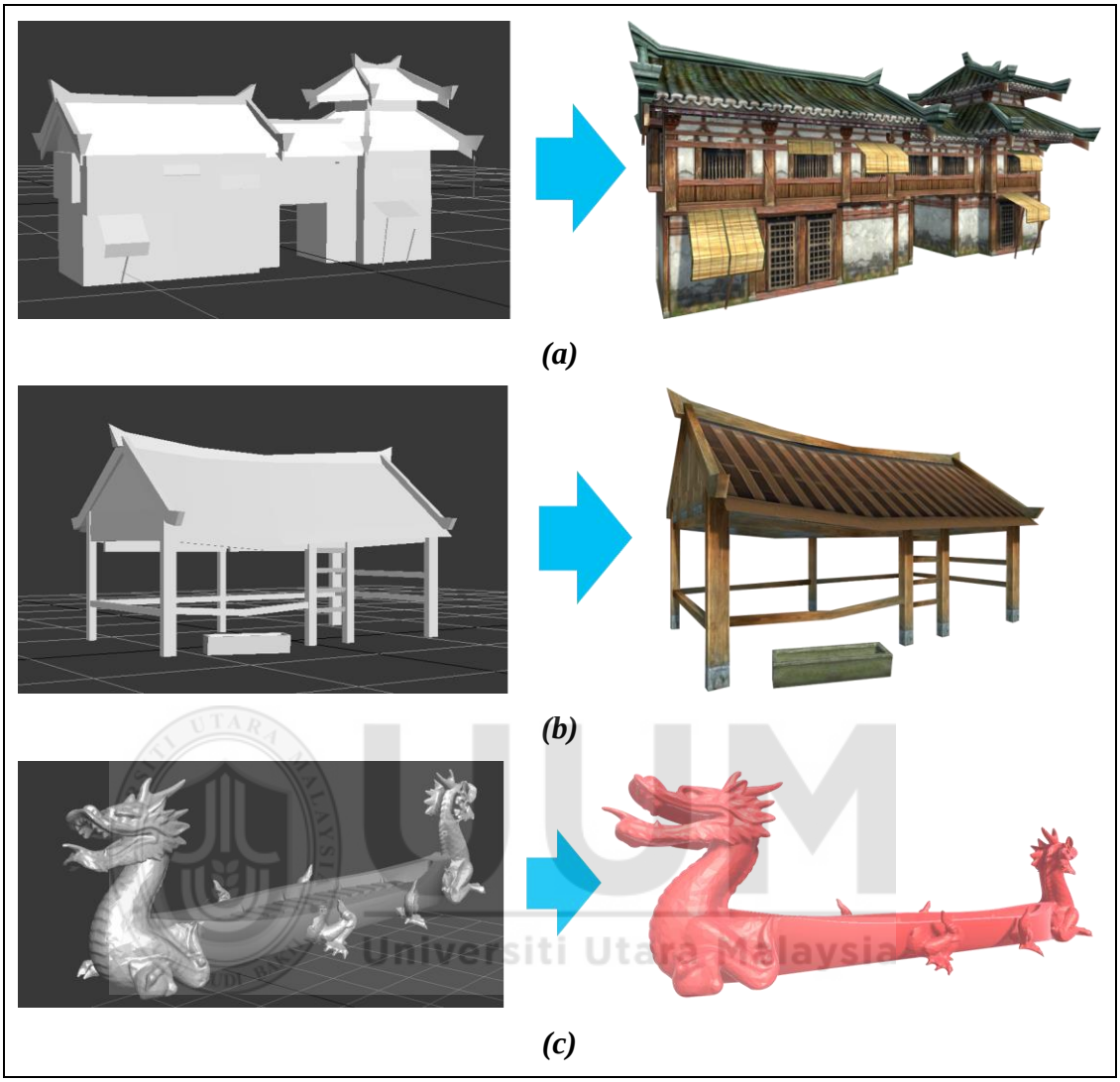


Figure 5.2. 3D modeling to texturing: (a) Chinese buildings, (b) Chicken coop, (c) Dragon boat

Meanwhile, characters were obtained from existing sources (Refer to Figure 5.3). However, their appearance was changed and enhanced by a researcher in 3D modeler. All sounds like background music and sound effects were obtain from existing sources, such as Chinese cultural festival music and etcetera. Meanwhile, voices in the game were produced by the researcher. Other 2D images and graphics like the logo of the game and pause menu layout were developed by the researcher (Refer to Figure 5.4(a) and (b)).

Figure 5.3. Changing 3D original character texturing into 3D Chinese character

Figure 5.4(a). Game logo design

Figure 5.4(b). Play button design (From left): Default state, mouse hover state, and mouse click state

5.3 Implementation

This phase requires programming skills in the game engine. All game assets (game aesthetics) in the design phase is implemented in this phase based on the requirement for the storyline and gameplay of the game. For example, there is a need of a village

3D asset because it is a part of the storyline and gameplay. This process also should consider game theories and narrative elements. At the same time, the conceptual model reviewed by the experts were implemented in this process, especially in visual and aural editing. The design phase was conducted again upon any new game asset requirements during the implementation phase. The developed narrative game was published into an executable file.

The implementation of a conceptual model on game aesthetics for perceived cultural learning is one of the major concern in this study. To begin with, Figure 5.5 illustrated the main page of the developed narrative game.

Figure 5.5. Main page of the developed narrative game

Among the game aesthetics, that embedded in the main page from Figure 5.5 are image and graphics; texts; textures; colors; shape and forms; layout; and Chinese background music. The main page should be able to be perceived by players on the general idea about the cultural learning content.

Figure 5.6 is the starting scene where the conversation between player and NPCs begin.

Figure 5.6. Stage 1 - Introduction

The conversation and the environment suggest the situation where the player is in. The text provides written dialogues. Images and graphics were formed in "NEXT" button which eases the player to read the dialogues for each sentence. Meanwhile, colors, textures, images, and graphics are texturing the shape and form for each 3D models within the game environment such as the Chinese characters, the Chinese buildings, sky, mountains, trees and grasses. There is also Chinese background music with waterfall and birds' sound effect nearby showing that is a peaceful Chinese village environment. This game environment setting is essential in order to arouse players' first impression towards the narrative game.

Figure 5.7(a)-(c) illustrate the situation where the player is searching for ZongZi's ingredients.

Figure 5.7(a). Stage 1 – Searching for Zong Zi's ingredients

Figure 5.7(b). Stage 1 – Searching for Zong Zi's ingredients

Figure 5.7(c). Stage 1 – Searching for Zong Zi's ingredients

Texts and colors help the player to determine which ingredients he has found in the Zong Zi list at the bottom layout of the screen. The text color changed from white to yellow when the ingredient was found. The images and graphics for each ingredient also help the player to easily recognize the ingredients that need to be searched. The texts and colors of "ZONG ZI LIST" help to signal the player by switching color from red into green when the player reach a certain length with the Zong Zi's ingredients. This helps the player to find the ingredients with a challenge without a mini map. There is also text for NPCs' dialogues which tells about the history of the Dragon Boat Festival for each time the player get near to the NPC. Voices among NPC also could be heard while searching the ingredients in the Chinese village.

Figure 5.8 depicted the pause menu of the narrative game.

Figure 5.8. Pause menu of the developed narrative game

The player may not be able to move and pause UI menu appeared during game pause by pressing Esc keyboard button. Abstract aesthetics can be seen in the game pause menu, where the layout was designed in an abstract way. The size of shape and form of the buttons represent the most recommended choice for the player to choose. The text color on the button may change from cyan to yellow upon mouse hover, and magenta upon clicked. This ease the player by giving respond towards his action on each button. Images and graphics on the pause menu act as theme enhancement because of the UI of the game also a part of Dragon Boat Festival theme content as well.

Figure 5.9 illustrate the situation where the player won the first stage of the game.

Figure 5.9. Stage 1 - complete

The real image and graphic of each ingredient appear on the middle of the screen every time the player found any of the ingredients within the Chinese village. At the same time, sound effect was played to notice the player about the identified ingredients. Images and graphics of all ingredients appeared together in the middle of the screen as illustrated in Figure 5.9 when the player was able to find all of the ingredients. Background music was played to congratulate the player.

Figure 5.10(a) and (b) is the beginning of the second stage of the game.

Figure 5.10(a). Stage 2 introduction dialogue

Figure 5.10(b). Stage 2 introduction dialogue

Similar game aesthetics as in Figure 5.6 were implemented in Figure 5.10(a) and (b). NPC Elder Leong continues with the story of the Dragon Boat Festival history. NPC

Chew who act as the player's younger sister is giving a motivation to the players to win the Dragon Boat racing match.

Figure 5.11 depicted the UI for how to play the second stage.

Figure 5.11. Stage 2 how to play menu

The UI was designed with classical layout aesthetics. Images and graphics in the UI show the screenshot before the second stage begin. Simple shape and form of an arrow, along with the text of A and D keyboard button tells a player on how to play the second stage. Text in the UI also provides a hint to the player to win the game.

Figure 5.12 illustrate the scenario when the Dragon Boat race begin.

Figure 5.12. Stage 2 – Dragon boat racing match

Image and graphic; color; and texture of fire at the back of player's Dragon Boat appeared when the player manages to collect Zong Zi which float on the river. A suspense Chinese background music was played during this stage which makes the player feels a bit of tense racing with his NPC opponent. Other game aesthetics that visualize the Chinese village environment also embedded in the narrative game such as the texture; image and graphic; shape and form; the color of Chinese buildings, grass, trees, river, land, and mountains.

Figure 5.13(a) and (b) shows the player's winning scenario during the second stage.

Figure 5.13. Stage 2 – Dragon boat racing match

Figure 5.14. Stage 2 – Ending dialogue

Image and graphic of YOU WIN text appeared if the player manages to win the match, while YOU LOSE text appeared if vice versa. A winning background music was played to celebrate the player's achievement or vice versa. The player will be

given an unlimited chance to play the second stage again and again if they have failed to win the match. However, the player also was allowed to give up the match and continue with the dialogues afterward. This is where the storyline split into two kinds of different ending (Refer to Figure 5.1). The dialogues after win or lose the match are the last storyline scene before the game ended.

Figure 5.14 depicted quite game UI of the narrative game.

Figure 5.15. Quit game menu of the developed narrative game

The UI were designed with more into classical layout aesthetics. The text provides the information of the UI menu. The button was embedded with shape and form; texture; text; and color. The image and graphic were a part of theme enhancement with Dragon Boat Festival elements. There was sound effect of each button clicking. The main theme of background music also was played as the same as in Figure 5.5.

In another word, the revised conceptual model of game aesthetics for perceived cultural learning has been implemented in the developed narrative game. Specifically, each of attribute was used during the implementation phase, such as image and

graphic; text; visual perspective; music; sound effect; voice; color; layout; shape and form; and texture (Refer to Table 5.3). Thus, it creates the game environment along with cultural learning content.

Table 5.3

Implemented Aesthetics Attributes in Developed Narrative Games

Attribute	Example of implementation
Image and Graphic	Main page (Figure 5.5), button dialog (Figure 5.6, 5.10, 5.14), UI for pause menu (Figure 5.8), quit page (Figure 5.15), and on all 3D modeling in the narrative games.
Text	Main page (Figure 5.5), pause menu (Figure 5.8), dialog (Figure 5.6, 5.10, 5.14), stage 1 (Figure 5.7, 5.9), stage 2 (Figure 5.11, 5.13), and quit page (Figure 5.15).
Visual Perspective	Stage 1 (Figure 5.7, 5.9), and stage 2 (Figure 5.11, 5.13).
Music	Chinese background music in stage 1, stage 2, and pause menu. Win and lose background music.
Sound Effect	Button clicking, birds, waterfall, and pickup items.
Voice	Chinese villagers' voices and counting voice in stage 2.
Color	Color applied on game's logo in main page (Figure 5.5), UI for pause menu (Figure 5.8), dialog (Figure 5.6, 5.10, 5.14), quit page (Figure 5.15), and on all 3D modeling in the narrative games.
Layout	Main page (Figure 5.5), pause menu (Figure 5.8), dialog (Figure 5.6, 5.10, 5.14), and quit page (Figure 5.15).
Shape and Form	Buttons in main page (Figure 5.5), button dialog (Figure 5.6, 5.10, 5.14), 3D modeling on each 3D environments in the game, such as Chinese characters, Chinese buildings, Zong Zi's ingredient, and dragon boat. (Figure 5.7, 5.9, 5.11, 5.13)
Texture	Texture applied on game's logo in main page (Figure 5.5), UI for pause menu (Figure 5.8), quit page (Figure 5.15), and on all 3D modeling in the narrative games.

Based on Costikyan (1994), it can be concluded that the guide for specification of a narrative game in this study is as listed in Table 5.4.

Table 5.4

Narrative Games Design Principles

Specification	Explanation
• **Decision making**	**Game:** The game environment provided the options for player to decide things. For example, the option to explore and pick Zong Zi's ingredients within the game environment (Refer to Figure 5.7(a)). **Narrative:** The story or dialogue provided reasons for a player to make decisions. For example, Elder Leong asked the player to find Zong Zi's ingredients in order to make the traditional food for Dragon Boat Festival in the next day.
• **Goals**	**Game:** The game goal in stage 1 is to find all Zong Zi's ingredients. The word "ZONG ZI LIST" is one of player's guide in order to find the ingredients (Refer to Figure 5.7). The game goal in stage 2 is to win the Dragon Boat race. The player can win in stage 2 by collecting Zong Zi that floats on the river which can boosted their movement. **Narrative:** NPC provides a hint for player to find the ingredients in stage 1, and a hint to win the dragon boat race in stage 2.
• **Opposition**	**Game:** Alfred acts as player's opponent in the narrative game to complete in both stage 1 and 2. Alfred makes the game in stage 2 much competitive, thus make the player struggle? **Narrative:** Player were introduced with his rival in the beginning of the story in stage 1. Player should be able to feel better when they won and felt dissatisfied with his opposition towards Alfred when losing the stage 2.
• **Game tokens**	**Game:** The game token in stage 1 is the Zong Zi's ingredients. Player will able to proceed to stage 2 when they managed to collect all the ingredients. The game token in stage 2 is the Zong Zi that floats on the river. Player's Dragon Boat can move faster when they hit Zong Zi with the Dragon Boat (Refer to Figure 5.12). **Narrative:** Player can learn about Zong Zi's ingredients in stage 1. Player can learn that Zong Zi and Dragon Boat are related together in this festival.
• **Information**	**Game:** There is two type of information to deliver in the narrative game. The first information is how to make the players understand the goal of each stage, how the game works, and some other information like pause and exit the game. The second information is how to make the players understand the learning content of the narrative game, which discussed earlier in this section. **Narrative:** The information delivered to the players through dialog scene among player and NPC.

(continued)

Table 5.4 (continued)

Narrative Games Design Principles	
• **Variety of encounter**	**Game and Narrative:** The player encounters many NPC that gives information about the location of Zong Zi's ingredients and also the learning content regarding the history of Dragon Boat Festival (Refer to Figure 5.7 (a), (b), and (c)) in Stage 1. The quantity of NPC depends on the amount of intended delivered information. The information from NPC encourages the socialization among players and NPC.
• **Socializing**	**Game and Narrative:** Player can approach NPC which provide a hint for player to find Zong Zi's ingredients in stage 1, and a hint to win the dragon boat race in stage 2.
• **Narrative tension**	**Game and Narrative:** The Dragon Boat race in stage 2 is the climax of the game because players have to beat Alfred in order to win the Dragon Boat Festival competition. Alfred was programmed to block players from passing him, which makes the game much tense and exciting.

The prototype of this study was also developed based on these eight narrative game specifications as in Table 5.4. Each specification determines the form of the narrative game that has been made, which is in developers' perspective.

For example, decision making in players' perspective is a players' action or respond to playing. However, in developers' perspective, the decision making is something that provides options for that action or responds from players. There is two form to provide the options, which is in term of game mechanics and also narrative as in Table 5.4. In term of game mechanics, the game environment should provide the options for players to decide things. For example, the option to explore and pick Zong Zi's ingredients within the game environment (Refer to Figure 5.7(a)). Meanwhile, in term of narrative, the story or dialogue should provide a reason for a player to make a decision. For example, Elder Leong asked the players to find Zong Zi's ingredients in order to make the traditional food for Dragon Boat Festival in the next day.

The game goal in stage 1, is to find all Zong Zi's ingredients while winning the Dragon Boat race in stage 2. Some NPC provides a hint for players to find the ingredients.

Alfred acts as players' rival in the narrative game to complete in both stage 1 and 2. Players should be able to feel better when they won and felt dissatisfied with his opposition towards Alfred when losing the stage 2.

The game token in stage 1 is the Zong Zi's ingredients. Player will able to proceed to stage 2 when they managed to collect all the ingredients. The game token in stage 2 is the Zong Zi that floats on the river. Player's Dragon Boat can move faster when they hit Zong Zi with the Dragon Boat (Refer to Figure 5.12).

There is two type of information to deliver in the narrative game. The first information is how to make the players understand the goal of each stage, how the game works, and some other information like pause and exit the game. The second information is how to make the players understand the learning content of the narrative game, which discussed earlier in this section.

The player encounters many NPC that gives information about the location of Zong Zi's ingredients and also the learning content regarding the history of Dragon Boat Festival (Refer to Figure 5.7 (a), (b), and (c)) in Stage 1. The quantity of NPC depends on the amount of intended delivered information. The information from NPC encourages the socialization among players and NPC.

The Dragon Boat race in stage 2 is the climax of the game because players have to beat Alfred in order to win the Dragon Boat Festival competition. Alfred was

programmed to block players from passing him, which makes the game much tense and exciting.

5.4 Testing

This phase is the crucial part in the narrative game development process. Three experts in multimedia and computer science have been chosen to test the developed narrative game. The aim of this phase is to check for problems, such as programming bugs, inconsistencies in narrative structure, consistency of artwork, and gameplay such as difficulties. The implementation phase was conducted again to fix the problems mentioned by the experts (refer to Table 5.6). Table 5.5 describe details of experts who has been engaged during the testing process.

Table 5.5

List of Experts and Their Demographic Profiles for Prototype Testing

Expert (E)	Expertise	Affiliation	Experiences (Years)	Age	Gender	Highest Education Level
E1	Multimedia (Game Design)	Senior Lecturer	20	54	Male	Ph.D.
E2	Multimedia (Game Design)	Senior Lecturer	15	42	Male	Ph.D.
E3	Computer Science	Senior Lecturer	12	38	Female	Ph.D.

Note. Ph.D. = Doctor of Philosophy

Table 5.5 shows the list of three experts and their demographic profiles for the prototype testing. One female expert comes from computer science related field, while the other two male experts come from multimedia expertise. All of them has Ph.D. as their highest education level and work as a senior lecturer in the particular local university.

Table 5.6

Narrative game tested by experts

Experts [E]	Feedback	
	Problems	**Recommendations**
E1	• Player and camera movement is very hard to control.	• Overall the prototype is good enough for user testing.
E2	• Player and camera movement is very hard to control. • Add narrative audio along with the written dialogues.	• The prototype provides sufficient game aesthetics for user testing. • The prototype is fun and interactive • The prototype provides sufficient cultural content for user testing.
E3	• -	

Based on Table 5.6, the player and camera movement in the narrative game were changed and fixed. However, the voice audio on written dialogue is not added because it would increase significantly the size of the game. In addition, there is only slightly significant between reading-while-listening mode and reading only mode (Brown, Waring, & Donkaewbua, 2008). Moreover, there is also the possibility that players might have mute the sound causing the narrative with a huge amount of size mentioned earlier could not be worth making.

In addition, the Chinese learning content of the narrative game in this study also has been validated by two Chinese experts (E1 and E2) during expert review for a conceptual model (Refer to Table 4.1).

CHAPTER SIX

USER EVALUATION

This chapter describes the evaluation process on game aesthetics for perceived cultural learning in the developed narrative game. The evaluation process was conducted through quasi-experimental design.

6.1 Quasi-Experimental Design

Quasi-experimental evaluation was conducted on 43 youngsters as participants which taking Diploma in Computer and Mathematical Sciences at a local university. Table 6.1 shows the demographic background of the participants.

Table 6.1

Participants Demographic Background for Quasi-Experimental Design

	Gender		**Age**	**Gaming skills**			**Money spent for games monthly**			**Know the learning content before play**	
	Male	Female	19-24 years old	Beginner	Intermediate	Advance	RM0 = No cost	RM1-500	RM501-RM1000	No	Yes
Male	22	-	22	1	14	7	2	17	3	21	1
Female	-	21	21	8	13	-	5	15	1	21	-
Total	22	21	43	9	27	7	7	32	4	42	1
Grand Total	43		43	43			43			43	

There is slightly equal for the gender of the participants. The selected participants were in the age between 19-24 years old. Most of the participants have intermediate gaming skills. The majority of them also spent money for games monthly about RM1-RM500 roughly. Only one participant who already know about Dragon Boat Festival

before playing the narrative game during user evaluation, while the rest does not know about it.

6.1.1 Evaluation

The evaluation was conducted in two days for two different sessions. The second session evaluation was conducted a day after the first evaluation in a different computer laboratory, due to a limitation of space and also official rules set by the local university to book a larger place with computers. The first session consists 23 participants while the remaining twenty was in the second session. There was 11 male and 12 female participants participated in the first session. Meanwhile, 11 male and 9 female participants have participated in the second session. Figure 6.1 – 6.3 illustrated the evaluation process in action for both sessions.

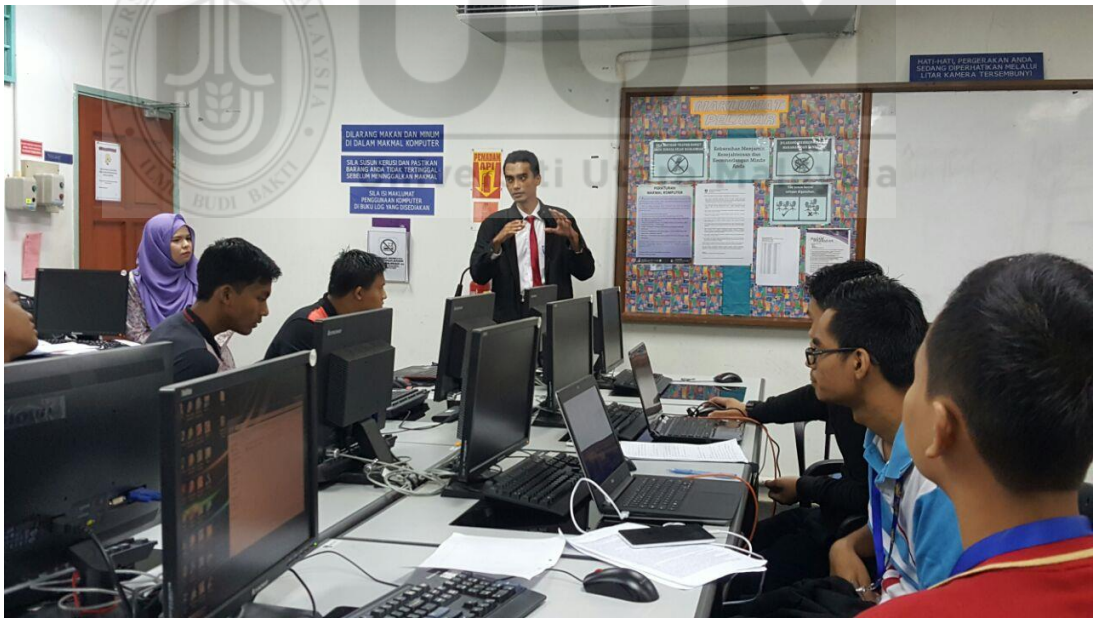


Figure 6.1. Briefing Session by Researcher

The evaluation process started from a briefing session by the researcher as depicted in Figure 6.1. At the same time, the narrative game was installed on the computer laboratory or participants' personal laptop. During the briefing session, all

participants were asked to confirm either they have played computer games before or not. They have been told that they were allowed to stop the game at their own pace. Meanwhile, all three assistants were in their position to start observe the selected participants in a particular area given.

Figure 6.2. Searching Zong Zi's Ingredients in the First Stage

The user evaluation begins at the same time once all the participants and assistants were prepared (Refer to Figure 6.2). The participants' behavior were observed and recorded during this moment. There were no critical incidents during the evaluation process that have been recorded.

In addition, the time spent for each player for both stages in the narrative game were also recorded. Some of the participants have failed during the second stage of the game. Their respond either to repeat or give up on the stage were also recorded.

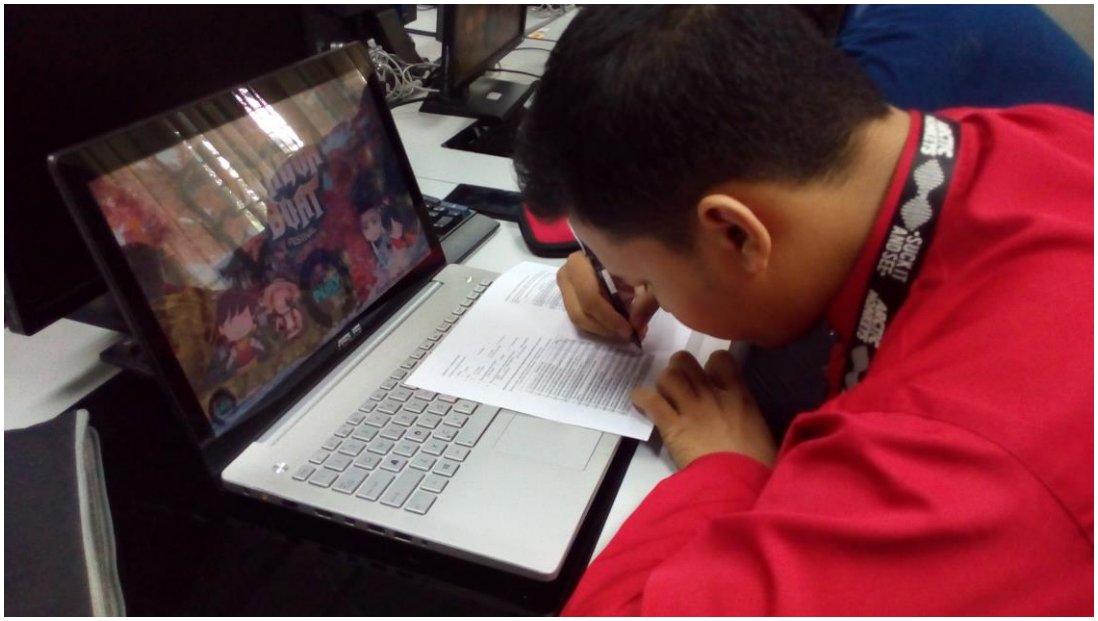


Figure 6.3. The Participants is Filling the Given Questionnaire

Each participant were given the questionnaire once they have done with the narrative game (Refer to Figure 6.3). All of them were asked for answers all the questions in the questionnaire and leave no empty answer behind. Once all questionnaire has been collected. All participants were asked in general about how they feel about the narrative game in gameplay context, perceived cultural learning context, and also what benefit did they get from playing it. Some of the participants have verbally responded by giving their own opinions and recommendations towards the narrative game.

The user evaluation ends with giving tokens to all participants as a token of appreciations. All the collected data were analyzed through descriptive analysis, normality test and also correlation analysis which discussed in next subsections respectively.

6.1.2 Descriptive Analysis

All the experimental data from both sessions was collected and analyzed through descriptive analysis. The results for main elements in this study are concentration on game aesthetics and perceived cultural learning as depicted in Table 6.2. The data were measured into a mean, median, and mode value.

Table 6.2

Mean, Median and Mode of Game Aesthetics and Perceived Cultural Learning in Narrative Game

Elements		Item	Mean	Std. Deviation	Median	Mode
Concentration on Game Aesthetics	(B2)	Image/ Graphic	4.0930	0.81105	4.0000	4.00
	(B3)	Layout	4.3023	0.80282	4.0000	5.00
	(B4)	Color	4.4651	0.59156	5.0000	5.00
	(B5)	Text	**4.5116**	0.70279	5.0000	5.00
	(B6)	Shape/ Form	4.4419	0.76539	5.0000	5.00
	(B7)	Visual Perspective	**3.6047**	1.02677	4.0000	3.00
	(B8)	Texture	3.6279	0.84581	4.0000	4.00
	(B9)	Music	4.0233	0.88609	4.0000	4.00
	(B10)	Sound Effect	3.9535	0.95002	4.0000	5.00
	(B11)	Voice	3.7674	0.84056	4.0000	4.00
Perceived Cultural Learning		(C1)	4.1163	0.66222	4.0000	4.00
		(C2)	3.7442	0.90219	4.0000	4.00
		(C3)	4.0465	0.97476	4.0000	5.00
		(C4)	4.2326	0.81174	4.0000	4.00
		(C5)	3.7907	0.96506	4.0000	4.00
		(C6)	3.6047	1.09413	4.0000	3.00
		(C7)	4.1860	0.82392	4.0000	4.00

All mean value for game aesthetics and perceived cultural learning has higher than average 3.0000 mean value. The highest game aesthetics mean is text with 4.5116 mean value. The lowest game aesthetics mean is visual perspective with 3.6047 mean value.

The highest median value for game aesthetics is color; text; and shape and form by 5.0000, while the rest has equally 4.0000 median value. All median value for perceived cultural learning has 4.0000 median value.

The highest mode value for game aesthetics is layout; color; text; shape and form; and sound effect by 5.00 mode value. The lowest mode value for game aesthetics is visual perspective by 3.00 mode value. The highest mode value for perceived cultural learning is 5.00 mode value, while the lowest is 3.00 mode value.

The other elements in the questionnaire were not the main objective of the study. However, it also should be measured in order to know the perceived quality of the developed narrative game during the evaluation process (Refer to Table 6.3).

Table 6.3

Perceived Quality of Narrative Game

Elements	Item	Mean	Std. Deviation	Median	Mode
	B12	4.5116	0.82728	4.0000	4.00
Challenge	B13	3.0698	1.16282	5.0000	5.00
	B14	4.3721	0.87351	3.0000	3.00
Player Skill	B15	4.0000	0.87287	5.0000	5.00
	B1	4.0465	0.75446	4.0000	5.00
	B16	3.6512	1.17278	4.0000	4.00
	B17	3.2093	1.08140	3.0000	3.00
	B18	3.8140	0.79450	4.0000	4.00
Control	B19	3.9070	0.83990	4.0000	4.00
Clear Goal	B20	4.3721	0.72451	4.0000	5.00
Feedback	B21	4.1628	0.75373	4.0000	4.00
Immersion	B22	3.8837	1.02839	4.0000	5.00

6.1.3 Normality test

In order to analyze correlation, the data must be normally distributed at first (Siti Mahfuzah, 2011). In short, the following numerical and visual outputs should be investigated to do correlation analysis:

a) The Skewness and Kurtosis z-values: must be in between -1.96 to +1.96. The closer to 0 value the better.

b) The Shapiro-Wilk p-value: should be above 0.05.

c) The Histograms of normal Q-Q plots: should visually indicate that the analyzed data are approximately normally distributed.

Table 6.4 displays the Skewness and Kurtosis z-values. The skewness for game aesthetics is 0.072 and kurtosis are -1.280. Skewness for perceived cultural learning is -0.720 and kurtosis are -0.478. These data are a little skewed and kurtotic for both game aesthetics and perceived cultural learning. However, this does not differ significantly from normality.

Table 6.4

Skewness and Kurtosis of Game Aesthetics and Perceived Cultural Learning

	Descriptives		Statistic	Std. Error
Game Aesthetics	Mean		4.0791	.07893
	95% Confidence Interval for Mean	Lower Bound	3.9198	
		Upper Bound	4.2384	
	5% Trimmed Mean		4.0797	
	Median		4.0000	
	Variance		.268	
	Std. Deviation		.51758	
	Minimum		3.10	
	Maximum		5.00	
	Range		1.90	
	Interquartile Range		.80	
	Skewness		.026	.361
	Kurtosis		-.908	.709
Perceived Cultural Learning	Mean		3.9601	.09618
	95% Confidence Interval for Mean	Lower Bound	3.7660	
		Upper Bound	4.1542	
	5% Trimmed Mean		3.9779	
	Median		4.0000	
	Variance		.398	
	Std. Deviation		.63071	
	Minimum		2.43	
	Maximum		5.00	
	Range		2.57	
	Interquartile Range		1.00	
	Skewness		-.260	.361
	Kurtosis		-.339	.709

Table 6.5 shows the results from both Kolmogorov-Smirnov and Shapiro-Wilk method. However, this study was only focused on Shapiro-Wilk method. Game aesthetics has p-value 0.337 while perceived cultural learning has p-value 0.387. This means that both has larger p-value than 0.05.

Table 6.5

Shapiro-Wilk Results of Game Aesthetics and Perceived Cultural Learning

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Game Aesthetics	.094	43	.200*	.971	43	.337
Perceived Cultural Learning	.103	43	.200*	.973	43	.387

Note. *. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

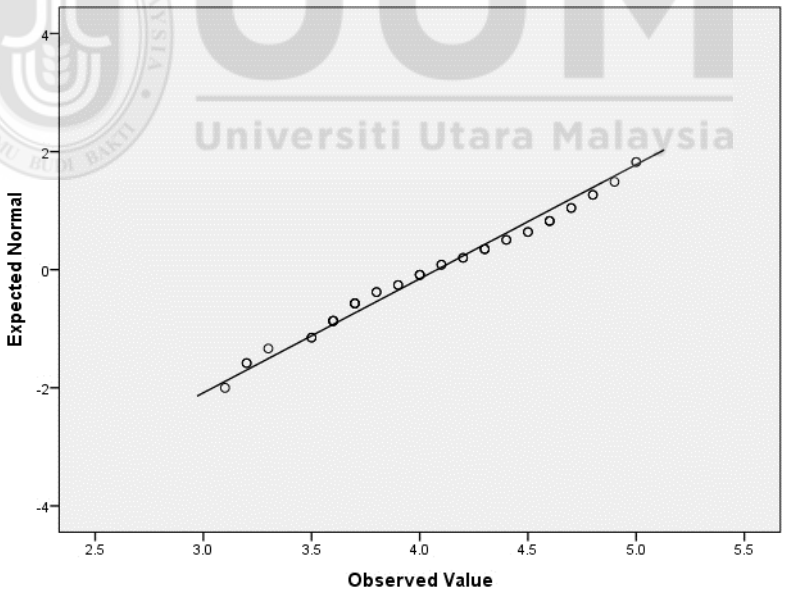


Figure 6.4. Normal QQ Plot of Game Aesthetics

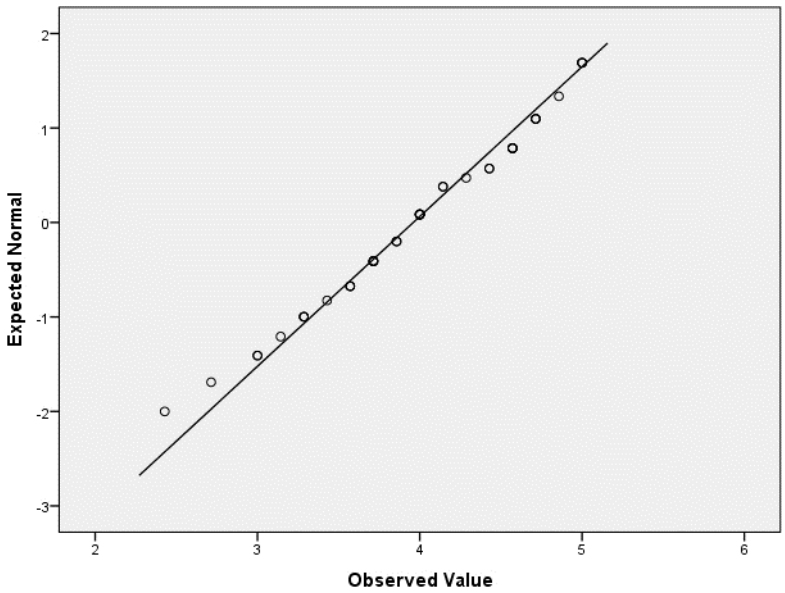


Figure 6.5. Normal QQ Plot of Perceived Cultural Learning

Both Figure 6.4 and 6.5 shown that the data for both game aesthetics and perceived cultural learning are in between the line, which is normal.

6.1.4 Relationship between Game Aesthetics and Perceived Cultural Learning

Correlation analysis was analyzed in order to achieve the third research objective of this study. It also should reflect the proposed consolidated conceptual model in this study. The aim of correlation analysis is to measures the strength of the relationship between variables. Significant correlations are highlighted with an asterisk (*) for a significance of $p < .05$ and double asterisks (**) for $p < .01$.

The data were analyzed through Pearson Correlation Analysis to indicate the relationship (Hashiroh & Norshuhada, 2015). Results from Table 6.6 indicate that there is a positive moderate relationship between all game aesthetics and perceived cultural learning with significant value: $p < 0.01$ and $r = 0.523$.

Table 6.6

Correlation Analysis between all Game Aesthetics and Perceived Cultural Learning

		Mean GA	**Mean PCL**
	Pearson Correlation	1	0.530**
	Sig. (2-tailed)		0.000
GA	N	43	43
	Pearson Correlation	0.530**	1
	Sig. (2-tailed)	0.000	
PCL	N	43	43

Note. GA = Game Aesthetics, PCL = Perceived Cultural Learning
** Correlation is significant at the 0.01 level (2-tailed)

In addition, each of game aesthetics also was analyzed for contribution perceived cultural learning. The indicate results were depicted from table 6.7 to 6.16.

Table 6.7

Correlation Analysis between Image and Graphic and Perceived Cultural Learning in developed Narrative Game

		Image and Graphic	**PCL**
	Pearson Correlation	1	0.400**
	Sig. (2-tailed)		0.008
Image and Graphic	N	43	43
	Pearson Correlation	0.400**	1
	Sig. (2-tailed)	0.008	
PCL	N	43	43

Note. PCL = Perceived Cultural Learning
** Correlation is significant at the 0.01 level (2-tailed)

Results from Table 6.7 indicate that there is a positive relationship between image and graphic; and perceived cultural learning with significant value: $p < 0.01$ and $r = 0.400$. Based on Dhar et al. (2011), it can be concluded that image and graphic can be measured by players' interestingness towards the narrative game. This interestingness is the player focus and attention towards what they perceived about the image and graphic; which makes image and graphic is one of the most important game aesthetics for perceived cultural learning.

Table 6.8

Correlation Analysis between Layout and Perceived Cultural Learning in developed Narrative Game

		Layout	**PCL**
Layout	Pearson Correlation	1	0.340*
	Sig. (2-tailed)		0.026
	N	43	43
PCL	Pearson Correlation	0.340*	1
	Sig. (2-tailed)	0.026	
	N	43	43

Note. PCL = Perceived Cultural Learning
* Correlation is significant at the 0.05 level (2-tailed)

Results from Table 6.8 indicate that there is a positive relationship between layout and perceived cultural learning with significant value: $p < 0.05$ and $r = 0.340$. The higher level of layout aesthetics, the better the game experience and perceived cultural learning (Ngo et al., 2000; Salimun et al., 2010).

Table 6.9

Correlation Analysis between Color and Perceived Cultural Learning in developed Narrative Game

		Color	**PCL**
	Pearson Correlation	1	0.179
	Sig. (2-tailed)		0.252
Color	N	43	43
	Pearson Correlation	0.179	1
	Sig. (2-tailed)	0.252	
PCL	N	43	43

Note. PCL = Perceived Cultural Learning

Results from Table 6.9 indicate that there is a non-significant relationship between color and perceived cultural learning where the p-value is larger than 0.05 and r = 0.179.

Table 6.10

Correlation Analysis between Text and Perceived Cultural Learning in developed Narrative Game

		Text	**PCL**
	Pearson Correlation	1	0.139
	Sig. (2-tailed)		0.373
Text	N	43	43
	Pearson Correlation	0.139	1
	Sig. (2-tailed)	0.373	
PCL	N	43	43

Note. PCL = Perceived Cultural Learning

Results from Table 6.10 indicate that there is a non-significant relationship between text and perceived cultural learning where the p-value is larger than 0.05 and r = 0.139.

Table 6.11

Correlation Analysis between Shape/Form and Perceived Cultural Learning in developed Narrative Game

		Shape and Form	**PCL**
Shape and Form	Pearson Correlation	1	0.383*
	Sig. (2-tailed)		0.011
	N	43	43
PCL	Pearson Correlation	0.383*	1
	Sig. (2-tailed)	0.011	
	N	43	43

Note. PCL = Perceived Cultural Learning
* Correlation is significant at the 0.05 level (2-tailed)

Results from Table 6.11 indicate that there is a positive relationship between shape and form; and perceived cultural learning with significant value: $p < 0.05$ and $r = 0.383$. Shape and form are essential in producing shape and form recognition for players to easily to identify things (Ward et al., 1991).

Table 6.12

Correlation Analysis between Visual Perspective and Perceived Cultural Learning in developed Narrative Game

		Visual Perspective	PCL
Visual Perspective	Pearson Correlation	1	0.138
	Sig. (2-tailed)		0.378
	N	43	43
PCL	Pearson Correlation	0.138	1
	Sig. (2-tailed)	0.378	
	N	43	43

Note. PCL = Perceived Cultural Learning

Results from Table 6.12 indicate that there is a non-significant relationship between visual perspective and perceived cultural learning where the p-value is larger than 0.05 and r = 0.138.

Table 6.13

Correlation Analysis between Texture and Perceived Cultural Learning in developed Narrative Game

		Texture	PCL
Texture	Pearson Correlation	1	0.462**
	Sig. (2-tailed)		0.002
	N	43	43
PCL	Pearson Correlation	0.462**	1
	Sig. (2-tailed)	0.002	
	N	43	43

Note. PCL = Perceived Cultural Learning
** Correlation is significant at the 0.01 level (2-tailed)

Results from Table 6.13 indicate that there is a positive relationship between texture and perceived cultural learning with significant value: $p < 0.01$ and $r = 0.462$. Texture are very important in order to increase the realism level (Gentle et al., 2004) and quality of appearance (Cheng & Bischof, 2006) thus enhance the presence of being in the game world.

Table 6.14

Correlation Analysis between Music and Perceived Cultural Learning in developed Narrative Game

		Music	**PCL**
Music	Pearson Correlation	1	0.610**
	Sig. (2-tailed)		0.000
	N	43	43
PCL	Pearson Correlation	0.610**	1
	Sig. (2-tailed)	0.000	
	N	43	43

Note. PCL = Perceived Cultural Learning
** Correlation is significant at the 0.01 level (2-tailed)

Results from Table 6.14 indicate that there is a positive relationship between music and perceived cultural learning with significant value: $p < 0.01$ and $r = 0.610$. Music is also recommended by many scholars and developers (Hedegaard & Simonsen, 2013; Herbert, 2010; Hsu & Sosnick, 2009; Wanderley & Orio, 2002). Based on Ariza (2009) and her "musical judgment", choosing a right and good music may able to make players to loves to continue to listen and focus, thus enjoy the narrative game.

Table 6.15

Correlation Analysis between Sound Effect and Perceived Cultural Learning in developed Narrative Game

		Sound Effect	**PCL**
	Pearson Correlation	1	0.241
	Sig. (2-tailed)		0.120
Sound Effect	N	43	43
	Pearson Correlation	0.241	1
	Sig. (2-tailed)	0.120	
PCL	N	43	43

Note. PCL = Perceived Cultural Learning

Results from Table 6.15 indicate that there is a non-significant relationship between color and perceived cultural learning where the p-value is larger than 0.05 and r = 0.241.

Table 6.16

Correlation Analysis between Voice and Perceived Cultural Learning in developed Narrative Game

		Voice	**PCL**
	Pearson Correlation	1	0.412**
	Sig. (2-tailed)		0.006
Voice	N	43	43
	Pearson Correlation	0.412**	1
	Sig. (2-tailed)	0.006	
PCL	N	43	43

Note. PCL = Perceived Cultural Learning
** Correlation is significant at the 0.01 level (2-tailed)

Results from Table 6.16 indicate that there is a positive relationship between voice and perceived cultural learning with significant value: $p < 0.01$ and $r = 0.412$. As discussed in the literature, cultural learning also can be easily perceived through voice. This is because voice can increase players experience, memories, presence, and arousal (Abdul Syafiq, Juliana A., & Abdul Razak, 2015; Herbert, 2010; Jeong et al., 2008; Juliana et al., 2014).

In brief, the significance correlation of game aesthetics with perceived cultural learning can be seen in table 6.17.

Table 6.17

Relationship of Game Aesthetics with Perceived Cultural Learning in developed Narrative Game

Correlation with Perceived Cultural Learning	**P Significance Value**	**R Value**
Overall Game Aesthetics	0.000	0.530**
Image and Graphic	0.008	0.400**
Layout	0.026	0.340*
Color	0.252	0.179
Text	0.373	0.139
Shape and Form	0.011	0.383*
Visual Perspective	0.378	0.138
Texture	0.002	0.462*
Music	0.000	0.610**
Sound Effect	0.120	0.241
Voice	0.006	0.412**

Note. ** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Based on Table 6.17, cultural learning content in the developed narrative game for this study are more perceived through image and graphic; layout; shape and form; texture; music; and voice. Image and graphic increases players' motivation towards the learning content of the narrative game, for example, the image and graphic of the main page and ZongZi's ingredients. A Higher level of layout design has increased the game experience and perceived cultural learning. During the user evaluation, most players were able to recognize all the shape and form of the ZongZi's ingredients and find it easily. Players also able to recognize ZongZi food as an item to boost up their Dragon Boat's speed during the last stage. Texture used in the narrative game has increased the realism level and quality of appearance, thus enhance the presence of being in the Chinese village. Voice used in the narrative game has increases players' presence of being in the Chinese village, thus arouse them to focus more on finding the ZongZi's ingredient. Music makes players to listen, focus and enjoy the narrative game.

Meanwhile, color, text, visual perspective and sound effect were among the non-significant attributes for players' perceived cultural learning in the developed narrative game. The color is not among the best for the contribution toward perceived cultural learning because it may have contributed more toward players' emotion (Jeong et al., 2008) rather than perceived cultural learning. The text also may have contributed more toward players' emotion (Alm et al., 2005), rather than perceived cultural learning. It also may focus more on differentiate an important and unimportant content (Sáenz & Fuchs, 2002), such as learning the game task and goals, rather than perceived cultural learning. First person visual perspective can greatly increase players' arousal (Anderson & Bushman, 2001; Schneider et al., 2004; Tamborini et al., 2004), compared to a third-person visual perspective which used in

this study. The reason the third person was used in this study because it was intended to give the players an opportunity to perceived and learn the cultural environments from many angles. However, unfortunately, there were some players during the evaluation who had difficulties to control the camera view movement as discussed in Section 6.2.1, because each of them has their own different mouse sensitivity preferences. The sound effect was probably among the attribute who does not have strong point for the cultural content to be perceived by players, as mentioned by an expert (E6) in Section 4.2.1. All these non-significant results tell that there is a possibility that it had been affected by the other three factors mentioned by experts during the expert review processes, such as player motivation, learning content, and gameplay. Future studies might enlighten the results on non-significant attributes in this study.

Moreover, the non-significant results were probably gained from players who does not seem to be much-paying attention to the color, text, visual perspective and sound effect during the evaluation. There were one feature in the narrative game where "ZHONG ZI" text color may change from red to green when players are in the close range with the hidden ingredients. However from observation during the evaluation, most players does not seem to put this features in a good use even though they have been told in "how to play" menu. Most of them rather finding the hidden ingredients by themselves of asking their friends nearby. From observation and through questionnaire answer in section D, there is also a player with ludologist ideology where they preferred playing the game only rather than reading the information and dialogues. Based on the participants' feedback also, most of them were having difficulties to control the third-person camera view controller using mouse controller. Sound effect is also essential for increasing the attention and presence (Herbert, 2010)

of being in the narrative game thus affect perceived cultural learning. However, there was probably lack of sound effect in the narrative game that may affect the learning process. All these factors are probably the cause that makes the results are lower than other game aesthetics. This is probably due to lack of game developing skills by the game developer in making a perfect game for user testing.

6.1.5 Player Preferences on the Narrative Game

These responses were taken based on the results from Section D and E in the questionnaire, respectively. Two questions were asked for player preferences on the developed narrative game. Question 1 asked for good responses: What are the features of the games which you just have played and liked it? Question 2 asked for adverse responses: What are the features of the games which you just have played and didn't like it? The results on both good and adverse responses by participants on the developed narrative game were included in Appendix F.

Meanwhile, two questions were asked for player preferences on other narrative games. Question 1 asked for good responses: What are the features of other narrative game which you have played before and liked it? Question 2 asked for adverse responses: What are the features of other narrative game which you have played before and didn't like it? The results on both good and adverse responses by participants on other narrative game were included in Appendix F.

6.2 General Observation

Findings during observation also did suggest playability issues that might be overlooked by the developer during the development phase. However, this findings are not the major approach to this evaluation. In addition, it is difficult to provide

specific observations on each participant due to the limitation on equipment and space during the evaluation. Nevertheless, only general observations through note taking were conducted during this evaluation. The following are the general observation findings on participants during the user evaluation.

6.2.1 Playability Issues

It is observed that participants do not have a hard time in controlling the character movement by using the keyboard to move forward, backward, left and right. However, there were some participants who had difficulty to control the camera view using the mouse to move the character around to look for ZongZi's ingredients in stage 1. The reason given was because of each of participant has different mouse sensitivity preferences.

6.2.2 Social Interaction and Motivation

There were some participants who had a hard time in finding the Zong Zi's ingredients during the stage 1. Some of them do not give up and try to find the ingredients by themselves. This tells that the developed narrative game does motivate the players to finish what they have started by themselves. Meanwhile, the rest of them did ask other participants for the ingredients' location. This tells that the developed narrative game may have social interaction among players if it has multiplayer features.

In addition, there were some participants who had failed to win the Dragon Boat race in stage 2. There was two option when the player failed the stage 2, either to repeat the stage or continue and end the game. It is observed that all of them had chosen to restart the stage 2 for at least four times to repeat until they win the race.

6.2.3 Completion Time

Time for participants to finish both stages were also recorded in order to measure the length for most players to finish the narrative game. In addition, the research also intended to record the time length for any participants who stop playing in the middle of the evaluation. It is found that no one stopped playing, and majority has complete both stages in 401-600 seconds. The results for the participants to finish both stages were discussed in Appendix G. The game goal in stage 1 is to find Zong Zi's ingredients. The game goal in stage 2 is to play a Dragon Boat race.

6.3 Summary

Findings on an empirical evidence in this evaluation have demonstrated that there is a significant correlation between overall game aesthetics and perceived cultural learning in the developed narrative game. It also demonstrated the degree of important on each attribute of game aesthetics for perceived cultural learning. From ten determined game aesthetics, six attributes reveal significant contribution towards perceived cultural learning, namely image, and graphic; layout; shape and form; texture; music; and voice. Meanwhile, the remaining four does not have a significant contribution towards perceived cultural learning, namely color, text, visual perspective, and sound effect.

These empirical evidence are one of the main contributions in this study. The findings may benefit to game design for narrative game development; and discussion among scholars and researchers who researching in cultural learning and narrative game design related fields. The findings may provide supportive and good literature for narrative games design and discussion, especially for the educational purpose. The findings also may provide a guide and understanding to narrative game developers

who are developing an educational narrative games design, especially with cultural learning content.

CHAPTER SEVEN

CONCLUSION

This study aimed to measure the relationship of game aesthetics for perceived cultural learning. Hence, this study was conducted based on two research questions:

a) What is the required game aesthetics that contributes to perceived cultural learning in narrative games development? (Refer to Section 7.1)

b) To what extent game aesthetics contribute to perceived cultural learning? (Refer to Section 7.2)

Therefore, this chapter describes the proposed solutions for each research questions by achieving three research objectives as follows:

a) To determine game aesthetics that contribute to perceived cultural learning in narrative games. (Refer to Section 7.1)

b) To develop a narrative game based on determined game aesthetics. (Refer to Chapter 5)

c) To produce empirical evidence on the contribution of game aesthetics towards perceived cultural learning. (Refer to Section 7.2)

In addition, this chapter also provides notable findings, research contributions, and future work.

7.1 Game Aesthetics for Perceived Cultural Learning in Narrative Games

Based on the literature, 12 game aesthetics has been identified in initial proposed conceptual model of game aesthetics for perceived cultural learning in this study. However, only 10 game aesthetics for perceived cultural learning were determined by experts during the expert review, namely image and graphic; layout; shape and form; texture; voice; music; color; text; visual perspective; and sound effect in a revised conceptual model. Figure 7.1 illustrated the final conceptual model.

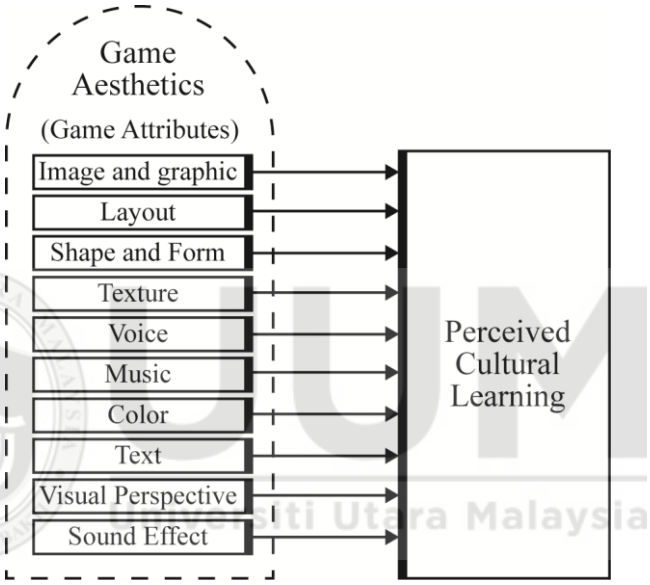


Figure 7.1. Conceptual Model of Game Aesthetics for Perceived Cultural Learning

Based on presented conceptual model, all identified game aesthetics were found to have a relationship with perceived cultural learning. However, experts suggested that all these game aesthetics may provide different requirement based on different type of narrative games. For example, some narrative game has to focus more on music if it is a part of the learning content in the narrative game. This means that all game aesthetics could be included in narrative games. However, it is essential to know the focus on each attribute of game aesthetics in each specific place, or otherwise, the

perceived cultural learning could not be interpreted by players while playing the narrative games.

This conceptual model may benefit narrative game developers. The findings may provide supportive and good literature for narrative game development and discussion, especially for the educational purpose. The findings also may provide a guide and understanding to narrative game developers who are developing an educational narrative game development, especially with cultural learning content.

7.2 Contribution of Game Aesthetics towards Perceived Cultural Learning

All the determined game aesthetics were implemented in the narrative game development. After that, the evaluation was conducted through quasi-experimental user evaluation. The data were analyzed using Pearson Correlation Analysis to indicate a relationship between game aesthetics and perceived cultural learning. The results from the evaluation shows that there is the significant result for the contribution of game aesthetics towards perceived cultural learning with significant value: $p < 0.01$ (refer to table 7.1). The majority of the participants was very happy and satisfied with the game, thus appreciated the new cultural knowledge that they have just learned after the evaluation.

Each attribute of game aesthetics was also analyzed. There are significant results for the contribution of image and graphic; layout; shape and form; texture; music; and voice towards perceived cultural learning by at least significant value $p < 0.05$. Meanwhile, there are non-significant results for the contribution of color, text, visual perspective, and sound effect towards perceived cultural learning by significant value $p > 0.05$.

Table 7.1

Relationship of Game Aesthetics with Perceived Cultural Learning

Relationship with Perceived Cultural Learning	Significance
Overall Game Aesthetics	Significant
Image and Graphic	Significant
Layout	Significant
Shape and Form	Significant
Texture	Significant
Voice	Significant
Music	Significant
Color	Non-Significant
Text	Non-Significant
Visual Perspective	Non-Significant
Sound Effect	Non-Significant

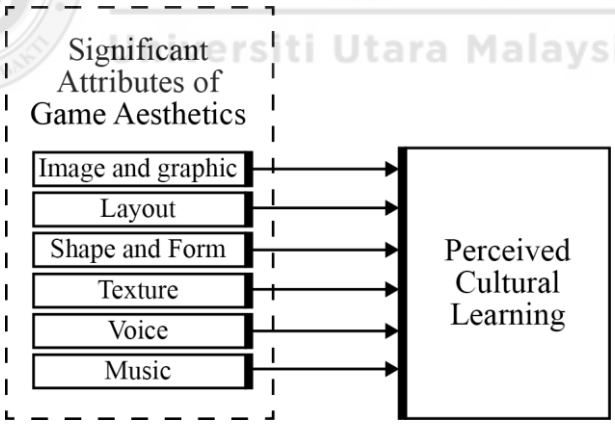


Figure 7.2. Relationship of Significant Game Aesthetics with Perceived Cultural Learning

Table 7.1 demonstrated that there is a significant relationship between overall game aesthetics and perceived cultural learning in the developed narrative game. From ten determined game aesthetics, six attributes reveal a significant relationship with

perceived cultural learning, namely image, and graphic; layout; shape and form; texture; music; and voice (Refer to Figure 7.2). Meanwhile, the remaining four does not have a significant relationship towards perceived cultural learning, namely color, text, visual perspective, and sound effect.

Aside from results in Table 6.2, this empirical evidence also may benefit to narrative game development; and discussion among scholars and researchers who researching in cultural learning or narrative game development related fields. The findings may provide supportive and good literature for narrative game development and discussion, especially for the educational purpose. The findings also may provide a guide and understanding to narrative game developers who are developing an educational narrative game development, especially with cultural learning content.

The findings indicate empirical evidence on the relationship between game aesthetics and perceived cultural learning. It also explains an understanding the importance of game aesthetics for perceived cultural learning. The findings also has provided support from previous findings on the significant relationship between game aesthetics attributes of image and graphic; layout; shape and form; texture; voice; and music toward perceived cultural learning.

7.3 Future Work and Recommendations

As mentioned by scholars and experts, there were also other factors that may have a relationship with perceived cultural learning. This study only focuses on game aesthetics factor while ensuring the developed narrative game is in a good condition. Further research on other factors should be conducted to explain better holistic overview on the contribution of game aesthetics towards perceived cultural learning.

Future work also could be done through comparison between methodologies or type of narrative games. Research on another cultural learning context in narrative games also can be tested with a different target player. Single player versus multiplayer also could be tested to see if they can learn while collaborating with other players or not.

References

Abadiano, H. R. (2002). Reading expoitory text: The challenges of students with learning disabilities. *The NERA Journal*, *38*, 49–55.

Abdul Syafiq, B., Juliana A., A., & Abdul Razak, Y. (2015). Consolidated Model of Visual Aesthetics Attributes for Sense-Based User Experience. *Jurnal Teknology (Sciences & Engineering)*, *77*(29), 35–40. Retrieved from http://www.jurnalteknologi.utm.my/index.php/jurnalteknologi/article/view/6808/4511

Adams, E. (2010). *Fundamentals of Game Design*. *Design*.

Adams, E. (2013). Resolutions to Some Problems in Interactive Storytelling, *1*(January), 189.

Agos Jr, C. T., Bal-ut, M. L. C., Calam, L. G., Cantuba, R. N., Heindric, M., Engr, M. V., & Regina, M. (2013). Game Development Of Ibong Adarna Visual Novel. *International Journal of Scientific & Technology Research*, *2*(9), 259–266.

Ahmad Affandi, S. (2014). *Tag Clouds Algorithm With The Inclusion of Personality Traits (Master's thesis)*. University Utara Malaysia.

Ahmad Affandi, S., & Azizi, A. A. (2014). Tag Cloud Algorithm with the Inclusion of Personality Traits. *International Journal of Computer Applications.*, *101*(3), 15–22.

Alm, C. O., Roth, D., & Sproat, R. (2005). Emotions from text machine learning for text-based emotion prediction. In *Human Language Technology Conference and Conference on Empirical Methods in Natural Language Processing* (pp. 579–586). Vancouver: Omnipress Inc.

Alofs, T., Theune, M., & Swartjes, I. (2012). A tabletop board game interface for multi-user interaction with a storytelling system. *Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering*, *78 LNICST*, 123–128. https://doi.org/10.1007/978-3-642-30214-5_14

Andersen, E., Liu, Y., Snider, R., Szeto, R., & Popovi, Z. (2011). Placing a Value on Aesthetics in Online Casual Games. *Human Factors*, 1275–1278. https://doi.org/10.1145/1978942.1979131

Anderson, C. a, & Bushman, B. J. (2001). Effects of violent video games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, and prosocial behavior: a meta-analytic review of the scientific literature. *Psychological Science : A Journal of the American Psychological Society / APS*, *12*(5), 353–359. https://doi.org/10.1111/1467-9280.00366

Ariza, C. (2009). The interrogator as critic: The questionable relevance of Turing tests and aesthetic tests in the evaluation of generative music systems. *Computer Music Journal*, *33*(1), 1–23.

Barr, P., Noble, J., & Biddle, R. (2007). Video Game Values: Play as Human–Computer Interaction. *Interacting with Computers*, *19*(2), 180–195. https://doi.org/10.1016/j.intcom.2006.08.008

Barthes, R. (1968). *Elements of Semiology*. New York: Hill and Wang.

Basso, A., Goldberg, D., Greenspan, S., & Weimer, D. (2001). First impressions. *Proceedings of the 3rd ACM Conference on Electronic Commerce - EC '01*, (JANUARY), 137–143. https://doi.org/10.1145/501158.501173

Beal, V. (n.d.). Font. Entry 1. In *Webopedia*. Retrieved from http://www.webopedia.com

Bonini, E. (2008). Building virtual cultural heritage environments: the embodied mind at the core of the learning processes. *International Journal of Digital Culture and Electronic Tourism*, *1*(2/3), 113–125. https://doi.org/10.1504/IJDCET.2008.021402

Bostan, B., & Marsh, T. (2010). The "interactive" of interactive storytelling: Customizing the gaming experience. In H. S. Yang, R. Malaka, J. Hoshino, & J. H. Han (Eds.), *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* (Vol. 6243 LNCS, pp. 472–475). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-15399-0_63

Brown, R., Waring, R., & Donkaewbua, S. (2008). Incidental vocabulary acquisition from reading , reading-while-listening , and listening to stories. *Reading in a Foreign Language*, *20*(2), 136–163.

Bryce, J., & Rutter, J. (2001). In the game–In the flow: Presence in public computer gaming. *Computer Games and Digital Textualities Conference*. Retrieved from http://www.cric.ac.uk/cric/staff/Jason_Rutter/presence.htm

Cassidy, G., & Macdonald, R. (2010). The effects of music on time perception and performance of a driving game. *Scandinavian Journal of Psychology*, *51*(6), 455–464. https://doi.org/10.1111/j.1467-9450.2010.00830.x

Cawthon, N., & Moere, A. Vande. (2007). The effect of aesthetic on the usability of data visualization. *Proceedings of the International Conference on Information Visualisation*, 637–645. https://doi.org/10.1109/IV.2007.147

Champion, E. (2003). Applying game design theory to virtual heritage environments. *Proceedings of the 1st International Conference on Computer Graphics and Interactive Techniques in Austalasia and South East Asia - GRAPHITE '03*, 273–274. https://doi.org/10.1145/604526.604532

Champion, E. (2006). Evaluating cultural learning in virtual environments, (January), 247. Retrieved from http://sites.google.com/site/nzerik/PhDBound-Jan2006.pdf

Champion, E., & Dave, B. (2002). Where is this place ?, 1–16.

Chen, C. P., Shih, J. L., & Ma, Y. C. (2014). Using Instructional Pervasive Game for School Children's Cultural Learning. *Educational Technology & Society*, *17*(2), 169–182.

Cheng, I., & Bischof, W. (2006). *A Perceptual Approach to Texture Scaling based on Human Computer Interaction*. *Computing*.

Chittick, A. (n.d.). *Patronage and Community in Medieval China*.

Chloe5972. (2004). Patchwork Angel. Retrieved February 25, 2015, from http://www.dafont.com/

Cook, M. P. (2006). Visual representations in science education: The influence of prior knowledge and cognitive load theory on instructional design principles. *Science Education*, *90*(6), 1073–1091. https://doi.org/10.1002/sce

Costikyan, G. (1994). I Have No Words & I Must Design. Interactive Fantasy 2. Retrieved May 19, 2015, from http://www.costik.com/nowords.html

Costikyan, G. (2000). Where Stories End and Games Begin. *Game Developer*, *7*(9), 44–53. Retrieved from http://cumincad.architexturez.net/system/files/pdf/b8bc.content.pdf

Coyne, R. (1995). *Designing information technology in the postmodern age: From method to metaphor*. Cambridge, MA: MIT Press. https://doi.org/10.1016/S0167-6245(96)00014-5

dafont.com. (n.d.). Retrieved February 25, 2015, from http://www.dafont.com/

Datta, R., Joshi, D., Li, J., & Wang, J. Z. (2006). Studying aesthetics in photographic images using a computational approach. In *Computer Vision–ECCV 2006* (pp. 288–301). Springer. https://doi.org/10.1007/11744078_23

David, A., & Glore, P. R. (2010). The Impact of Design and Aesthetics on Usability, Credibility, and Learning in an Online Environment. *Online Journal of Distance Learning Administration*, *13*(4). Retrieved from http://www.westga.edu/~distance/ojdla/winter134/david_glore134.html

Dempsey, J. V. (1996). Instructional applications of computer games, 13.

Dhar, S., Ordonez, V., & Berg, T. L. (2011). High level describable attributes for predicting aesthetics and interestingness. In *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition* (pp. 1657–1664).

Dragon Boat Festival in China. (n.d.). Retrieved July 27, 2015, from http://www.timeanddate.com/

Egenfeldt-Nielsen, S., Smith, J. H., & Tosca, S. P. (2013). *Understanding video games: The essential introduction*. New York: Routledge.

El-Nasr, M. S., & Smith, B. K. (2006). Learning through game *modding*. *Comput. Entertain.*, *4*(1), 7. https://doi.org/10.1145/1111293.1111301

Engelbrecht, K. (2003). The Impact of Color on Learning. *NeoCon Perkins & Will*, 1–5.

Fabricatore, C. (2000). Learning and Video Games: An Unexploited Synergy. *The International Conference of the Association for Educational Communications and Technology.*

Fallman, D. (2008). The Interaction Design Research Triangle of Design Practice, Design Studies, and Design Exploration. *Design Issues*, *24*(3), 4–18. https://doi.org/10.1162/desi.2008.24.3.4

Ferrari, V., & Zisserman, A. (2008). Learning visual attributes. Retrieved from http://eprints.pascal-network.org/archive/00003146/

Forlizzi, J., & Battarbee, K. (2004). Understanding Experience in Interactive Systems Understanding Experience in Interactive Systems.

Free Animal Sound Effects. (n.d.). Retrieved February 21, 2015, from http://www.audiomicro.com/free-sound-effects/free-animal-sound-effects

Freifeld, S. (2005). *Shape and Form in Art Instructional Program for Grades K-4 Teacher ' s Guide*.

Fruchterman, J. (2004). Technology benefiting humanity. *Ubiquity*, *2004*(March), 1–1. https://doi.org/10.1145/985619.985620

Fullerton, T. (2008). *Game Design Workshop: A Playcentric Approach to Creating Innovative Games*. *Technology*. Retrieved from http://www.amazon.de/dp/0240809742

Ganguly, D., Leveling, J., & Jones, G. J. F. (2014). Automatic Prediction of Text Aesthetics and Interestingness (pp. 905–916).

Gentle, J. E., Hardle, W., & Mori, Y. (2004). *Handbook of computational statistics : concepts and methods* (second edi). Berlin: Springer.

Glore, P., & David, A. (2012). Design and Aesthetics in E-Learning: A Usability and Credibility Perspective. *International Journal on E-Learning*, *11*(4), 383–390. Retrieved from http://www.editlib.org/p/35417/

Göbel, S., Mehm, F., Radke, S., & Steinmetz, R. (2009). 80Days: Adaptive digital storytelling for digital educational games. In *CEUR Workshop Proceedings* (Vol. 498).

Graphic. (2015). In *Merriam-Webster*. Retrieved from http://www.merriam-webster.com/

Hampson, C., Gürel, M., & Conlan, O. (2011). Using expert-derived aesthetic attributes to help users in exploring image databases. In *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* (Vol. 6861 LNCS, pp. 334–349).

Hashiroh, H., & Norshuhada, S. (2015). Components of Heuristic Strategy : Evaluation of Stories with DST tool on Touch Screen Tablet. *International Journl of Computer Application*, *130*(11), 6–10.

Hassenzahl, M. (2004). The Interplay of Beauty, Goodness, and Usability in Interactive Products. *Human-Computer Interaction*, *19*(4), 319–349. https://doi.org/10.1207/s15327051hci1904_2

Hassenzahl, M., Lindgaard, G., Platz, A., & Tractinsky, N. (2008). 08292 Abstracts Collection Dagstuhl Seminar 08292 Executive Summary The Study of Visual Aesthetics in Human-Computer Interaction, 1–12.

Hassenzahl, M., & Tractinsky, N. (2006). User experience - a research agenda. *Behaviour & Information Technology*, *25*(2), 91–97. https://doi.org/10.1080/01449290500330331

Hedegaard, S., & Simonsen, J. G. (2013). Extracting usability and user experience information from online user reviews. In *Proceedings of the SIGCHI conference on Human factors in computing systems - CHI '13* (pp. 2089–2098). Paris: ACM Press. https://doi.org/10.1145/2470654.2481286

Helppi, V.-V. (2015). *The Fundamentals of Mobile Game Development and Testing*. *testdroid.com*. Retrieved from http://testdroid.com/tech/the-agile-process-for-

mobile-game-development-and-testing

Herbert, Z. (2010). *Sight, Sound, Motion: Applied Media Aesthetics*. *Wadsworth Series in Broadcast and Production* (6th ed.). Wadsworth Publishing Co Inc.

Holzinger, A., & Ebner, M. (2003). Interaction and Usability of Simulations & Animations: A Case Study of the Flash Technology. *Human-Computer Interaction INTERACT*, *780*, 777–780. Retrieved from http://lamp.tu-graz.ac.at/~i203/ebner/publication/03_zuerich.pdf

Hsu, W., & Sosnick, M. (2009). Evaluating Interactive Music Systems : An HCI Approach. *Proceedings of the International Conference on New Interfaces for Musical Expression*, 25–28.

Huhtamo, E. (2003). Visual Communication and Semiotics: Some basic concepts. *Signs*.

Hummel, J. E., & Biederman, I. (1992). Dynamic binding in a neural network for shape recognition. *Psychological Review*, *99*(3), 480–517. https://doi.org/10.1037/0033-295X.99.3.480

Hunicke, R., LeBlanc, M., & Zubek, R. (2004). MDA: A Formal Approach to Game Design and Game Research. *Workshop on Challenges in Game AI*, 1–4. https://doi.org/10.1.1.79.4561

Ibrahim, A. R. H. (2006). *The Significance of Philosophy in Film as an Important Content Analysis in Film Studies and Criticism in Malaysia*. *UiTM Press*. Universiti Teknologi MARA.

Image. (2015a). In *Oxford Dictionaries online*. Retrieved from http://www.oxforddictionaries.com

Image. (2015b). In *Merriam-Webster*. Retrieved from http://www.merriam-webster.com/

Images or Text? (n.d.). Retrieved February 18, 2015, from http://www.berta.me/images-or-text-does-one-demand-higher-priority-than-the-other/

Janko, T., & Knecht, P. (2013). Visuals in Geography Textbooks: Categorization of Types and Assessment of Their Instructional Qualities, *3*(1). Retrieved from https://www.muni.cz/research/publications/1104692

Jeon, H.-J., & Park, S.-B. (2015). Contemporary Architecture Theory and Game Storytelling. In D. Camacho, S.-W. Kim, & B. Trawiński (Eds.), *New Trends in Computational Collective Intelligence* (volume 572, pp. 149–154). Springer International Publishing. https://doi.org/10.1007/978-3-319-10774-5_14

Jeong, E. J., Biocca, F. A., & Bohil, C. J. (2008). Effects of Representational Realism in 3D Violent Games. In A. Spagnolli & L. Gamberini (Eds.), *PRESENCE 2008 annual convention* (pp. 191–200). CLEUP.

Johnson, C. G., & Jones, G. J. F. (1999). Effecting affective communication in virtual environments. In *Proceedings of the Second Workshop on Intelligent Virtual Agents* (pp. 135–138).

Jørgensen, A. H. (2004). Marrying HCI/Usability and computer games. *Proceedings of the Third Nordic Conference on Human-Computer Interaction - NordiCHI*

'04, 393–396. https://doi.org/10.1145/1028014.1028078

Juliana, A. A., Abdul, S., Sobihatun, N., Abdul Nasir, Z., Mohd Khairie, A., & Mohd Zulfadli, R. (2014). The Effect of 3D Realism and Meaning Making : A Conceptual Model. In *Knowledge Management International Conference (KMICe)* (pp. 12–15). Retrieved from http://www.kmice.cms.net.my/

Julita. (2011). Difference Between Shape and Form. Retrieved March 9, 2015, from http://www.differencebetween.net/language/difference-between-shape-and-form/

Karsvall, A. (2002). Personality preferences in graphical interface design. *Proceedings of the Second Nordic Conference on Human-Computer Interaction - NordiCHI '02*, 217. https://doi.org/10.1145/572043.572049

Karvonen, K. (2000). The beauty of simplicity. *Proceedings on the 2000 Conference on Universal Usability - CUU '00*, 85–90. https://doi.org/10.1145/355460.355478

Katzman, N., & Nyenhuis, J. (1972). Color vs. black- and- white effects on learning, opinion, and attention. *Educational Technology Research and Development*, *20*(1), 16–28. https://doi.org/10.1007/BF02768385

Ke, Y., Tang, X., & Jing, F. (n.d.). The Design of High-Level Features for Photo Quality Assessment. *2006 IEEE Computer Society Conference on Computer Vision and Pattern Recognition - Volume 1 (CVPR'06)*, *1*, 419–426. https://doi.org/10.1109/CVPR.2006.303

Khalifa, M., & Lam, R. (2002). Web-Based Learning : Effects on Learning Process and Outcome, *45*(4), 350–356.

Khanana, K. (2016). *Development of Design Heuristics for Dgital Educational Games for School Children of 7 to 11 Years Old (PhD's thesis).* University of Leicester.

Khanana, K., & Law, E. L.-C. (2013). Designing children's digital games on nutrition with playability heuristics. *CHI '13 Extended Abstracts on Human Factors in Computing Systems on - CHI EA '13*, 1071. https://doi.org/10.1145/2468356.2468548

Kiili, K. (2005). Digital game-based learning: Towards an experiential gaming model. *The Internet and Higher Education*, *8*(1), 13–24. https://doi.org/10.1016/j.iheduc.2004.12.001

Klein, M. (2005). Tango Macabre. Retrieved February 25, 2015, from http://www.dafont.com/

Kozma, R. (2003). The material features of multiple representations and their cognitive and social affordances for science understanding. *Learning and Instruction*, *13*(2), 205–226. https://doi.org/10.1016/S0959-47520200021-X

Laird, J. E. (2001). Using a Computer Game to Develop. *Computer*.

Laird, J. E., & van Lent, M. (2000). Human-level AI's killer application: Interactive computer games. *AI Magazine*, *22*(2), 15–25. https://doi.org/10.1609/aimag.v22i2.1558

Lavie, T., & Tractinsky, N. (2004). Assessing dimensions of perceived visual aesthetics of web sites. *International Journal of Human-Computer Studies*,

60(3), 269–298. https://doi.org/10.1016/j.ijhcs.2003.09.002

LeBlanc, M. (2004). Game Design and Tuning Workshop Materials. In *Game Developers Conference 2004*. Retrieved from http://algorithmancy.8kindsoffun.com/GDC2004/

Lebowitz, J., & Klug, C. (2011). *Interactive Storytelling in Video Games*. Focal Press.

Lidwell, W., Holden, K., & Butler, J. (2010). Garbage in-Garbage out. In *Universal principles of design: 125 ways to enhance usability, influence perception, increase appeal, make beter design decisions, and teach through design.* (pp. 112–113). Rockport Publishers Inc.

Lindgaard, G., & Dudek, C. (2002). Usability. In J. Hammond, T. Gross, & J. Wesson (Eds.), *Usability: Gaining a competitive edge* (Vol. 99, pp. 231–246). Boston, MA: Springer US. https://doi.org/10.1007/978-0-387-35610-5

Lindgaard, G., Fernandes, G., Dudek, C., & Brown, J. (2006). Attention web designers: You have 50 milliseconds to make a good first impression! *Behaviour & Information Technology*, *25*(2), 115–126. https://doi.org/10.1080/01449290500330448

Lipscomb, S. D., & Zehnder, S. M. (2005). Immersion in the virtual environment: the effect of a musical score on the video gaming experience. *Journal of Physiological Anthropology and Applied Human Science*, *23*(6), 337–343. https://doi.org/10.2114/jpa.23.337

Luo, Y., & Tang, X. (2008). Photo and Video Quality Evaluation :, 386–399. https://doi.org/10.1007/978-3-540-88690-7_29

Maiorano, S. (2014). Video Game Narrative Workshop. Retrieved July 13, 2015, from http://www.slideshare.net/SimonaMaiorano1/video-game-narrative-workshop?next_slideshow=1

Manovich, L. (2001). The Language of the New Media. Cambridge, MA: The MIT Press.

Mayer, R. E. (2005). *Cognitive theory of multimedia learning*. Cambridge University Press.

Mayer, R. E. (2009). Research--- Based Principles for Designing Multimedia Instruction Overview of Multimedia Instruction.

Mayer, R. E., & Moreno, R. (2002). Animation as an aid to multimedia learning. *Educational Psychology Review*, *14*(1), 87–99. https://doi.org/10.1023/A:1013184611077

Miércoles. (2015). Six Sigma Methodology And Game Development. Retrieved August 1, 2016, from http://oniralia.blogspot.my/

Mitchell, A., & McGee, K. (2009). Designing storytelling games that encourage narrative play. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *5915 LNCS*, 98–108. https://doi.org/10.1007/978-3-642-10643-9_14

Moriarty, S. (2004). Visual Semiotics Theory. In K. L. Smith, S. Moriarty, G. Barbatsis, & K. Kenney (Eds.), *Handbook of visual communication: theory, methods, and media* (pp. 227–241). Routledge.

https://doi.org/10.1080/10584600701641946

Narration. (n.d.). Retrieved July 12, 2015, from https://en.wikipedia.org/wiki/Narration

Nass, C., & Lee, K. M. (2001). Does computer-synthesized speech manifest personality? Experimental tests of recognition, similarity-attraction, and consistency-attraction. *Journal of Experimental Psychology: Applied*, *7*(3), 171–181. https://doi.org/10.1037//1076-898X.7.3.171

Newsam, S. D., & Kamath, C. (2004). Retrieval Using Texture Features in High Resolution Multi-spectral Satellite Imagery.

Ngo, D. C. L., Samsudin, A., & Abdullah, R. (2000). Aesthetic measures for assessing graphic screens. *Journal of Information Science and Engineering*, *16*(1), 97–116.

Niedenthal, S. (2009). What We Talk About When We Talk About Game Aesthetics. *Technology*, *9*, 15. https://doi.org/10.1177/0021943608325751

Nunnally, J., Bernstein, I., & Berge, J. (1967). Psychometric theory, *4*(10), 7–14. Retrieved from http://www.jstor.org/stable/pdf/1175619.pdf

Nurul Nadwan, A. (2015). *Conceptual design and development model of assistive courseware for young low vision learners (AC4LV)*. Doctoral dissertation, Universiti Utara Malaysia.

Offermann, P., Levina, O., & Bub, U. (2009). Outline of a Design Science Research Process. In *Proceedings of the 4th International Conference on Design Science Research in Information Systems and Technology*. ACM.

Olsen, J. (2010). The Effect of Color on Conscious and Unconscious Cognition, 1–30.

Pajusalu, M. (2012). *The Evaluation of User Interface Aesthetics*. Tallinn University.

Peirce, C. S., Weiss, P., Hartshorne, C., & Burks, A. W. (1994). The Collected Papers of Charles Sanders Peirce [electronic resource]. *Past Masters*.

Pinelle, D., Wong, N., & Stach, T. (2008). Heuristic evaluation for games: usability principles for video game design. *Proceedings of SIGCHI Conference on Human Factors in Computing Systems*, 1453–1462. https://doi.org/10.1145/1357054.1357282

Preece, J., Rogers, Y., & Sharp, H. (2002). Interaction Design: Beyond Human-Computer Interaction. *Design*, *18*, 68–68. https://doi.org/10.1016/S0010-4485(86)80021-5

Prensky, M. (2001). *Digital Game Based Learning*. (M. Burmester, D. Gerhard, & F. Thissen, Eds.), *icom* (Vol. 152). McGraw-Hill. Retrieved from http://www.amazon.de/exec/obidos/redirect?tag=citeulike01-21&path=ASIN/3866440103

Randel, J. M., Morris, B. A., Wetzel, C. D., & Whitehill, B. V. (1992). The Effectiveness of Games for Educational Purposes: A Review of Recent Research. *Simulation & Gaming*. https://doi.org/10.1177/1046878192233001

Riedl, M., Thue, D., & Bulitko, V. (2011). Game AI as Storytelling. In P. A.

González-Calero & M. A. Gómez-Martín (Eds.), *Artificial Intelligence for Computer Games* (pp. 125–150). Springer New York Dordrecht Heidelberg London. https://doi.org/10.1007/978-1-4419-8188-2

Rollings, A., & Morris, D. (1999). *Game Architecture and Design with Cdrom*. Paraglyph.

Roscoe, J. (1975). *Fundamental Statistics for the Behavioural Science*. New York: Holt.

Ross, D. (2009). Game Theory. In E. N. Zalta (Ed.), *The stanford encyclopedia of philosophy (Spring 2009 Edition)*. Retrieved from http://plato.stanford.edu/archives/spr2009/entries/game-theory/

Rubin, R., & Dehon, A. (2011). Choose-Your-Own-Adventure Routing : Lightweight Load-Time Defect Avoidance Categories and Subject Descriptors. *ACM Transactions on Reconfigurable Technology and Systems*. https://doi.org/10.1145/2068716.2068719

Rusnida, R., Abdul Razak, Y., Juliana Aida, A. B., & Abdul Syafiq, B. (2014). The Theoretical Framework of Designing DesktopVR in Learning Environment. In *The 3rd International Conference on Computer Engineering and Mathematical Sciences* (pp. 805–809).

Sáenz, L. M., & Fuchs, L. S. (2002). Examining the Reading Difficulty of Secondary Students with Learning Disabilities. *Hammill Institute on Disablilities*, 31–41. https://doi.org/10.1177/074193250202300105

Salazar, F. L., Nakajima, T., & Alexandrova, T. (2013). Visual Novels: An Methodology Guideline for Pervasive Educational Games that Favors Discernment. In J. J. Park, H. R. Arabnia, C. Kim, W. Shi, & J.-M. Gil (Eds.), *Grid and Pervasive Computing* (pp. 234–243). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-38027-3_25

Salimun, C., Purchase, H. C., Simmons, D. R., & Brewster, S. (2010). The effect of aesthetically pleasing composition on visual search performance. *Proceedings of the 6th Nordic Conference on Human-Computer Interaction Extending Boundaries - NordiCHI '10*, 422. https://doi.org/10.1145/1868914.1868963

Schenkman, B. N., & Jönsson, F. U. (2000). Aesthetics and preferences of web pages. *Behaviour & Information Technology*, *19*(5), 367–377. https://doi.org/10.1080/014492900750000063

Schneider, E. F., Lang, A., Shin, M., & Bradley, S. D. (2004). Death with a Story. *Human Communication Research*, *30*(3), 361–375. https://doi.org/10.1111/j.1468-2958.2004.tb00736.x

Schnotz, W. (2002). Commentary: Towards an Integrated View of Learning from Text and Visual Displays. *Educational Psychology Review*, *14*(1), 101–120. https://doi.org/10.1023/A:1013136727916

Sekaran, U. (2003). *Research methods for business: a skills-building approach* (4th ed.). USA: John Wiley & Sons, Inc.

Shape. (2015a). In *Oxford Dictionaries online*. Retrieved from http://www.oxforddictionaries.com

Shape. (2015b). In *Merriam-Webster*. Retrieved from http://www.merriam-webster.com/

Shen, Y. T., & Mazalek, a. (2010). Puzzle tale: A tangible puzzle game for interactive storytelling. *Computers in Entertainment*, *8*(2). https://doi.org/10.1145/1899687.1899693

Siti Mahfuzah, S. (2011). *Conceptual Design Model of Computerized Personal-Decision Aid (ComPDA) (PhD's thesis).* Universiti Utara Malaysia.

Skalski, P., & Whitbred, R. (2010). Image versus sound: A comparison of formal feature effects on presence and video game enjoyment. *PsychNology Journal*, *8*(1), 67–84. https://doi.org/Article

Solarski, C. (2013). The Aesthetics of Game Art and Game Design. Retrieved April 9, 2015, from http://www.gamasutra.com/view/feature/185676/the_aesthetics_of_game_art_and_.php

Sonderegger, A., & Sauer, J. (2010). The influence of design aesthetics in usability testing: Effects on user performance and perceived usability. *Applied Ergonomics*, *41*(3), 403–410. https://doi.org/10.1016/j.apergo.2009.09.002

Sotamaa, O. (2007). Perceptions of Player in Game Design Literature. In *Proceedings of DiGRA 2007 Conference* (pp. 456–465).

Sound Effect. (2015). In *Oxford Dictionaries online*. Retrieved from http://www.oxforddictionaries.com

Suh, K.-S., & Chang, S. (2006). User interfaces and consumer perceptions of online stores: The role of telepresence. *Behaviour & Information Technology*, *25*(2), 99–113. https://doi.org/10.1080/01449290500330398

Sun, X., Yao, H., Ji, R., & Liu, S. (2009). Photo Assessment based on Computational Visual Attention Model. *ACM MM*, *1658*(92), 541–544. https://doi.org/10.1145/1631272.1631351

Sweetser, P., & Wyeth, P. (2005). GameFlow: a model for evaluating player enjoyment in games. *Computers in Entertainment*, *3*(3), 1–24. https://doi.org/10.1145/1077246.1077253

Szczesniak, A. S. (2002). Texture is a sensory property. *Food Quality and Preference*, *13*, 215–225. https://doi.org/10.1016/S0950-3293(01)00039-8

Tamborini, R., Eastin, M., Skalski, P., & Lachlan, K. (2004). Violent virtual video games and hostile thoughts. *J. Broad. & Elec. Media*, *48*(3), 335–358. Retrieved from http://heinonlinebackup.com/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/jbem48&section=28

Texture. (2015). In *Oxford Dictionaries online*. Retrieved from http://www.oxforddictionaries.com

The Ren'Py Visual Novel Engine. (n.d.). Retrieved December 2, 2014, from http://www.renpy.org/

Tong, H., Li, M., Zhang, H., He, J., & Zhang, C. (2005). Classification of digital photos taken by photographers or home users. *Advances in Multimedia …*, 198–205. Retrieved from http://link.springer.com/chapter/10.1007/978-3-540-30541-

5_25

Tong, H., Li, M., Zhang, H., Zhang, C., He, J., & Ma, W. (2005). Learning No-Reference Quality Metric by Examples. *11th International Multimedia Modelling Conference*, 247–254. https://doi.org/10.1109/MMMC.2005.52

Tractinsky, N. (2005). Does Aesthetics Matter in Human- Computer Interaction ?, 29–42.

Tractinsky, N. (2013). Visual Aesthetics. Retrieved January 14, 2015, from https://www.interaction-design.org/printerfriendly/encyclopedia/visual_aesthetics.html

Tractinsky, N., Katz, A. S., & Ikar, D. (2000). What is beautiful is usable. *Interacting with Computers*, *13*(2), 127–145.

Ulka Chandini, P., Zaibon, S. B., & Juliana Aida, A. (2014). User Experience on Enjoyable Informal Learning via Mobile AR : Development and Evaluation. *International Journal of Interactive Digital Media (IJIDM)*, *2*(2), 29–34.

United Nations Educational, Scientific and Cultural Organization (UNESCO). (2016). Retrieved July 14, 2016, from http://en.unesco.org/

Van Eck, R. (2006). Digital Game-Based Learning: It's Not Just the Digital Natives Who Are Restless. *Educause Review*, *41*(2), 16–30. https://doi.org/10.1145/950566.950596

Vicary, A. M., & Fraley, R. C. (2007). Choose your own adventure: attachment dynamics in a simulated relationship. *Personality & Social Psychology Bulletin*, *33*(9), 1279–91. https://doi.org/10.1177/0146167207303013

Voice. (2015a). In *Oxford Dictionaries online*. Retrieved from http://www.oxforddictionaries.com

Voice. (2015b). In *Merriam-Webster*. Retrieved from http://www.merriam-webster.com/

Wages, R., Grünvogel, S. M., & Grützmacher, B. (2004). How realistic is realism? Considerations on the aesthetics of computer games. *Ifip International Federation For Information Processing*, *3166*, 216–225. https://doi.org/10.1007/b99837

Wanderley, M. M., & Orio, N. (2002). Evaluation of Input Devices for Musical Expression: Borrowing Tools from HCI. *Computer Music Journal*, *26*(3), 62–76. https://doi.org/10.1162/014892602320582981

Ward, T. B., Becker, A. H., Duffin Hass, S., & Vela, E. (1991). Attribute availability and the shape bias in children's category generalization. *Cognitive Development*, *6*(2), 143–167. https://doi.org/10.1016/0885-2014(91)90034-B

Wardrip-Fruin, N., & Harrigan, P. (2004). *FirstPerson*. Cambridge, Massachusetts: MIT Press. Retrieved from https://mediacultures.net/xmlui/bitstream/handle/10002/616/FP-ch4.pdf?sequence=1

Wei, H., Bizzocchi, J., & Calvert, T. (2010). Time and space in digital game storytelling. *International Journal of Computer Games Technology*, *2010*. https://doi.org/10.1155/2010/897217

Werner, L., Denner, J., Bliesner, M., & Rex, P. (2009). Can Middle-Schoolers use Storytelling Alice to Make Games? Results of a Pilot Study. *Proceedings of the 4th International Conference on Foundations of Digital Games*, 207–214. https://doi.org/10.1145/1536513.1536552

What is Communication? (2015). Retrieved February 18, 2015, from http://www.skillsyouneed.com

Whiteside, J., & Wixon, D. (1988). Contextualism as a world view for the reformation of meetings. *Proceedings of the 1988 ACM Conference on Computer-Supported Cooperative Work - CSCW '88*, 369–376. https://doi.org/10.1145/62266.62295

Worley, G. M. (1999, March 11). *The Effects of Highlight Color on Immediate Recall in Subjects of Different Cognitive Styles*. Faculty of the Virginia Polytechnic Institute and State University. Retrieved from http://scholar.lib.vt.edu/theses/available/etd-030999-145545/

Worley, G. M., & Moore, D. M. (2001). The effects of highlight color on immediate recall on subjects of different cognitive styles. *International Journal of Instructional Media*, *28*(2), p169-179. Retrieved from http://eric.ed.gov/?id=EJ633055

Wu, A. (2015). Dragon Boat Festival 2015. Retrieved July 27, 2015, from http://www.chinahighlights.com/

Zaibon, S. B. (2011). *Mobile Game-Based Learning (mGBL) Engineering Model (PhD's thesis)*. Universiti Utara Malaysia.

Appendix A:

Instrument for Expert Review

DESIGNING NARRATIVE GAMES WITH GAME AESTHETICS FOR PERCEIVED LEARNING IN CULTURAL CONTEXT

Dear Prof / Dr. / Sir / Mdm

EXPERT REVIEW OF GAME AESTHETICS IN NARRATIVE GAME

I am Abdul Syafiq bin Bahrin and currently pursuing Master studies in Multimedia at Universiti Utara Malaysia. I am delighted to inform you that you have been selected to participate in this research on reasons as follows:

- Your qualifications either in Multimedia (especially in game designer) or Instructional Expert in on Computer Science related areas, and/or

- You have been studying/researching/teaching Multimedia (especially in game design) or Instructional Expert in Computer Science areas for at least 5 years.

My Master research proposes the **Designing Narrative Games with Game Aesthetics for Perceived Learning in Cultural Context**. However in short, the objective of this expert review is to validate all the identified aesthetics in interactive product design (especially Game Aesthetics) by scholars that can be relates with Perceived Learning in Narrative Games, from the current game expert in current game industries. For better understanding, below are the operational definition of term in my study:

1) <u>Operational Definition:</u>

Operational Definition 1: Narrative Games

Narrative games is an extended term for a '*game*' which use *narrative elements* (e.g. storyline: plot, character, theme, etcetera) that act as game flow for player to proceed from start until end of the game story. It is a domain for any digital type of narrative games in general, such as Massive Multiplayer Online Role Playing Game (MMORPG), Role Playing Game (RPG), and etcetera. It is also referring to a method of narrating a story in a game.

Operational Definition 2: Game Aesthetics

Game aesthetics is defined as game "attributes" that represent tangible look and sound of the narrative game and contribute to some degree of learning. It also represents game assets such as 2D sprites, 3D models, audio, and etcetera.

The term "*attributes*" in this research represents visual and aural appearance that can be changed. Visual appearance is the look of the game such as text, image, and color. Aural appearance is the sound of the game such as music, sound effect, and voice.

Operational Definition 3: Perceived Learning

Perceived learning are not the learning outcome of the game, but it is defined as *the player's perception towards their content-learning (i.e. cultural content) through the game*, such as ease of understanding/learning in a every/certain part of the game, like "can you understand the story?", "Is it easy or not to understand this/that?", "Can you feel or get the picture of the historical environment within the game?", "Are all the designed characters that participated in the game story helped you to understand the story?", "Is the dialogue/conversation used make you interested to know more about the historical stories?".

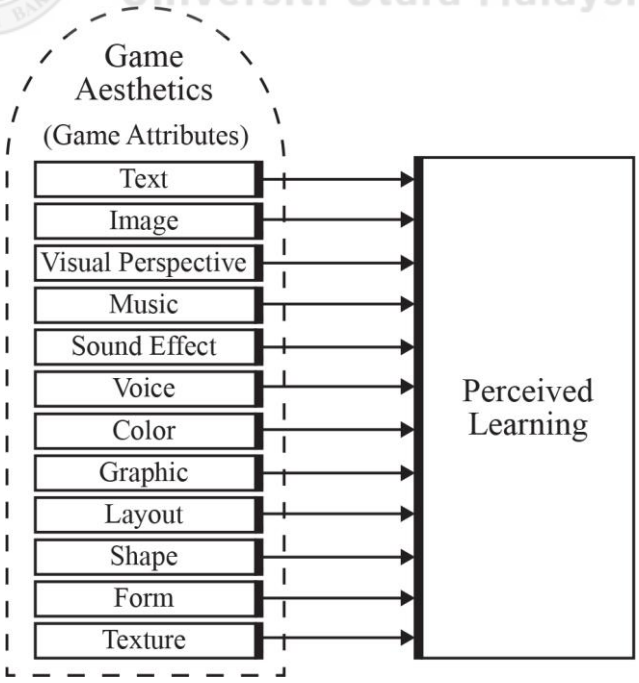
***INSTRUCTIONS:**

Please read and go through the **proposed conceptual model** and its **explanation/previous studies on relationship between game aesthetics and perceived learning** for narrative games development carefully. After that, please fill up the form starting from page 4 until the end. The information supplied will be treated as confidential and will be used for research purposes which may be reported anonymously in academic publications.

Please feel free to contact me by email (syafiqbahrin@gmail.com) in regards to any queries or my supervisor liana@uum.edu.my.

Thank you for your time and assistance.

2) Proposed Conceptual Model:



Proposed Conceptual Model of Relationship Game Aesthetics with Perceived Learning.

This conceptual model were derived from literature that related to interactive digital media including game design by scholars, where most of the previous studies were directly/indirectly concluded that there is relationship between Game Aesthetics and Perceived Learning. Further example/explanation for each relationship were provided in the table below.

3) Explanation/Previous Studies on Relationship Between Game Aesthetics and Perceived Learning

Based on my proposed conceptual model above, each of Game Aesthetics (i.e. ***text, image, visual perspective, music, sound effect, voice, color, graphic, layout, shape, form, and texture***) has its own benefits towards learning by scholars, especially perceived learning. For example:

RELATIONSHIP OF GAME AESTHETICS AND PERCEIVED LEARNING	**EXPLANATION/PREVIOUS STUDIES OF THE RELATIONSHIP**
Text – Perceived Learning	**Text** may contribute into a few factors, such as emotion (Alm, Roth, & Sproat, 2005); connecting ideas in text, differentiate an important and unimportant content (Sáenz & Fuchs, 2002); provide instructions before reading, and awareness during reading (Abadiano, 2002), before analyze the meaning of the content as a whole.
Image – Perceived Learning	**Image** prediction study shows that it can measure the level of interestingness of a person towards the content of the picture, which indirectly relate to learning interest (Dhar, Ordonez, & Berg, 2011)
Visual Perspective – Perceived Learning	**First-person game perspective** can greatly increase players' arousal compared to a **third-person game perspective** (Anderson & Bushman, 2001; Schneider, Lang, Shin, & Bradley, 2004; Tamborini, Eastin, Skalski, & Lachlan, 2004)
Music – Perceived Learning	**Music, sound effect,** and **voice** are a part of sound/audio. It has been suggested by Wanderley and Orio (2002) that there are four essential features that should be main concern in sound/audio development, which are learnability, explorability, feature controllability, and timing controllability. In addition, according to Herbert (2009), there are five factors of aesthetic sounds in aiding the (audio) continuity for the visual narrative (i.e. film, movie), which are environment; dialogue; rhythm; perspective and presence; and dynamic.
Sound Effect – Perceived Learning	
Voice – Perceived Learning	
Color – Perceived Learning	**Color** may develop positive physiological and emotional effects. It also can support the function of the (layout) design, and the carried task in it (Engelbrecht, 2003).

Graphic – Perceived Learning	There is lack of direct-to-**graphic** study. However, it is indirectly contributed to perceived learning as it defined by Oxford dictionary: - "Graphic" (2015), graphic is any kind of pictorial/visual representation of an item (i.e. pictures, words, shapes) that perceived and/or described in a very clear way. In games, graphic usually perceived as Heath Bar (HP), Windows for: volume adjustment, dialogue, and etcetera.
Layout – Perceived Learning	**Layout** aesthetics can be measured in six component, namely cohesion, economy, regularity, sequence, symmetry, and unity (Ngo, Samsudin, & Abdullah, 2000; Salimun, Purchase, Simmons, & Brewster, 2010) for general interactive product design, but it also reflect well in narrative game development. The finding in their study has proved that the higher level of layout aesthetic, the better the game experience/UX (i.e. user learning performance) and also perceived learning, which in term of respond time in a task of visual search (much suitable for narrative game with visual searching gameplay).
Shape – Perceived Learning **Form** – Perceived Learning	Both **shape** and **form** can easily provide shape/form recognition of something without having people to read the label on it. There is no bias (even among school children) in determining the intended message; either shape/form with or without the label on it (Ward, Becker, Duffin Hass, & Vela, 1991).
Texture – Perceived Learning	There is lack of study in term of **texture** studies. However, it may provide greater appearance in term of realism if it combined with another attribute such as color, which also affecting players' recognition memory (Jeong et al., 2008), and perhaps with more attributes such as shape, form, and etcetera.

4) <u>Instrument: Questionnaire Form</u>

EXPERT/REVIEWER DETAILS

Name* :

Age :

Gender : ☐ Male ☐ Female

Highest education level* :

Experiences* : ☐ years

ITEMS TO REVIEW

Section A (Question 1)

Based on the provided literature (in Section 2 and 3), please tick (√) for your choice on which game aesthetics that contribute to perceived learning at most, and justify the reason based on each of your answer.

1. Degree of important on the game aesthetics contribution for perceived learning:

	Game Aesthetics	Very important	Somewhat important	Not very important	Not at all important	Reason/Justification
a)	Text					
b)	Image					
c)	Visual perspective					
d)	Music					
e)	Sound Effect					
f)	Voice					
g)	Color					
h)	Graphic					
i)	Layout					
j)	Shape					
k)	Form					
l)	Texture					

Section B (Question 2)
Based on the **operational definition** (in Section 1), please tick (√) for your choice either Yes or No. However if the answer is NO, please kindly provide your suggestion the following row.

2.	The terms and explanation on each **operational definition** are easy to understand		Yes		No
If the answer is No, please write your suggestion to improve my study. **Suggestion:**					

Section C (Question 3 and 4)
Based on the **proposed conceptual model** (in Section 2), please tick (√) for your choice either Yes or No for all questions. However if the answer is NO (on each question), please kindly provide your suggestion the following row (on each question).

3.	The relationships, connections and flows of all the attributes with perceived learning in **proposed conceptual model** are logical		Yes		No
If the answer is No, please write your suggestion to improve my study. **Suggestion:** I will share with you below on how my team and I refer to a conceptual framework for building narrative in a game.					

4.	Overall, the conceptual model is understandable		Yes		No
If the answer is No, please write your suggestion to improve my study. **Suggestion:**					

5. Please write your further comments below (if have any):

Thank you

Appendix B:
Game Storyline and Gameplay

This section is the details of the game storyline and gameplay for the narrative game's development in this study. The game is estimated to end within 10 minutes of the gameplay.

A. Starting scene:

The story focused in a small Chinese village where the festival will happen one day before. There will be some dialogues among player and all NPCs: Alfred, Chew and Elder Leong. The dialogues tell about what is Dragon Boat Festival by NPC: Elder Leong. Meanwhile, the story also has side story:

[Side Story] - The player is an active Chinese kid. He has a few friends, which one of them is his "love" rival: Alfred. Spoiler: both player and Chew are actually siblings. It will be revealed at the game end. Refer to the conversation below for the dialogues' details.

[Explanation] - To let the player know a little about what kind of thing that they will be playing soon. After having this starting scene, the player should already learn a bit of the game content and objective, so they can proceed to the game without having so much doubt on what is this all about.

Elder Leong asks the player and Alfred to find all the Zong Zi's ingredients for Dragon Boat festival that will be held tomorrow. The player got challenged by Alfred, for tomorrow's competition in order to determine who should give up on "dating" Chew.

Elder Leong : Good morning, kids.
Elder Leong : Tomorrow is the fifth day of the fifth Lunar month.
Elder Leong : It's a DRAGON BOAT FESTIVAL day!!
Elder Leong : Aaron, Alfred. I want you both find ZONG ZI's ingredient.
Alfred : Hey Aaron, I'll find all the ingredient before you!!!
Chew : Good luck Aaron ^__^ I'll cook for the festival.

Aaron : Haha thanks Chew! Then I'll find lots of it :)

Alfred : AAaaaAAaaA!! I won't lose to youuuu!!!!

Aaron : Hey take it easy Alfred, lets do our best, kay? :)

Elder Leong : Enough talking! Hurry up find it before sunset!

Stage one starts here by focusing on the player in a third person view. Player can now freely move in the village to start searching for Zong Zi's ingredients.

B. Stage One Completed

Stage one will be completed when all Zong Zi's ingredients were collected. There will be another conversation among all characters.

Elder Leong : Oh thank you Aaron! Now we have all of the ingredients!

Chew : Congratulations Aaron! You really did bring lots of them!

Aaron : No Problem elder! Thanks Chew! This was nothing :)

Alfred : No!! How could I lost to you!! AAAaaaAA!!!

Elder Leong : Hey you two! This is not a competition.

Elder Leong : If you want a battle, tomorrow will be the day!

Alfred : I will win the DRAGON BOAT RACE and win Chew's heart!

Aaron : So this is what the fuss is all about, huh -_-

C. Middle Scene

The game will loading into next game scene. Elder Leong will explain more about Qu Yuan and Dragon Boat festival history. The side story will continuous as in the conversation below.

Elder Leong : Today, we will celebrate DRAGON BOAT FESTIVAL

Elder Leong : The festival commemorates the death of the poet and minister Qu Yuan

Elder Leong : Qu Yuan suicide in Miluo river because he failed to defense his kingdom.

Elder Leong : As a way of paying respect, we will throw ZongZi into the river.

Elder Leong : And beat on drums and have a Dragon Boat race.

Alfred : Aaron, I will win this main event!! Hahaha!!!

Chew : Good luck Aaron ^__^ and have fun!!!

Aaron : Haha thanks Chew! Ok lets do this Alfred! :)

Stage two will start here. The player will have a Dragon Boat race with Alfred.

D. Ending Scene

There are two ending in this game, either when the player win or lose the final stage.

Winning ending:

The Mayor announcing the winner and congratulates the player's team. Chew feel so happy for the player. Alfred ignore the bet and do not want to give up for the next year's event.

Elder Leong : The winner is...!!! Aaron team!!! Haha!!! Congratulations!!!

Chew : You win again, Aaron! I'm so proud of you, big brother! ^__^

Aaron : Thanks Chew, my cute little sis! It was nothing... hahahaha..!!

Alfred : Noo!!! Not again!! Arrghh!! You won't beat me again next year, Aaroonnn!!!

Losing ending:

The Mayor announcing Alfred's team as the winner and congratulates them. Chew feel so happy for Alfred's, but still supporting the player for the effort. Alfred laughing out loud to the player, showing off his victory, and proud for winning his own bet.

Elder Leong : The winner is...!!! Alfred team!!! Haha!!! Congratulations!!!

Alfred : Awesome!!! I've won!!! Hahaha take that Aaron!!! Hahaha!!! Ya-hooo!!!

Chew : Don't give up Aaron, You can try again next year, my big brother! ^__^

Aaron : Haha yeah I guess so, Chew. Thanks my cute little sis!!!! :)

The game will return back to main page.

THE END

Appendix C:

Questionnaire for Evaluation Process

This section is a questionnaire instrument that will be used in the evaluation process.

MEASURING CONTRIBUTION OF GAME AESTHETICS FOR PERCEIVED CULTURAL LEARNING IN NARRATIVE GAME

Researcher's Name : Abdul Syafiq bin Bahrin
Department : School of Multimedia Technology and Communication, College of Arts & Sciences, Universiti Utara Malaysia, Sintok
Telephone : 012-5956252
Email : syafiqbahrin@gmail.com

Purpose

The purpose of this study is to test on to what extend game aesthetics contributed to perceived cultural learning in the narrative game, based on specific criteria:

- The genre of the game are role-playing, adventure and fantasy.
- The theme of the game is a traditional Chinese cultural and historical of Dragon Boat Festival, which learning content also included.
- The selected player are used to play 3D video games, which will ease and shorten the time of testing process in term of controllability/playability.

Instructions

Please write down your details as in the blank below. After that, please fill up the form starting from page 2 until the end. The information supplied will be treated as confidential and will be used for research purposes which may be reported anonymously in academic publications.

Please feel free to contact me by email (syafiqbahrin@gmail.com) or my supervisor (liana@uum.edu.my) if there is any query.

Thank you for your time and assistance.

Name : _____

Contact No : _____

SECTION A: Demographic participant

Tick your answer where appropriate.

1. Gender:
   ( ) Male ( ) Female

2. Age:
   ( ) 7-12 years old ( ) 13-18 years old ( ) 19-24 years old

   ( ) 25-30 years old ( ) 31 years old and above

3. Gaming skills:
   ( ) Beginner ( ) Intermediate ( ) Advance

4. Money spent for games monthly (in average):
   ( ) RM0 = No cost ( ) RM1–RM500 ( ) RM501-RM1000

   ( ) RM1001-RM1500 ( ) RM1501 and above

SECTION B: The usability and user experience of the narrative game

Circle the number that fits your response best for each statement. Use the following scale:
1-Strongly disagree | 2-Disagree | 3- Neutral | 4-Agree | 5-Strongly agree

	Indicator Statements	Scale				
1)	I like the interface of the game	1	2	3	4	5
2)	I like the graphics/ pictures	1	2	3	4	5
3)	The layout menu are simple to understand	1	2	3	4	5
4)	I like the colors used in the game	1	2	3	4	5
5)	The text is easy to read	1	2	3	4	5
6)	The shapes and forms used in the game are recognizable	1	2	3	4	5
7)	I like the perspective view in the game	1	2	3	4	5
8)	The game has realistic texturing	1	2	3	4	5
9)	I like the background music in the game	1	2	3	4	5
10)	The sound effect aroused/motivated me to enjoy the game	1	2	3	4	5
11)	The voice increases my make-believe of the game	1	2	3	4	5
12)	I could progress through each of the levels of the game	1	2	3	4	5
13)	There is/are level(s) which is hard to play	1	2	3	4	5
14)	The instructions on how to play are easy to understand	1	2	3	4	5
15)	I am used to play this kind of game	1	2	3	4	5
16)	It is easy to control the character	1	2	3	4	5
17)	It is easy to control the camera view	1	2	3	4	5
18)	The interactions of interface are easy to manage	1	2	3	4	5
19)	The interactions within the game world are easy to manage	1	2	3	4	5
20)	The goals of the game are easy to understand	1	2	3	4	5
21)	The hint/feedback is given when I need it	1	2	3	4	5
22)	I always felt immersed in the game environment while playing	1	2	3	4	5

SECTION C: Perceived cultural learning in narrative game

This section will measure on how far your perceived cultural learning towards the content of the narrative game. Circle the number that fits your response best for each statement. Use the following scale:

1-Strongly disagree | 2-Disagree | 3- Neutral | 4-Agree | 5-Strongly agree

	Indicator Statements	Scale				
1)	I have learned about Dragon Boat Festival	1	2	3	4	5
2)	I have learned that the Dragon Boat festival occurs every year on the fifth day of the fifth month on the Chinese lunar calendar	1	2	3	4	5
3)	I have learned that Zong Zi is the main Chinese traditional food for Dragon Boat festival	1	2	3	4	5
4)	I have learned the ingredients for making Zong Zi	1	2	3	4	5
5)	I have learned the festival commemorates the death of the poet and minister Qu Yuan	1	2	3	4	5
6)	I have learned the history of Qu Yuan's death	1	2	3	4	5
7)	I have learned that the dragon boat racing is the main event in Dragon Boat festival	1	2	3	4	5

SECTION D: The preference on the narrative game

1) What are the features of the games which you just have played and liked it?

2) What are the features of the games which you just have played and didn't like it?

SECTION E: The preference on general narrative game

1) What are the features of other narrative game which you have played before and liked it?

2) What are the features of other narrative game which you have played before and didn't like it?

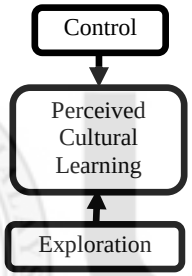
Appendix D:

Transcription of Reasons Given by Experts

Table 1

Degree of Importance of Game Aesthetics for Perceived Cultural Learning in Narrative Games

Game Aesthetics	E1	E2	E3	E4	E5	E6
Image	How I group the elements of conveying narrative: - Cutscene. cinema - Dialogue [ingame interaction], theatre - Flavor Text [worldbuilding], poetry - Typography [part of interface design], calligraphy - Environment [part of level design], architecture, landscaping, sculpture - Sound [sound design], music and singing - Costume [worldbuilding], fashion and culture - Animation, dance - Setting [worldbuilding], prose and painting Provided is also the corresponding Fine Arts or Performing Arts in the analog space of our world that assists in mastering the principles to create the respective narrative elements for a game.	All Game Aesthetics are important because it can make a player(s) 'invested' in their time and effort (interested/pay attention) for the game. (This does not mean that learning are included in their 'investment') The biggest reason they (player) do not want to learn is they do not have the "illusion of choice", which are:	-	-	-	For a learning game to become interesting, the use of images is very important.
Text			-	-	Depend on the game design on what genre and how the game should be played	Text can be somewhat important, but for a learning game on cultural content, text may become very important so that new terms/words/concept can be introduced.
Visual Perspective			-	-	Mostly important	For a learning game on cultural content, visual perspective may become very important so that players may experience or take a closer look at the cultural content from players' perspectives. The game will become more interesting and the learning content can be memorable.
Color			-	-	Components that need to be addressed, especially in certain target user / special need	Color is a very important feature. Choices of colors play an important role in controlling players feeling and creating the game environment. It may transform the players emotion, the look & feel, and turn the game environment into a comfortable one or otherwise.
Graphic			-	-	Mostly important	Graphic is somewhat important. Sometimes it may be omitted.
Layout			-	-	Mostly important	Layout can be considered as a very important feature. Deciding on a layout for a game needs further analysis on the human-computer interaction aspects to optimize the effectiveness of the learning game.

Sound Effect	The reason I do this is because we noticed the exposure level of a designer in real world disciplines, tend to reflect the depth and quality of design ideas in gameplay or narrative provided by the designer. A designer really is only as creative or useful as the amount of time spent living an enriching and educated life. This is why for your Section A Question 1, I marked all elements as very important, because, a person can find ways to turn each visible or aural element of a game towards a narrative focus that becomes a primary means of storytelling, provided the designer has such a skill level to execute it.		-	-	-	Sound effect is normally shorter in length than music and more preferably be used in a learning game than music. So, the sound effect is somewhat important. If it is provided, always allow users to be able to turn the sound on/off.
Voice			-	-	Components that need to be addressed, especially in certain target user / special need	If the voice plays important roles or is part of the cultural content, then it may be very important. Otherwise, it is not very important. If it is provided, always allow users to be able to turn the sound on/off.
Music			-	-	-	Unless music is part of the cultural content than music may not very important features. If music is part of the cultural content, then it will become a very important feature. If it is provided, allow users to be able to turn the music on/off.
Shape			-	-	Depend on the game design on what genre and how the game should be played	Shape can be considered as accessories to layout and therefore can be considered as somewhat important features in a learning game. However, if shapes play an important role in the cultural content, then it can be a very important feature.
Form			-	-	Depend on the game design on what genre and how the game should be played	Form can be considered as accessories to layout and therefore can be considered as somewhat important features in a learning game. However, if forms play an important role in the cultural content, then it can be a very important feature.
Texture			-	-	Depend on the game design on what genre and how the game should be played	Texture can be considered as accessories to layout and therefore can be considered as somewhat important features in a learning game. However, if textures play an important role in the cultural content, then it can be a very important feature.

Appendix E:
Learning Content

A. Dragon Boat

Dragon Boat Festival celebrated traditionally by Chinese in every year. This traditional celebration is to commemorate Qu Yuan's life and death, a famous Chinese scholar in ancient Chinese era of 340-278 B.C ("Dragon Boat Festival in China," n.d.; Wu, 2015). The festival is held on every fifth day of the fifth month in Chinese (Lunar) calendar (Chittick, n.d.). Figure 1 visualizes the festival held in Hong Kong.

Figure 1. Dragon Boat Festival in Hong Kong (Wu, 2015)

B. Zhong Zi

Zhong Zi (Zongzi/Dzong-Dzuh) is the most related Chinese traditional food with the Dragon Boat celebration. It is believed among Chinese that by throwing the rice lumps into the river may stop the fish from eating Qu Yuan's drowned body (Wu, 2015). During the festival, Chinese loves to eat Zhong Zi along with Realgar wine because they believed that in ancient time, the wine was able to cure any poisons,

drive any evil spirits away, and effective to kill insects. (Wu, 2015). Figure 2 shows the image of Zhong Zi along with the wine.

Figure 2. Chinese traditional food (Zhong Zi) and Realgar wine (Wu, 2015)

Appendix F:

Player Preferences on Narrative Game

A. Player preferences on the developed narrative game

Table 1

Player Preferences on the Narrative Game

Good Responses	Adverse Responses
Good camera control; Attractive and interesting music; Easy gameplay; Challenging gameplay; Storyline; Adventure genre; Direct learning; Clear instructions; Attractive and cute character design; Interesting and beautiful graphic; Relaxed game; Easy character control; Hint (feedback) given; The gameplay of racing in stage 2; Learn something from the game; The gameplay of finding items in stage 1; Easily recognizable image material for ZongZi; Can be played by most ages; Free to go anywhere within the environment area; How to play instruction; Difficulty level on each stage; Colors; Cultural theme and information; Storyline is easy to understand;	Hard mouse (camera) control; Hard player control; Too easy; Have to talk to many NPC to get the information; No option to change mouse (camera) sensitivity; Hard Dragon Boat control; No compete with another player(s); No time limit; Hard to find all area; Game and storyline is too short; Unconvincing laws of physics; Confusing searching task; Too many female characters in stage 1 (repeated characters); The gameplay of finding items in stage 1; Dragon Boat movement in stage 2 is hard to control; The environment area is too small; Bad images; Character controller; Cannot move the player faster; Unattractive instruction; Slow dialogues; Not enough pressure; Difficulty is too easy; Not interesting;

Based on Table 1, not all participants have exactly the same preferences towards the narrative game. For example, some of the participants felt that the player and camera controller is good while some others felt it was difficult to handle; Some of the participants prefer the gameplay and objective of finding items in stage 1, while the rest prefer the gameplay of racing in stage 2; Some of the participants felt happy with the difficulty of the narrative game while the rest were vice versa; Some of the participants felt satisfied with what they called - relaxed game, while some others felt that the narrative game does not have enough pressure or excitement for them to play.

B. Player preferences on other narrative game

Table 2

Player Preferences on other Narrative Game

Good Responses	Adverse Responses
Attractive graphic; Challenging gameplay; Adventure genre; 3D game; 2 way communication using microphone (multiplayer); Fighting music in fighting stage; Quest and map on screen; Character with super power or fighting ability; Realistic 3D graphic; High graphic and resolutions; Low graphic and resolutions; Interesting character and storyline; Time limit; Compete with other player(s); Have many levels; Relaxed game; Fighting monster action; Easy to control; Simulation genre; Good graphic and sound effect; Cute character design; Time management gameplay (e.g. Cooking Dash game); Clear and understandable game goals; Complex and complicated storyline; Interaction with other player; Wide environment space; How to play instruction; Branches (nonlinear) dialogues; Easy to play; Faster loading, dialogues, so the player can play faster (ludologist); Killing something; Colors; Interaction; Fighting mechanics and style; Multiple main character to choose to play with; Story branches with different results; Less music; Long storyline;	Computer lag; Require high graphic and PC performance; Illogical environment, gameplay and story; Too many talking scene and no skip button; Too broad camera setting; Hard to proceed to next level; Unclear instruction; Not challenging; Elusive user interface; inappropriate graphic and music, especially on female characters; Unattractive graphic; Unattractive storyline and no moral value; No hint provided; Hard to understand storyline; Time limit to reach next level; Unclear game goals; Fighting or shooting gameplay; Unclear game goals; Too many of glitches (game bugs); Puzzle genre; Sound effect; Crowded area with other players; Voice; Too much repetition; Insane difficulty; Lack of "wow" impact; Complicated storyline; Too many characters;

Results from Table 2 tells that there were both ludologist and narrative ideologist participants during the evaluation. The ludologist prefer less talking scene; has skip button to skip the dialogue; and easy to understand the storyline. The narrativist prefer longer, attractive and complicated storyline.

There were also diversified of genre preferences among participants, such as fighting, shooting, adventure, and simulation genre. Most of the participants prefer cute and attractive character design with high graphic and screen resolutions.

Appendix G:

Completion Time during Quasi-Experiment

A. Time to finish stage 1

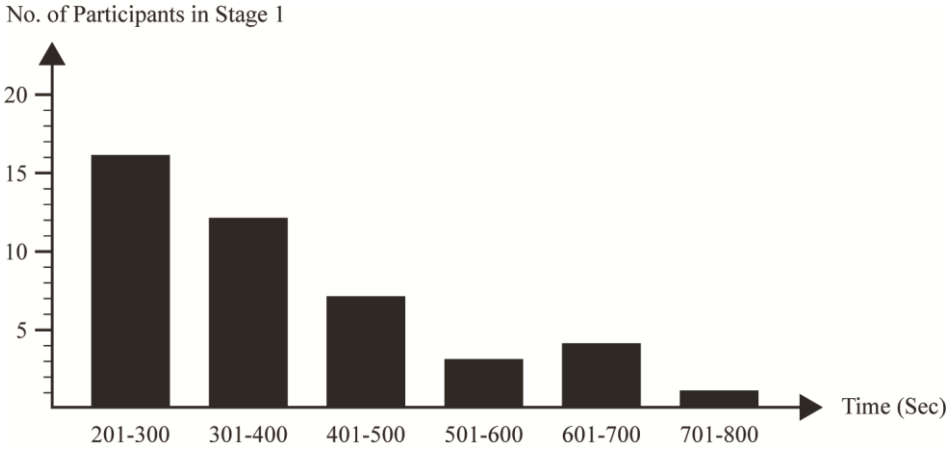


Figure 1. Time to Finish Stage 1

The fastest participant took 207 seconds to finish the stage 1, while the slowest was 735 seconds. However, majority of the participants has completed the stage 1 within 201-300 seconds. It is observed that participants who consumed more time to finish the stage 1 are among the participants who has difficulties with handling the camera movement as mentioned in Table 6.18 (Section 6.1.6). Even these participants were emotionally stressed finding the Zong Zi's ingredients with the difficulties, they tried their best and managed to find all of the ingredients in the end.

B. Time to finish stage 2

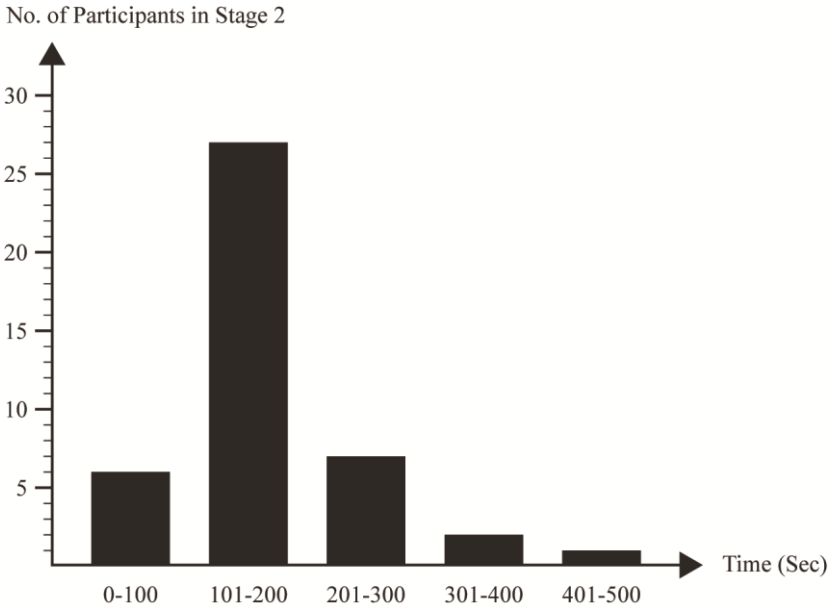


Figure 2. Time to Finish Stage 2

The fastest participant finishes the stage 2 took 55 seconds, while the slowest was 408 seconds which include the repeated stage. The majority of participants took about 101-200 seconds to finish the second stage. Stage 2 is shorter than stage 1. However, this stage has an option for those failed to repeat an unlimited number of attempt. It is observed that all participants managed to completed stage 2 for one time within 0-300 seconds. Those who have failed choose to repeat the stage until they win. The maximum number of attempt is at least four times.