



PROMOTING THE TRADITIONAL HERITAGE OF CHIANG MAI
LANNA CUISINE ARTS BY USING DIGITAL GAME APPLICATION



A Thesis Submitted in Partial Fulfillment of the Requirements
for Doctor of Philosophy DESIGN ARTS (INTERNATIONAL PROGRAM)

Graduate School, Silpakorn University

Academic Year 2021

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การส่งเสริมมรดกทางศิลปวัฒนธรรมศิลปะการทำอาหารล้านนา
จังหวัดเชียงใหม่ โดยใช้ดิจิทัลเกม



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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปรัชญาดุษฎีบัณฑิต
สาขาวิชาศิลปะการออกแบบ แบบ 1.1 ปรัชญาดุษฎีบัณฑิต(หลักสูตรนานาชาติ)

บัณฑิตวิทยาลัย มหาวิทยาลัยศิลปากร

ปีการศึกษา 2564

ลิขสิทธิ์ของมหาวิทยาลัยศิลปากร

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60155912 : Major DESIGN ARTS (INTERNATIONAL PROGRAM)

Keyword : Lanna Cuisine Arts, Digital Game Application, Traditional Heritage, Promoting

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In this research, digital games are designed and developed to promote arts and culture. The art of Lanna culinary in Chiang Mai province is selected as a core to achieve the three objectives of the study: (1) to study the culture of Northern Thai cuisine; (2) to integrate cultural content of Northern Thai cuisine into game design; (3) to develop an appropriate mobile game based on the content of Northern Thai cuisine. The methodology being used is mixed method as the goals are to obtain both qualitative and quantitative data.

The research was divided into 3 phases. Phase 1 was the study of collecting data and interviewing experts on local Lanna food, including researching data and analyzing case studies of digital game design guidelines; Phase 2 is the creation of game prototypes using workshops with a group of game design students and game prototypes using iterative design principles and testing with the group, representatives of Thai adolescents aged 16-18. Observations, questionnaires, and interviews were used to understand user gaming experience and preferences and bring information to develop game features and functions in phase 3 Lanna Cuisine Game that is the result of the final design. It was evaluated by a representative group of Thai teenagers aged 16-18, digital game design experts, educational technology, and Lanna studies by answering questionnaires and interviews from the playtest feedback. This game allows players to practice each step of the Lanna culinary arts. Players will experience cooking in each step from the selection and preparation of raw materials, ingredients, kitchen appliances, including techniques and methods of cooking according to northern recipes inherited in the form of an accurate cooking simulation.

The results in terms of performance, usability, and participation in playing the game Lanna Cuisine suggest that players were highly satisfied. The conclusions of this research contribute to the knowledge of game design methods and practices for cultural content. The guidelines demonstrate an understanding of game design elements associated with cultural content, which positively affects the player experience.

ACKNOWLEDGEMENTS

This research project would not have been possible without the support of many people. The author wishes to express gratitude to an adviser, Assistant Professor Dr. Jirawat Vongphantuset, Associate Professor Dr. Pairoj Jamuni and Assistant Professor Dr. Eakachat Joneurairatana and all lectures in the Design Arts program who were abundantly helpful and offered invaluable support, guidance and assistance this study would have been successful.

My sincere thanks also go to my family, friends and students who devote the time and power to push this research until the final stage with their encouragement and College of Art Media and Technology, Chiang Mai University, professors, and specialists who give the value suggestion Dr. Keattikorn Samarngoon, Dr. Patison Palee, Assistant Professor Dr. Manissaward Jintapitak, Mrs. Thitinadda Chinachan, Researcher of Social Research Institute, Chiang Mai University.

Special thanks must go to Chiang Mai University for the financial support.



Mr. Konlawat KLAYNAK

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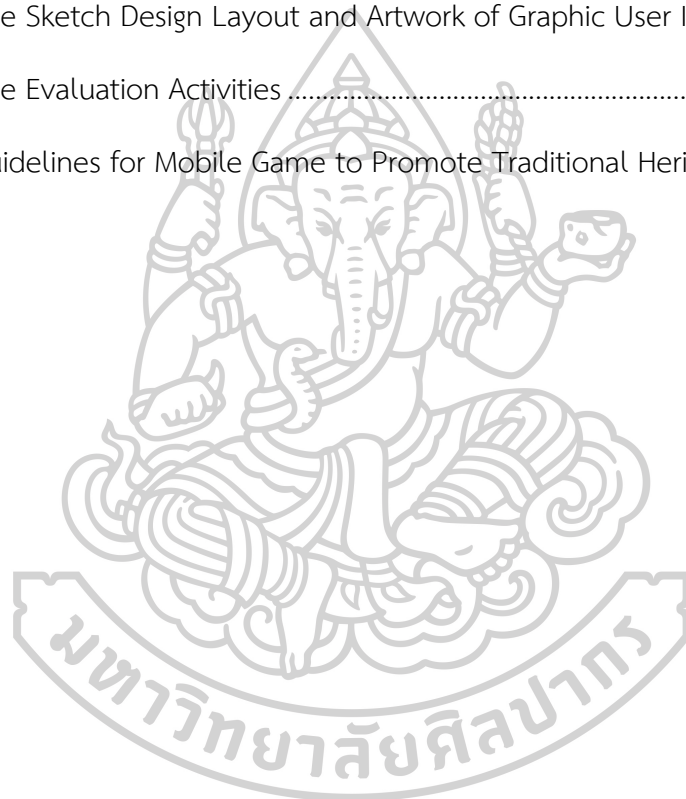
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Chapter 1

Introduction

1.1 Background of the Research

Food is essential to life in every culture as it provides nutrients that the body needs to function properly and contribute to good health and wellbeing. Local cuisine, moreover, holds the value embedded with traditional beliefs in the community and passed on from generation to generation. That is to say, culinary techniques are not spontaneous or instinctive, but have been practiced with family traditions and satisfaction of the society over a reasonable period of time (SaywiChien 2004).

Northern Thailand, also known as Lanna, is renowned for its food culture domestically and globally as the region once possessed considerable power and had great influence across its boundaries. At that time, once people from different backgrounds saw an opportunity to thrive, they started to settle there permanently, bringing cultural diversity to the region. Consequently, came the diversity in cooking methods. Traditional dishes became genuinely unique as the recipes were devised with combinations of flavors and ingredients from different ethnic groups. Lanna food represents its folk wisdom through the tastes, nourishment, and authenticity in every dish.(Suwanapha, Woowong et al. 2018).

Despite a variety of cooking methods and its popularity, some traditional dishes are not widely known and many of them are likely to be forgotten. One main reason is the fast pace of modern life. It is undeniable that globalization has led to homogenization of cultures. With the advancement of technology and freedom of information, not only the world but people's lifestyle has also changed, and this also has affected their eating habits and attitudes towards cultural preservation.

To learn about food in each culture, it is important to understand how people choose their ingredients as there are intimate connections between traditions and the society. (SaywiChien 2004). How people transfer their Local wisdom can be

divided into 2 different ways: unwritten (oral communication, observation and practice), and written on palm leaves or folding-book manuscripts (Suwanapha, Woowong et al. 2018)

Indeed, with young learners, simplicity, excitement and attractiveness of the content being transferred play an important role in effective communication. Common methods used are folk games, folklores, experiments, word puzzles, and entertainment media with local traditions such as lyrics in musical folk dramas, which hold different characteristics according to the regions and are sung in their local dialects.

Additionally, government organizations and private sectors may contribute to preserving and inheriting traditions and local wisdom by integrating them into school curriculums and activities outside the classroom such as talks that involves folk sages or specialist in local heritage, field trips across the regions as well as establishment of learning centers and museums for the community and tourism. (Gaewdang 1998)

The survey conducted by Adecco Group Thailand (2020) reveals that over 50 percent of Thai children taking part in the investigation use smartphones and computers for both study and entertainment purposes. In fact, activities that the children spend most time doing are playing games, browsing websites, hanging out with friends, reading, watching films and traveling, respectively.

Undoubtedly, most games provide playful and engaging activities, but they can also be applied in the process of knowledge sharing, content learning, motivation enhancing and study improving techniques (Hsu, Tsai et al. 2017, Elaiash, Ghani et al. 2018). This research demonstrates approaches to mobile game design to enhance children's learning in Lanna's food culture, fostered in Chiang Mai province. Digital game design involves a number of stages which include creating concept art, game graphics to represent the content, design document, game interface, and calculating system, all of which will benefit the players in learning and memorizing the content of Lanna cooking methods through the play. In addition, Digital games are expected to generate the sense of joy and excitement in children and inform them about local ingredients and recipes. Based on interactive design approaches, the games integrated data collected from experts' interviews, paper prototypes, and

application usability testing. The findings will be used to improve digital game designs that combine graphic novel and augmented reality and applied to other culture-based games in the future.

1.2 The Statements of Problems

This research study recognizes significant problems of cultural content transfer in the Thai culture context, emphasizing on wisdom, ways of life and traditional belief in native regions. One root cause to the problem is a lack of media integration for culture preservation purposes and effective sources of information, resulting in disregard of cultural values. As public interests, especially among the youth, the culture began to fade away, the study offers an alternative way to creating local cultural awareness and transfer, primarily food culture, based on creating inspiration and motivation to learn through gameplay. Media and tools are utilized to enhance student engagement and motivation to gain new experience while playing digital games, requiring them to learn and memorize certain kinds of information. Moreover, the new game design approaches should be beneficial for other culture-based game designs.

1.3 Research Objectives

1.3.1 To examine the fundamental of current practices of Chiang Mai Lanna Cuisine Arts in Northern Thailand.

1.3.2 To analyse the fundamentals of Chiang Mai Lanna Cuisine Arts in the form of Game Design.

1.3.3 To develop mobile game application of Chiang Mai Lanna Cuisine Arts for promoting purposes.

1.4 Research Questions

1.4.1 What are the fundamental practices of Chiang Mai Lanna Cuisine Arts in the Northern Thailand?

1.4.2 Why are the fundamentals contents of game design can help to boost in promoting Chiang Mai Lanna Cuisine Arts in Northern Thailand?

- 1.4.3 How is the Chiang Mai Lanna Cuisine Arts can be promoted by using game design applications?

1.5 Scope of the Research

1.5.1 Scope of Information

1.5.1.1 To study the current methods and elements of game design and function of mobile technologies that can be applied in the local food contents.

1.5.1.2 To study the activity of local food contents transmission to the young generation in Chiang Mai, Thailand.

1.5.1.3 To study the current media presentation of local food content transmission in Chiang Mai, Thailand.

1.5.1.4 To study the behavior, perceptions, and experiences of children who participated in the local food contents transmission by using a mobile game prototype.

1.5.2 Scope of Population

1.5.2.1 The children (age 16-18) who participated in the local food contents transmission by using a mobile game prototype.

1.5.1.5 The audience was interested in local food contents such as students, teachers, professors, historical scholars, and local executives.

1.5.3 Scope of Design

1.5.1.6 To determine the game design scope under the limitations of the mobile technology specification, and function.

1.5.1.7 Theme of the game is Lanna cuisine in Chiang Mai

1.6 Definitions of Terms

1.6.1 Lanna Cuisine Arts refer to prevailing wisdom shared by regional tribes who originally prepared meals with local ingredients with certain unique cooking methods. This resulted in common Lanna dishes the locals make and consume in both their everyday life and special occasions. In addition, Lanna cuisines are often included in cookery lessons for foreigners in Chiang Mai.

1.6.2 Chiang mai is a city in northern Thailand. In the past, the city played an important role in the economy of the Lanna kingdom, the land with heritage and history, and a variety of cultures. At present, Chiang Mai is one of the most visited tourist destinations among Thai people and foreigners. The city is known for its history, unique culture, pleasant weather, and geographical location with stunning views to which tourists are attracted.

1.6.3 Promoting is defined as the emphasis and extension of knowledge in one specific aspect so that the knowledge thrives and becomes more complete with some helpful factors such as the recovery and maintenance of customs, traditions, religions, languages, literatures, fine arts, historical sites, ancient items, musical performance, lifestyle and existing knowledge commonly accepted and perceived as valuables, and therefore, needed to be maintained or improved by its community.

1.6.4 Digital Game Application are games that require such tools as computers, smartphones, and tablets. Not only does the application, itself, provide entertainment, but can also be used in other industries, education and business. Moreover, digital game applications are sometimes designed for specific purposes and have the players think and make a decision in particular ways in order to end the game.

1.7 The Overview of the Thesis

Table 1 The Overview of the Thesis

Chapter 1	The introduction and backgrounds of this research, the statements of the problems, objectives, keywords,
Chapter 2	The Literature on the fundamentals of Lanna Cuisine Arts, Digital Game, Chiang Mai, City Branding and Tourism Industry and Digital Game Application
Chapter 3	The process of collecting data. (qualitative research approach in the two phases of data collection processes)
Chapter 4	The discussions of findings of second phase data collection processes.
Chapter 5	The conclusion and recommendation of this research

Chapter 2

Literature Reviews

In this chapter, the researcher reviews many aspects of game design principles, and Lanna's cultural contents, in the literature that is relevant to this study

2.1. Lanna Cuisine Arts

2.1.1. Definition

2.1.2. The Development of Lanna Cuisine Arts.

2.1.3. The significance of Lanna Cuisine Arts in the Chiang Mai Community.

2.2. Chiang Mai

2.2.1. The significance of Chiang Mai

2.3. Digital Game Application

2.3.1. Definition

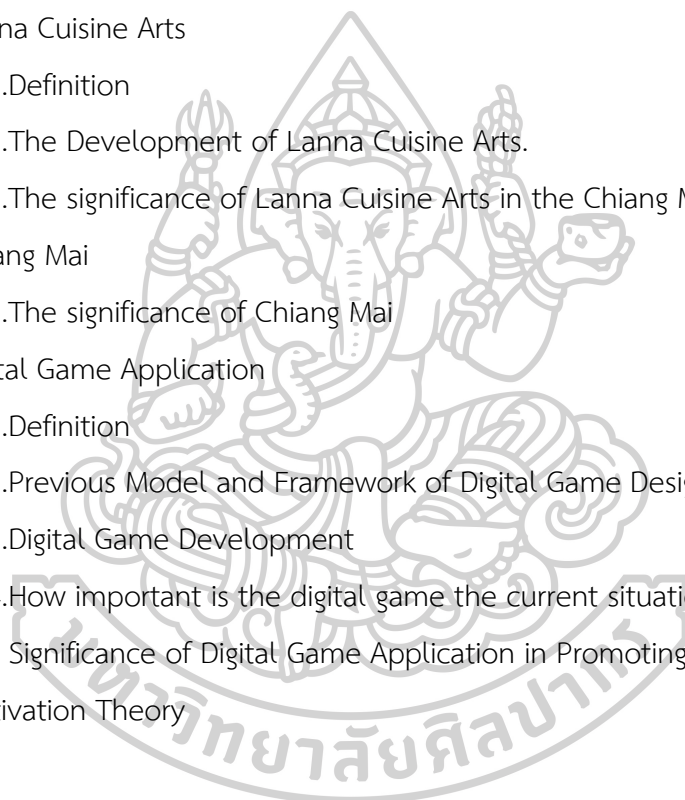
2.3.2. Previous Model and Framework of Digital Game Design

2.3.3. Digital Game Development

2.3.4. How important is the digital game the current situation.

2.4. The Significance of Digital Game Application in Promoting Lanna Cuisine Arts

2.5. Motivation Theory



2.1 Lanna Cuisine Arts

Food has unique characteristics in its cultural identity as it reflects how the locals use their native ingredients, spices and herbs and how they devise their cooking methods. More importantly, food culture shows a strong connection between generations as it represents traditional wisdom with regard to the procedures and preparations, accumulated and transmitted over decades or centuries (Gibson 2020). Culinary techniques are not spontaneous or instinctive but have been practiced with family traditions and satisfaction of the society over a reasonable period of time (SaywiChien 2004).

The responsibility for passing culinary knowledge to future generations rests with communities and ethnic groups since it is essential for the preservation of culinary cultures (Ohiokpehai 2003). The United Nations stressed the importance of preserving traditional food knowledge to new generations, carrying out deep cultural and ethnic identities for themselves or as peoples (UNESCO 2007) through the International Workshop on Traditional Knowledge.

Suwanapha, Woowong et al. (2018) states that local cuisine refers to food consumed in everyday life and occasions, as well as special events according to traditional practices. Ingredients and spices can be those found in the region, wild harvested or hunted, and domestic farms. Traditional cooking methods are unique and, as a result, bring about distinctive flavors and most prominent features of local food include:

- being consumed in every life and special occasions.
- being cooked with local ingredients and condiments found in the regions.
- being made with both simple and complicated methods but able to retain ingredient taste and flavor.
- comprising a variety of cooking methods and techniques.
- being prepared with different methods directly related to seasons.

Locally sourced ingredients can be classified in to 3 categories:

1. Indigenous vegetables, which can be found in the region (grown naturally in the wild) and private domestic gardens. These vegetables are prepared with traditional cooking techniques.

2. Sources of protein like fish, which in the past could be found in freshwater, poultry, which are common in many households, mice from the rice fields, birds and snakes, which the locals have to ensure that they are well cooked before serving.

3. Condiments, which were originally made with simple methods and therefore were often tasteless, are used for different purposes: enhancing the taste of the dish and other specific purposes such as suppressing meaty smell. There are 2 types of condiments: plants (lemongrass, bergamot, tamarine, or kaempferia) and dried or preserved condiments (shrimp paste, fish sauce, or fermented fish sauce).

2.1.1 Definition of Lanna Cuisine Arts

According to the research by Sikhiram (2018), Lanna food can be categorized into 3 groups according to seasons: winter, summer, and rainy. Not only the climate, but the terrain, occupations, ways of life and the relationship between local Lanna people and those in different regions play an important role in Lanna cooking techniques. There are 3 distinctive types of the food including rice, vegetables and meat.

- Rice is an integral part of Lanna culture, especially sticky rice grown in rainy seasons. This directly affects the local way of life, and therefore it contributes to rice-related beliefs and traditions in almost every aspect of the community (its local dialect, folk plays, cooking equipment, cuisine and the cooking methods).

- Vegetables (seasonal vegetables) are often naturally grown and can be found along the rivers or near the lake in particular. At the present time, the locals can find them from 3 different locations: in the wild, domestic garden, and at the market.

- Protein sources from freshwater (shrimp, molluscs, crabs and fish) and domesticated farms (cattle: pigs, cow and buffaloes, and poultry). Insects are also common in Lanna cuisines (crickets, ant eggs, dung beetles, dragon flies etc.)

Lanna cuisine is often full-flavored as its most common tastes are spicy, salty and sour while sweetness is not favorable. The Lanna dishes are therefore named with its cooking method and this influences how scholars classified the dishes into different groups, but desserts are not included.

Table 2 Classification of Lanna Cuisine Based on The Source of Ingredients or Seasons. (Bangsud and Arom 2015)

Seasons	Main Ingredients	Examples
Winter	Tomatoes, bok choy, beefsteak seeds and leaves, fermented soybean sheet.	Nam Prik Ong (น้ำพริกอ่อง) - Fried Chilli Paste with Minced Pork and Tomato, Puk Gad Jorr (ผักกาดจ้อ) - Northern-styled Bok Choy Soup, Kaeng Kradang (แกงกระด้าง) - Curry Aspic Jelly),
Summer	Sweetleaf bush, red ant eggs, green jackfruits, Piper sarmentosum leaves	Kaeng Khae (แกงแค) - Mixed Vegetable Curry with Piper sarmentosum leaves, Kaeng Kai Mod Daeng (แกงไข่มดแดง) - Spicy Ant Eggs Soup), Yum Banun (ตำบ่าหุน) - Spicy Jackfruit Salad
Rainy	Earthstars, bamboo shoots, green agaric mushrooms, black currant leaves, freshwater snails	Kaeng Hed Poh (แกงเห็ดเผาะ) - Earthstars Curry with Black Currant Leaves, Nam Prik Nampu (น้ำพริกน้ำปู) - Freshwater Crab Paste, Kaeng Nor Mai (แกงหน่อไม้) - Bamboo Shoot Soup, Hor Neung Pla (ห่อหนังปลา) - Steamed Fish in Banana Leaves
all year round	Green Cayenne pepper, eggplants, banana blossoms.	Nam Prik Num (น้ำพริกน้ำผัก) - Green Cayenne Pepper Paste, Kap Moo (แคบหมู) - Crispy Pork Rind Khai Pam (ไข่ป๋าม) - Grilled Egg in Banana Leaf Tray

Table 3 Classification of Lanna Cuisine Based on Traditions and Races. (Bangsud and Arom 2015)

Buddhist Practices	Jackfruit Curry (แกงขมูน), Spicy Chicken Soup (ยำจิ้นไก่), Spicy Buffalo Meat Salad (ลาบควาย), Hor Neung Jin Kai (ทอดนึ่งไก่) - Steamed Spicy Chicken in Banana leaves, Kaeng Ho (แกงโฮะ) - Hinley Curry with Mixed Vegetables and Glass Noodle
Chinese Muslims	Kao Soi (ข้าวซอย) - Curry Noodle
Burmese	Kaeng Hang Le (แกงฮังเล) - Hinley Curry
Shan	Sai Ua Spicy Sausage (ไส้อั่ว), Curry Aspic Jelly (แกงกระด้าง) Rice Noodle with Nam Ngiao Soup (ขนมจีนน้ำเงี้ยว),

Table 4 Examples of Lanna Food's Name and Description (Sikhiram 2018)

Cooking method	Local Name	Description	Examples
1. Curry	"Kaeng"	This kind of food is cooked from mixing water, and curry paste which its main ingredients are shallot, garlic, fermented soybean, shrimp paste (rough), and fermented fish, with meat and local mixed vegetables	Kaeng Banun (แกงขมูน) - Jackfruit Curry, Kaeng Hang Lay (แกงฮังเล) - Hinley Curry with glass noodle
2. Stir-fries	"Jao" or "So Namman"	Putting ingredients in a pan and stir-fry them with or without oil.	Laab Kua (ลาบคั่ว) - Spicy Meat Salad Stir-fries
3. Stew	"Kaeng Om"	Stew is slow-cooked meat soup enriched with different kinds of spices as well as sliced galingale and piece-cut lemongrass.	Beef Om Curry (แกงอ่อมเนื้อ), Pork Om Curry (แกงอ่อมหมู)

Cooking method	Local Name	Description	Examples
4. Spicy Salad	“Laab”	This kind of food is made of meats such as pork and fish by chopping them before mix with roasted pounded spices. There are both raw and cooked spicy salads.	Laab (ลาบ) - Spicy Minced Pork Salad and Spicy Minced Beef Salad
5. Chili Dip	“Nahm Prik”	Main ingredients of chili dips are chili (fresh or dried), salt, shallots, garlics, etc. Other ingredients can be also added, as shrimp paste, fermented soybean sheet,	Galingale Chili Dip (น้ำพริกข่า), Fermented Fish Chili Dip (น้ำพริกปลาเ้า), Fresh Water Cab Paste Chili Dip (น้ำพริกน้ำผัก)
6. Mixing	“Yam, Tam, and Sah”	This kind of food is similar to spicy salad in terms of cooking that all ingredients are mixed with little spicy seasoning sauce.	Tam Banun (ตำขมุน) - Green Jackfruit Spicy Salad, Sah Ba Khuea Phoi (สามะเขือ) - Thai Eggplant Spicy Salad.
7. Steamed	“Hor Neung”	This kind of food is made of well-mixed ingredients putting on a banana leaf to look nice and folding it before steaming in a steamer.	Hor Neung Kai (ห่อหนึ่งไก่) - Steamed Chicken
8. Grilled or Roasted		This kind of food is prepared for cooking by mixing meat with ingredients such as salt, curcumin, and pounded garlic, then grilled or roasted.	Jeant Ping (จิ้นปิ้ง), Tab Ping (ตับปิ้ง)
9. Grilled or Roasted	“Ab”	This kind of food is made of well-mixed ingredients putting on a banana leaf, then folded into flat pattern and clipped with bamboo pins before grilling or roasting.	Ab Pla (แอ็บปลา) - Grilled Fish in Banana Leaves), Ab Ong Or (แอ็บอ่องออ) - Grilled Pork Brain in Banana Leaves),

Cooking method	Local Name	Description	Examples
10. Grilled or Roasted	“Ok or Od”	This kind of food looks like “Ab” but it is cooked by putting the food in a pot and pouring some water before heating up with a light fire.	Ok Pla (อีอกปลา) Fish Ok), and Ok Kung (อีอกกุ้ง) - Shrimp Ok.
11. Grilled or Roasted	“Auk”	This kind of food looks like Ab and Ok in a way that curry paste is used but added with more water like curry, and it takes a longer time to cook. This method is widely used with a large piece of meat such as pork, beef, buffalo meat and chicken. It is stewed until soft, with kaffir leaves, cilantro and crushed lemongrass are added to make it smell nice.	Jeant Huam (จิ้นฮู่ม) – Meat Auk, Auk Kai (อีอกไก่) – Chicken Auk
12. Khao Bai		This kind of food is mainly made of cooked sticky rice. After, crab paste, chili paste, vegetable paste or fish are applied on the sticky rice, and it is folded before being rolled like a timber. Unfolded Khao Bai should be placed on a banana leaf before using a charcoal to apply on sticky rice giving a nice smell of crab paste will emerge.	Khao Bai Nam Pu (ข้าวบายน้ำปู), Khao Bai Pla Tu (ข้าวบายปลาทุ)
13. Juen		This kind of food is cooked with a great deal of oil in frying or deep-frying. It is widely used with pork rind.	Kap Mhoo (แคบหมู) - Pork Cracklings Juen, Nhang Pong (หนังพอง) - Nang Pong Juen

2.1.2 The Development of Lanna Cuisine Arts

Bangsud and Arom (2015) states that Lanna people often make every use of natural resources count. The term Lanna is defined in some record that it refers to the land with millions acre of rice fields (millions is Lan, the first part of the name, and rice field is na, the second part) surrounded with mountains, rivers, and canals flowing through towns. With the abundance of nature, Lanna cuisines originated from the local wisdom as the ancestors lived in harmony with nature. The cuisines have gone through changes and improvements over the time and finally formed the characteristics of Lanna food, made with locally grown vegetables and mixed with meat or other sources of protein like edible insects or caterpillars. There are different types of Lanna dishes, which include chili pastes, soup and Lanna salad. Traditionally, Lanna dishes were influenced by agrarian society, resulting in simple cooking approaches with similar main ingredients. For example, when it comes to chili pastes, the pastes are not only made with chili but also certain kinds of meat or edible insects, served with vegetables found in the area, such as jackfruits, bamboos, mushrooms, local nuts, tomatoes, egg plants, galangals and gingers. Freshwater is also a great source of ingredients for chili pastes.

Cookery skills in Lanna were learned and practiced in Krua-Fai, which refers to kitchen. There was no formal cooking class, so only those who spent much time in the kitchen were more likely to know how to cook. Another place where the local learned about the cuisine was when festivals or ceremonies were held as they often made special dishes like Kaeng Hang Lay (แกงฮังเล) Kaeng Banun (แกงขนุน) Spicy Buffalo Meat Salad (ลาบควาย), Hor Neung Jin Kai (ห่อหนึ่งไก่). Similarly, Tatsanee Aromgleang and Suparb Chattaporn (2014) mention that, to transfer knowledge in Lanna cooking culture, there should be (1) the sharers or the older family members who are knowledgeable and possess the ability to cook and willing to pass knowledge on to other (2) the receivers such as grandchildren, younger family members, relatives and friends (3) the methodology to transfer the cookery knowledge at everyone's convenience by practicing through each stage with particular techniques and secrets from previous generations, and (4) the result of knowledge transfer that equip the receivers with new experience, abilities and skills.

Moreover, this could bring about innovative ideas to improve classic cooking methods and recipes with adaptation to a fast-changing world.

Indeed, the passed-down family recipe of a dish called Kaeng Hung Le benefits Lanna culture by preserving a long-traditional cooking practice of the locals and the family by strengthening their relationship.

The previous generation of Lanna people favored an act of gathering with family during meals. Food was served on a round tray or Khantoke, a round low table used to serve the food in Lanna style made of teak wood. These days, rattan is more preferable because of its light weight. Khantoke is, therefore, considered a dining table for the Lanna (Bangsud and Arom 2015)



Figure 1 Food culture of Lanna people. (NorthernThai Information Center 2021).

In 1953, Lanna cuisine was served to welcome elites in the area for the first time. The food was served on a round wooden low table, called Khantoke, for dinner. This practice became common afterwards. Visitors to the land were then treated similarly until 1960, the Khantoke dinner was served to groups of youth Buddhist monks. Later in 1975, this unique style of dinner serving was used by Thailand Cultural Center, Chiang Mai, to promote Lanna tourism. (the Old Chiang Mai Cultural Center). (Porananond 2015).

At present, the Khantoke dinner is represented as activities where visitors take part to learn not only about the cuisines but also how to make them. This way, more and more tourists become interested and look forward to visiting the land. Likewise, the study conducted by Tantraseub and Madhyamapurush (2018) reveal more specific information after Chiang Mai province held cooking-related events: cookery classes, short cookery courses, sessions on how to select ingredients, campaign to invite tourists to try Lanna local food, as well as Thai food, in local restaurants, Khantoke dinner with Lanna shows, it is evident that local food can be utilised as soft power to reflect traditional way of life in Lanna, Chiang Mai.

2.1.3 The Significance of Lanna Cuisine Arts in Chiang Mai Community

Geography of Chiang Mai and its climate contribute to abundance in natural resources and water, allowing local people to find ingredients and prepare meals. Additionally, Chiang Mai is the center of Thai northern tourism, the uniqueness of Lanna cuisine have considerable potential to attract tourists, particularly in terms of Gastronomy tourism, because of richness in history, legends and diversity of cultures such as the Thai Lu, Thai Yai, and Thai Yuan. Such diversity, however, is finely blended and represented in Lanna cuisine. From the study carried out in 2015 Sompong and Rampai (2015) deep interview questions were used to gather information from tribe leaders and experts. The results show that Lanna cuisine can be seen as promising factors for the tourism industry, especially Lanna culture in the upper north. As there was a growth in the number of local restaurants along the main routes used by travelers, and many of traditional Lanna dishes were prominent in those located around tourist attractions.

2.2 The Significance of Chiang Mai

Nop Busi Sri Nakorn Ping Chiang Mai (known as Chiang Mai, the current name) was the center of the Lanna kingdom. At the time, Chiang Mai was defeated by Myanmar and other powerful kingdoms for many times, before it was ruled by Siam during the reign of King Chulachomklao (1868 - 1910). The king revolutionized and united his kingdom. Lanna became part of Thailand and is considered one of the

most important cities because of its geography and natural resources, including Suthep Mountain and Ping River. The city is large enough to accommodate migrants and tourists, so it is considered the center of Lanna. Ping River also played an important role in transporting goods and passengers from Chiang Mai and Bangkok for decades before the city became the center of Lanna culture and Lanna products in the late twentieth century. Chiang Mai has become a famous destination for not only Thai people but also foreign tourists because of its local history, diversity of races, culture and stunning scenery. Globalization has driven growth in the tourism industry, resulting in Chiang Mai being pushed to grow rapidly (Selway 2020) Growth in tourism brought about new potential for the city to boost its economy, enhance its identity and pride in cultural heritage. Moreover, in terms of transport, Chiang Mai is the start of a number of routes to other cities in Thai northern region, as well as its neighboring countries like Myanmar and Laos. In 2022, Chiang Mai is regarded as the best tourist destination in the world according to Conde Nast Traveler's Gold List 2022 (Tourism Authority of Thailand (TAT) 2021)

2.3 Digital Game Application

2.3.1 The Definition of Game

The term game, without one fixed definition, is distinctively seen by scholars, such as anthropologists, philosophers, and historians, and designers from different fields.

With an attempt to define the term with which everyone agrees, the discussion became a philosophical argument. Ludwig Wittgenstein, (Rader 1960) states that instead of making an effort to give a precise description, game can be described differently, but at the same time, they should have some common characteristics. He even compares the term with family. Midgley (1974) shares a similar view and explains further that Wittgenstein explores the term game from the perspective of a linguist while Midgley emphasizes on the needs that game fulfill and suggests that there are underlying reasons why we, as humans, play games. To illustrate, chess players do not, indeed, see the game as a brain teaser, but rather a

challenge given through rules and limitations. Therefore, to identify what a game literally is, elements such as determining its definition and its designs need to be considered.

According to the table 5, it is obvious that although the game definitions vary, there are connections in terms of words used and the mentions of similar elements. Thus, one of the keys to successfully design a game is the understanding of its meaning and the way the game is explained so that all the participants know what to expect from the game and see the entire perspective of its concept and scope. This, as a result, help the game communicate with players more efficiently.

Table 5 Examples of How the Term Game is Defined.

Name	Description
Salen and Zimmerman (2004)	A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome.
Fullerton (2008)	A closed, formal system that engages players in a structured conflict and resolves its uncertainty in an unequal outcome.
Burgun (2012)	A system of rules in which agents compete by making ambiguous, endogenously meaningful decisions.
Gibson (2017)	Game as consequences of decision-making once a player is motivated to achieve its goal by either solving problems or attempting to overcome unnecessary obstacles successfully
Adams (2019)	Games are a type of play activity, conducted in the context of a pretended reality, in which the participant(s) try to achieve at least one arbitrary, nontrivial goal by acting in accordance with rules.
Schell (2020)	A game is a problem-solving activity, approached with a playful attitude.

All things considered, the researcher concludes that games consist of an interactive system, responding to the player's commands, rules and regulations, and clear objectives all of which contribute to the player's progress and achievement that keep them challenged and motivated.

Digital Game

To understand 'digital game', similarities and differences between *playing toys* and *playing games* need to be clarified. According to the definition given by Adams (2019) a game requires two elements: rules and a clear objective. This, therefore, makes game structures more complicated when compared to those of toys or puzzles. Another point to consider is that most games are designed for a particular age group so that the players are able to understand the game system, stay focused as well as follow the rules, which helps explain why young players often begin with fun and easy puzzles before starting to play games.

Gibson (2017) refers to the term game as consequences of decision-making once a player is motivated to achieve its goal by either solving problems or attempting to overcome unnecessary obstacles successfully

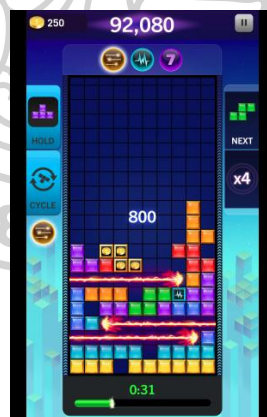


Figure 2 The Tetris Blitz by EA. (Tetris 2021)

Fisher (2015) has described digital games as a cooperative activity or an interactive experience to accomplish its mission by a single or multiple players, and the rules should always be followed. Tetris, for example, requires players to clear one or more horizontal grid lines by completely filling them with different

shaped pieces, which continuously descend to the screen. As the blocks disappear, points are calculated automatically. Every ten lines removed, and the game becomes more challenging. The shaped pieces fall faster. The goal is to remove as many lines as possible or earn the highest score until the pieces can no longer be placed, which means the game is over.

Video games are considered a digital game where players interact via technology equipment with visualizing responses on a display screen. (Aslan 2016) Then, players can now access games through various hardware platforms, including console systems, personal computers, smartphones, tablets, virtual reality headsets, and smartwatches.

Games are items that motivate play, according to Schell (2020), who also defines a game as a problem-solving task done with a fun mindset. There are 10 important features in all game: 1) to enter willfully 2) goals 3) conflict. 4) rules. 5) to be won or lost. 6) to be interact. 7) challenges 8) to create their own internal value 9) to engage players 10) to be close formal systems.

Zubek (2020) proposes that, in order to understand and develop games, the four main components: storytelling, art and visual design, game cultural analysis, and gameplay and interaction whereby the player performs have to be taken into account.

Overall, a digital game is a playful interactive experience with the use of technology and digital automation systems for visual and auditory perception that allows players to make decisions and accomplish the goals while complying to its rules, making the game challenging.

Digital gaming platform

Digital games have seen a vast improvement in its artistic content and gameplay since its beginning in the late twentieth century (1950s and 1960s). Also, the gaming industry is expanding as new platforms for video games have been introduced to the market every year, some of which take advantage of cutting-edge technology and offer virtual reality experience to the players. Others, meanwhile, are more casual and can be played while traveling. That is to say, it is important to

consider all the positive and negative aspects of each platform before choosing which one to develop. Choosing the one that significantly contributes to the player's entertainment experience is key to good game design. Currently, all the digital games platforms available are as follows:



Figure 3 Console Gaming (Rivera 2020)

credit: Photo-Illustration: Vulture, PlayStation, Nintendo and Xbox

Console gaming has existed for a long time and been one of players' preferences because its compatibility extends to a large number of digital games. Nintendo, Xbox and Play Station take turns to become the market leader in the console gaming market. This is a good indicator of technology development and innovation.

Initially, joysticks were mainly used with a graphic processor to simply control or move an object on the screen, and they have been revolutionized with gyroscope, accelerometer, or even GPS to enhance the controller's performance. 4K gaming monitors have also seen an increase in demand as most of the console games require a high-resolution display so that the game can operate smoothly and deliver the most realistic graphics possible, especially for AAA (Triple A Game) or high-profile games, which are developed by major publishers with a large development and marketing budget. Therefore, it is suitable for players with higher engagement and immersion.



Figure 4 Computer Gaming. (Sebastian 2014)

Personal computer (PC) gaming has over one billion players (1.2 billion) as a personal computer and the internet is more accessible when compared to other platforms, and because a computer is an efficient tool for high resolution image processing and real-time visualization. More importantly, computer networks allow players in different locations to interact in the game, cooperate in problem solving, or compete against each other with realistic experience. In addition, players can customize their computer hardware specifications (ram, graphic card, mouse and keyboard, as well as a joystick) to meet gaming system requirements or maximize its performance. Moreover, computers support live streaming, which makes it more enjoyable when players broadcast themselves real-time via the internet while playing so that the live audience can watch the game on their devices.

Personal computer (PC) gaming ranges from casual games, often played with Flash, HTML5, unity, and other plug-ins on internet browsers to AAA (Triple A Game), so they can run on both desktops and laptops. With a large number of users and its convenience, there have been thousands of free games available on the internet, for example RuneScape, FarmVille, Catan Universe, Slither.io, Freeciv, Townscaper (Hadley and Morton 2021) In fact, there are also a number of educational games which teachers can adapt to their lessons in order to increase student motivation. Organizations like PBS KIDS, Nick Jr. and Disney have also launched a website, in particular to offer fun classroom games and interactive activities for children.

Cloud gaming, the latest gaming service, refers to the method of using cloud servers to store data instead of the players' devices. This provides the players

with hardware flexibility as they can use personal computers, consoles, laptops or even mobile phones, any of which, however, requires reliable internet connection in order to access the game servers. That is to say, game cards or installation files are no longer needed. Vortex, Parsec, and Google Stadia are some of the most popular games on this platform. The services have received positive reviews saying the games run smoothly without restriction of time and place. (Thongsumrit 2019)

Arcade gaming is a coin-operated machine, also known as an arcade cabinet, designed for one game. The machines themselves are equipped with consoles and controllers such as joystick and control panels, CRT (Cathode ray tube) as well as speakers. The shape and size of each cabinet, therefore, are determined by the game it contains, but they often share some features; upright and painted with the game logo and parts of a scene which can be seen from a distance.



Figure 5 Arcade Gaming. (Wikipedia 2022)

In the 1980s, arcade gaming was considered successful business as the machines, with a variety of games, appeared in most locations, while these days arcade gaming is relatively common in shopping centers or cinemas.

Virtual Reality (VR) gaming offers an experience in a three-dimensional environment that simulates reality, immersing the players in an artificial world with VR gaming hardware such as Oculus Rift, headphones, and joysticks, whichever is compatible with an item being used in the game (a weapon, a golf club or even a pan). The players then feel as if they were in a fantasy world where they could do anything, from playing golf to fighting with monsters, according to the game theme.



Figure 6 VR Gaming (Wikipedia 2022). and AR Gaming. (Dorfman 2018).

Augmented reality (AR) gaming, in contrast, brings three-dimensional objects into the real world. One of the most obvious examples is Pokemon Go, a game in which players use their smartphones to discover monsters in the physical world. The players' experience is enhanced as they can find the monster throughout the city, at any time. This outstanding example shows how gaming technology has expanded the digital game market while broadening the player experience.



Figure 7 Mobile Game. (Nadav 2021)

Mobile gaming is video gaming designed for smartphones and tablets on which the players download and install from online stores such as Apple App Store, Google Play or Amazon. Mobile game genres range from casual to more complicated ones, in which players sometimes have to invest both time and money. Common features of this kind of game are uses of camera, GPS, gyrometer or accelerometer to support a variety of games.

According to the data gathered in 2019, mobile gaming accounted for 45% of the video game industry. Almost a third of the world's population use game applications because of its variety and convenience. Not only do they require additional devices, but the players can also play them anywhere at any time. On average, people spend approximately 6.5 hours per week playing mobile games instead of doing other recreational activities. In addition, the mobile gaming market is growing well as there have been more and more investments and innovations in the field of game design contribute to more countless challenging games.

The Core of a game

Core game or Core dynamic is considered a vital part of the gameplay as it represents the experience the creators intend to offer to their players while playing (Brathwaite and Schreiber 2009). In other words, the core game is the way the players should play it. Most common core games are as follows:

Territorial Acquisition, whose concept is to reach zero-sum or a win-lose situation, is based on a mathematical model where one player fails to dominate another player in all circumstances (Binmore 2007) resulting in zero-sum for their outcome. Many turn-based strategy games and games like Risk and Carcassonne feature this core dynamic.

Prediction is employed in the games by which players anticipate the outcome concerning their decisions in a particular situation. Only if they have done something accurately or at the right time, will they be rewarded for their anticipation, before starting a new round. Most games with this core dynamic are fortune-oriented like Roulette or Rock-Paper-Scissors (Cesa-Bianchi and Lugosi 2006)

Trading has different features as players exchange information, sell and buy game items instead of competing against one another. This core dynamic involves a variety of resources for each player such as Settlers of Catan, where players negotiate for items for which they are looking, Animal Crossing and Pokemon also feature market channels where players negotiate trades. (Brathwaite and Schreiber 2009)

Survival games refer to those with the concept of staying alive, and the objective of each game may vary. Such games as Don't Starve or Minecraft start from collecting food supply, building the shelter, to utilizing other resources while games like Contra or Hades can be more stimulating as the players have to gain power and fight against their enemies or make an escape from certain conditions. (Jamal and Semwal 2019)

Spatial Reasoning requires the players to think logically and figure out the most feasible solution on what needs to be done in order to solve each problem. Chess is among the clearest examples of how this core is put to use. Chess players think of strategies and tricks to anticipate and control how their opponent would move their pieces before they make their own move. Another example can be seen in games like Tetris, where players have a clear picture of all the blocks they lined up while considering how to move or rotate the coming piece as it falls and paying attention to the following one as well. (Brathwaite and Schreiber 2009)

Destruction is a core dynamic for games where players destroy or stop something from existing. It is common in PvP (Player versus Player) and FPS (First person shooter).

Building is created on the basis of development and management strategy where players make plans for a city, town or even a game character in an RPG (Role Playing Game). Core dynamic is chiefly concerned with character development as their power and weapon skills increase.

Race to the End is on the basis of winning a race with speed like Candy Land, and Mario Kart.

Chasing or evading involves the chase or evasion like Pac-man, a classic game with this core.

Collecting or matching is a core game where players score by matching things that look alike or that fit a specific description; creating pairs or groupings such as Candy crush, and Bejeweled, or collecting specified objects to successfully solve the problems or win the game. Pokemon, for example, requires the players to discover and collect as many characters as possible, card games like Magic: The Gathering, also known as a collectible card game, in which players use cards to

defeat their opponents is another good example, and as well as coin-collecting games, namely Super Mario Bros, and Cookie Run. (Kapp and Boller 2017)

Urban planning games like SimCity and Caesar are city-building simulation games while some board games like Settlers of Catan are also strategy games where players manage their resources so that they defeat their enemies (Brathwaite and Schreiber 2009)

2.3.2 Previous Model and Framework of Digital Game Design

What is Digital Game Design

Brathwaite and Schreiber (2009) proposes that good game designs start with a focus on players. That is to say, all the game elements need to be taken into account, with perceptions of the players. To illustrate, interesting game content: what it requires the players to do, how they win the game, what motivates them to keep playing, etc. Therefore, the players should be given chances to make their own meaningful decisions which will ultimately produce different outcomes, for example the moves of each chess pieces, the second the players press the button when playing music and rhythm games (Dance Dance Revolution), the skills they choose for their protagonist in Role playing game (RPG)

Fisher (2015) also emphasizes that game design is directly concerned with rule development and all the possible results whereby the players respond to the rules or violate them.

To conclude, the approach to game design involves content and rule development. Key elements to the good one includes a clear objective that keeps players motivated and engaged throughout the play and how well they follow the rules in order to make a decision and reach the goal.

Similar to animation production, game production begins the initial stage with main elements: a story outline, character designs and techniques, for example what kind of a game it is, what the player will do, or how it will look. All these concepts will then be transformed into a more concrete idea, followed by game mechanics, feedback loops, player actions, and player motivations before being made into a

prototype and undergoing the process of testing. (Zubek 2020) Several authors introduce models or frameworks of game design. These works are summarized below.

Table 6 Previous Model and Framework of Digital Game Design.

Name	Model & Framework	Description
Hunches' MDA Framework (Hunicke, LeBlanc et al. 2004)	Mechanics, Dynamics, and Aesthetics	The dynamics are the behavior of mechanics when the user interacts with them; aesthetics is the emotional response in the player after the interaction with the game's systems and game rules (mechanics).
Ermi and Mäyrä's SCI model (Ermi and Mäyrä 2005)	Sensory, Challenge, and Imaginative Immersion	Sensory Immersion is the audiovisual execution of a game. Challenge Immersion is the feeling when one is able to achieve a satisfying balance of challenge and ability, such as mental or motor skill in strategic thinking and problem solving. Imaginative Immersion is when the game allows the player to use her imagination, empathize with the characters, or enjoy the fantasy of the game.
Björk and Holopainen's Game Design Patterns (Björk and Holopainen 2004)	Hundreds of game design patterns exist and catalog the most common game functions and the types of gameplays they support.	A pattern language is a method consisting of a syntax and grammar to explain invariant components of a domain. Each pattern follows the same template, including definition, description, application, consequence, and relationships with different patterns.

Name	Model & Framework	Description
Schuytema's game design theory (Schuytema 2006)	The atoms of a game (i.e. the element properties and functions)	How the interaction with these elements creates challenge, influences the player's perceptions, and emotions.
FDD Framework (Fullerton 2008)	Formal, Dramatic, and Dynamic	Formal elements are those components which are not present in any other entertainment format – e.g. resources, rules, limits; dramatic elements are the story and the way it is being present; dynamic are the elements which the player can change each time he is playing the game – e.g. strategy, behavior, attitude towards game objects.
Elemental Tetrad (Schell 2020)	Mechanics, Aesthetics, Story, and Technology.	Mechanics include the ways players interact with the game and their goals; aesthetics is the effects from the game on the player; story fits the description given by FDD; technology is the business logic, algorithms and data structures as well as hardware software, models and API implementation.

Element of Digital Game Design

Adams (2019) refers to game design as a “craft” as its role is to comprise all the primary elements to precisely specify objectives. According to models and frameworks of game design on the previous pages, there are a number of elements that need to be taken into account. Therefore, a development team is responsible for creating and making a good combination of all the components. Analyzing the

table mentioned above, the researcher has separated the game design models and frameworks into different groups, conforming to the method used by Brathwaite and Schreiber (2009), (Zubek 2020) in categorizing game design.

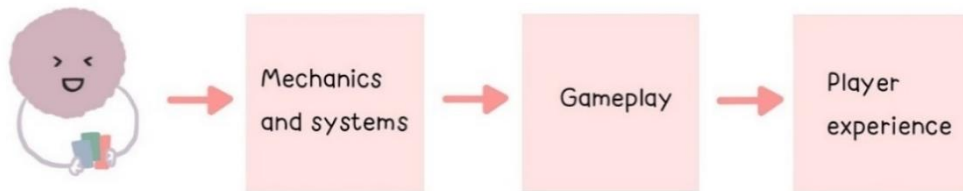


Figure 8 Game System Model. (Zubek 2020)

As seen in the diagram below, which describes a compulsion loop or a gameplay cycle, when a player interacts with game objects which have been designed to conform with game rules and mathematical patterns, and controlled with certain programming method, they will learn the result patterns, according to their action, which will consequently give them a set of different feelings and experience from other players. For that reason, system design for digital games is to write clear rules that abide by mathematical patterns and programming techniques so that players are ensured to be in the same condition, follow the same rules, and have the same goal when playing the same game.

Game mechanics

Game mechanics is an important tool for gameplay (Fabricatore 2007) as it governs game objects in which players interact with or shows response to players' actions.

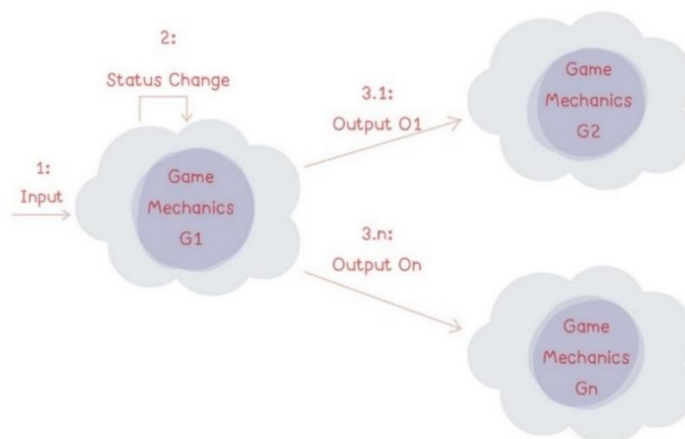


Figure 9 Player-Centered Model of a Game Mechanics (Fabricatore 2007)

Likewise, Brathwaite and Schreiber (2009) define one aspect of game mechanics as a set of rules or conditions by which the game objects interact with player input actions. When playing Monopoly, for instance, a player can buy property when they land their token on an unowned land. This is an example of a simple mechanic

(Fisher 2015) also adds more explanation into the meaning of Game mechanic, saying that the mechanic occupies different roles when compared to gameplay which generates the results of players' decisions or experience according to game rules. To illustrate, the number on a dice rolled by each player, which is random, indicates the move on board games. Similarly, Hunicke, LeBlanc et al. (2004) emphasizes that game's mechanics or the game's rules define what players are and are not allowed to do in a game. They often understand the mechanics after watching the tutorials which usually include graphical, text, and auditory descriptions that describe the rules and show players how to play the game.

Without tutorials, players may struggle trying to understand the gameplay because games are writing coding, which can be too abstract to be interpreted.

Gameplay

Rouse III (2001) states that the Player-centered approach has 2 main features: the way a game is played and only when the rules are followed can the players interact with it. To be more precise, gameplay is how players interact with the system.

Fabricatore (2007) expands a broader overview on a player-centered practice as it brings about the idea of offering independent experience to players, which contributes to a more enjoyable experience.

Ernest Adams (2012) proposes that gameplay can be fun challenges that require specific actions, defined by a set of rules, from players to solve the problems or achieve game goals. However, there are actions like changing the color of a racing car or having a conversation with an NPC, but these do not affect the performance. Those concerned with challenge-oriented ones, for example the protagonist can only jump with prescribed conditions, are controlled by game mechanics. This idea is

strengthened by the explanation from Czauderna and Guardiola (2019), expressing that gameplay consists of actions controlled by a player with rule obedience, and the game challenges, which will combine a player's feelings with the game, and form a particular experience for each player.

Player experience

Player experience is the player's subjective experience of gameplay whereas gameplay cycle refers to a recurrence of interactive actions between players and the system until the goal is attained or the players are defeated.

Fabricatore (1999). The cycle starts with information gathering from visual and auditory tutorials in a virtual world. Once the players understand how the game works, they can start playing, making decisions and interacting within the gaming world. While decision making is an essential part of the system, the information represented in all forms plays an important role in how players decide which action should be taken. That is to say, user interface or even additional minor elements in a game do have influences on players' thinking process.

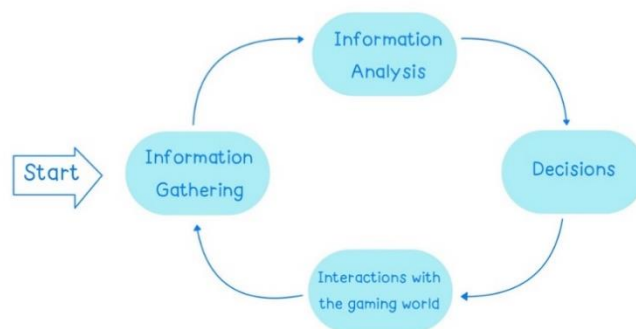


Figure 10 Gameplay Diagram (Fabricatore 2007)

The information itself can be divided into 2 categories: Functional information, providing overall gameplay to the players and teaching them all the rules and everything they should know in order to achieve game goals, and Aesthetic information, which attract the players' attention and fill them with emotions just as activities in games happened in the real world, such as game scenes, characters, storyline, and sound. (Fabricatore, Nussbaum et al. 2002)

It is obvious that mechanics, gameplay, and player's experience are the core of game system design, but, more importantly, other components (the game world, content, visual and sound, user experience and user interface, and technical program) are fundamental to players' attention and experience in virtual reality games. (Zubek 2020)

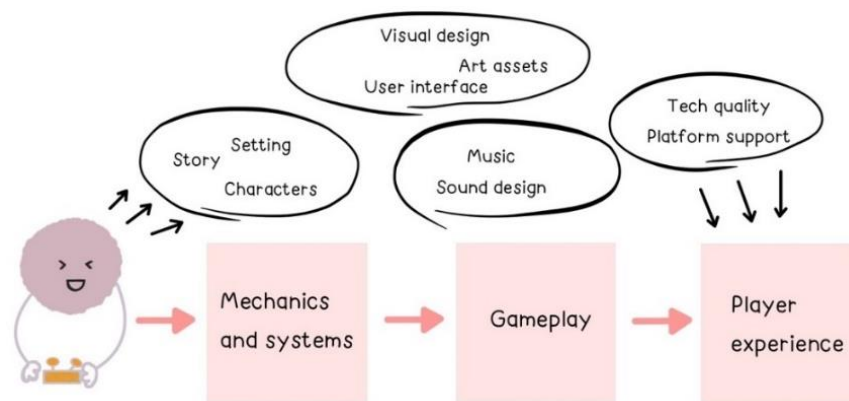


Figure 11 Outside of Gameplay Elements (Zubek 2020)

World design

World design is the process of visualizing a game world and is described by Adams (2019) and Cole (2021) that it involves the actions of creating environment, structures, technology, cultures, community and characters with their way of life. The more realistic graphics of the virtual world are generated, the more effective the game contributes to players' experience. FIFA, a series of association football video games, simulate all the components from the real world while some games constitute fantasy or imaginary elements. The others, like Tic-tac-toe, are classified as an abstract game due to a lack of such elements whereas chess pieces, which are moved and placed on a board with abstract ideas, are named with medieval royal titles and ranks like king, queen, knight, and bishop.

Content design

Content design is the discipline of creating game characters and planning the storyline, similar to the way stories in movies and books are written. The results of this process play a part in creating emerging experience and explaining the gameplay. (Zubek 2020)

Level design

Schell (2020) explains that level design concerns a development of increasing difficulty levels by generating more complicated obstacles or object positions as players move through next stages. This is one of the most important efficient techniques to sustain players' motivation.

Visual and sound

Visual and sound have considerable impact on players' experience as they are also integrated into mechanics of the game world. Game design teams, therefore, are responsible for creating everything that players see and hear in a game, including main characters and their enemies, effects, the environment, animation, as well as music and sound. In fact, there are some games where music and sound are key elements. (Mehrafrooz 2020)

User experience (UX) and User interface (UI) Design

User experience and user interface design focus on the means by which players and the game itself interact, which also add to the player experience. (Deacon 2020, Habunzinski 2020).

Technical design

Zubek (2020) describes technical design as parts of the game created by computer programming such as enemy artificial intelligence (AI), a non-player character (NPC), a character in a game that is not controlled by players for a lively environment, game scoring and reward systems, and online service which multiplayer take part in the same game through a network.

2.3.3 Digital Game Development

The concept of game design and development is fundamental to a successful and widely played game as it investigates game design methodology, the game

designers themselves, and the players or research subjects. All the experience gained in this stage is essential to improve game quality. To identify a game concept, the process can be done in 2 ways:

2.3.3.1 Game post-mortems and reviews

The data gathered from previous experience, both accomplished and disappointing, of former game designers is considered the most effective way to develop a new game when applied to an analysis of player reviews. This is important because it directly reflects their thoughts and feelings while playing the game. That is to say, game post-mortems provide a thorough method for delicate game development while the comments from players reinforce the notion of what to consider when designing a game with great impact on their experience. (Desurvire, Caplan et al. 2004, Petrillo, Pimenta et al. 2008, Pinelle, Wong et al. 2008, Zagal and Ladd 2009).

2.3.3.2 Iteration and playtesting

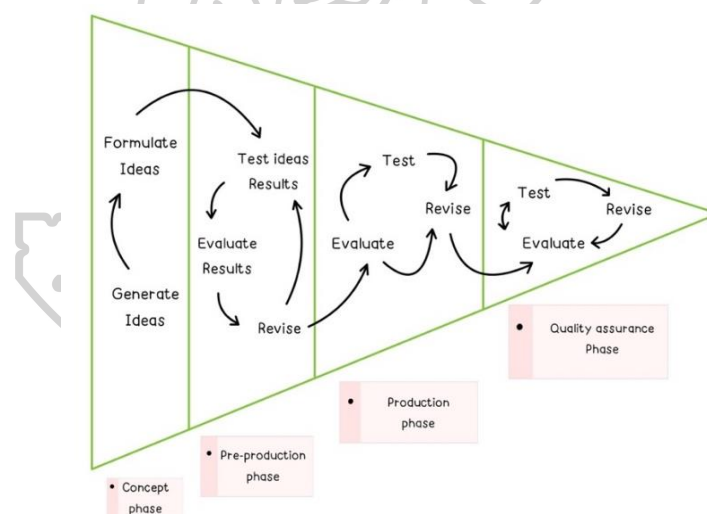


Figure 12 Fullerton, Swain, and Hoffman Model for Iterative Game Design (Fullerton, Swain et al. 2004)

Fullerton, Swain et al. (2004) defines the concept of iteration game design as it is the process concerning a functional testing, evaluation and modification. Similar to the definition given by Salen and Zimmerman (2004) saying that the process is like a cycle that begins with making a game prototype, testing and result analysis.

The process is repeated along with the in-depth discussions between the designers and game testers until the final stage of the production is reached. This allows the development team to learn all the factors to create a playful and enjoyable experience for their target players before making a decision which one to keep. Playtesting, meanwhile, refers to the tests that only involve players, all of whom are not either members of the development or design team.

2.3.4 How important is the digital game the current situation

2.3.4.1 Digital Game for Education

The idea of using digital games as educational tools to promote logical thinking and practical skills with the emphasis on students' needs and their enthusiasm for using them. This is an alternative to traditional methods of teaching that most schools opt for (Manesis 2020)

Digital games are said to be a perfect combination of engagement, challenge, entertainment, and learning (Kaimara and Deliyannis 2019) since they combine entertainment media and aesthetic quality (graphics, effects, and music). Also, games are often well structured and designed with clear learning objectives which help increase student engagement effectively (Prensky 2007).

Moreover, using multimedia and the internet, students are able to learn at their own pace when using applications or participating in interactive activities: as a result, they can understand the lessons better. To assess the quality of digital education games, there are range of indicators to be considered, including game design, user interface, engagement, enjoyment, usability, playability, usefulness, cognitive behavior, pedagogical aspects, and learning outcomes (Abdellatif, McCollum et al. 2018).

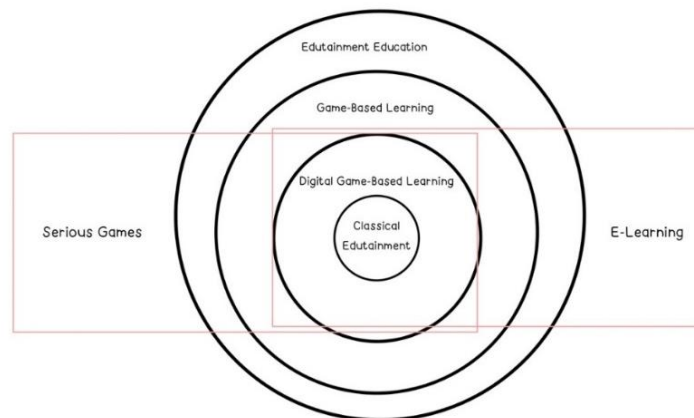


Figure 13 The Relationship between Serious Games and Related Concept. (Breuer and Bente 2010)

Provide a good summary and map to digital games and learning and how these relate to other similar definitions.

Game-based learning (GBL) is a practise where games are used as tools for knowledge transfer. Educational games are efficient in generating learners' motivation and encouraging participation in the classroom.

A brief description of game-based learning is learning through games. It often sounds exciting when educators embrace the idea of using games as part of a lesson plan and employing student-centered approaches. The focus is shifted from teachers, who dominate all or most of classroom activity as in traditional teaching methods, to learners. Games offer a more productive and enjoyable method to attract students. How an instructor, however, employs game-based learning approaches vary according to what they consider important regarding principles for teaching, what the students can or cannot do, what kind of software and hardware is required and what is available at that time. (Schaaf 2017)

The use of video games in the classroom is known as game-based learning. The majority of these games are educational in nature, engaging and inspiring children to study. Game-based learning, rather than adding a layer of badges and prizes, exploits the advantages of video games to teach a topic or skill. Students are more motivated to think critically and solve issues for themselves when games are used as an instructional tool.

Serious games refer to games with specific purposes, apart from entertainment, and they usually meet these criteria (Michael and Chen 2006) Criteria to define the usefulness of serious games:

- (a) active involvement and stimulation of all players
- (b) sufficient realism to convey the essential truths of the simulation
- (c) clarity of consequences and their causes in both rules and gameplay
- (d) repeatability and reliability of the entire process

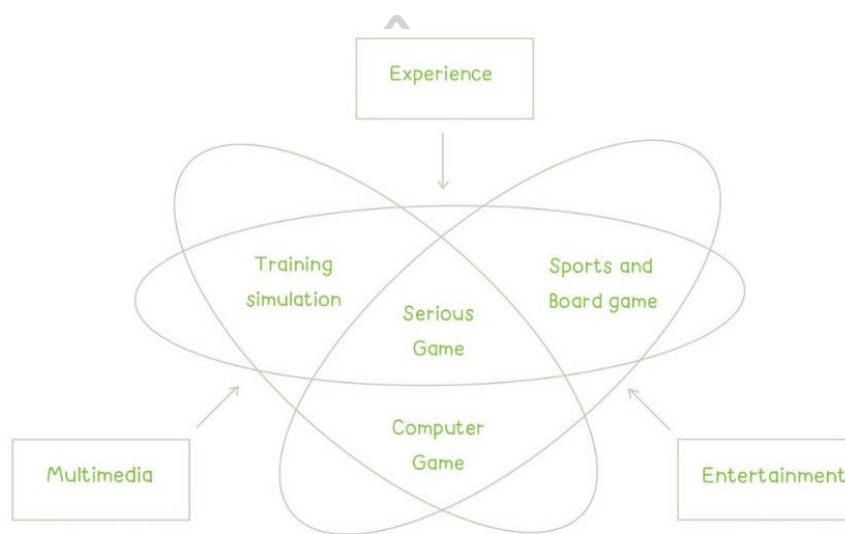


Figure 14 The Definition of Serious Game. (Laamarti, Eid et al. 2014)

Serious games are now being developed for many industries such as education, organization management, military service and public health (Zyda 2005)

Activity Theory-based Model of Serious Games (ATMSG) models (Carvalho, Bellotti et al. 2015) is preferable for serious game design because they take methodology, tools, game goals and learning process into account throughout the design stage.

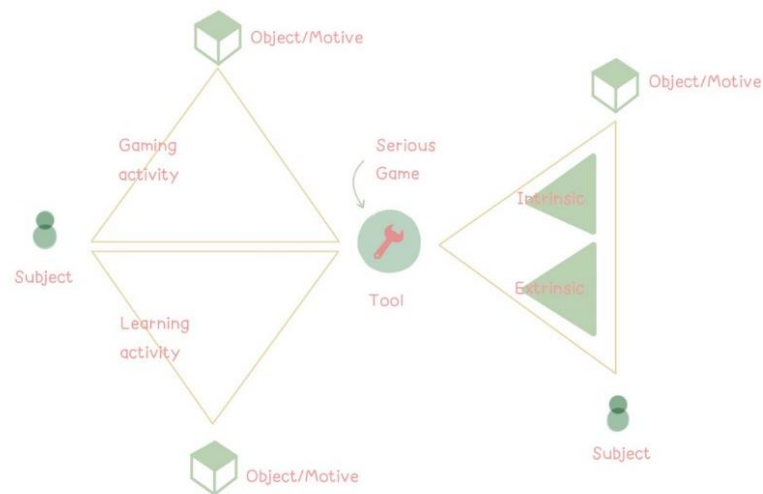


Figure 15 Activity Theory-Based Model of Serious Games (ATMSG) Models. (Carvalho, Bellotti et al. 2015)

According to Pitarch (2018) digital education games mainly consist of these four elements: engagement, autonomy, mastery, and progression. However, there are other components mentioned by different specialists as shown below.

Table 7 Other Model of Education Game Components.

Models	Components
Key Characteristics of a Learning Game (Malone and Lepper 1987)	Challenge, Curiosity, Control, Fantasy
Foundations of Game-Based Learning (Plass, Homer et al. 2015)	Game mechanics, Visual aesthetics, Narrative design, Incentive system, Musical score, Content and skills
Classification of Game Elements (Deterding, Dixon et al. 2011)	Challenge, Curiosity, Control, Fantasy, Mechanics Dynamics Aesthetics (MDA), Core element of gaming experience, Game design atoms
8 Game Elements to Make Learning More Intriguing (Kapp 2018)	Mystery, Action, Challenge, Being at risk, Uncertainty of outcome, Opportunity for mastery, Visible signs of progress, Emotional content

2.3.4.2 Benefits of Education Game

Recent studies have proved that games offer a number of advantages to the players and one obvious benefit is that it empowers learning development in both children and adults. Like doing physical exercise to strengthen muscles, playing games increases activity in the brain and improves its functions. Benefits of playing games are as follows (Sheila Eugenio, 2017):

1. Playing games helps improve multisensory performance (vision, auditory, and body movements).

2. Some games, especially those with strict rules, help players improve their problem-solving skills as they are forced to think fast but carefully before taking any actions.

3. Playing games also has potential in boosting brain function and memory as players have to learn and memorize how buttons on a controller work by reading or listening to the instruction. The more they remember, the better they control their protagonist. Game graphics and audios play an important role in improving their short-term and long-term memory.

4. Games, action games in particular, help increase attention span and improve concentration as they motivate players to achieve game goals and reach higher levels.

- 5 Games can be great learning resources for not only adults and teenagers but also children. A number of modern education institutions have integrated the games designed to support intelligence and creativity development into their curriculums. This helps children harness their academic skills effectively.

6. When playing games, the players' brain is stimulated by various types of media, including animated pictures and sound, which improve their processing speed when compared to counterparts, as research found.

7. Playing games also enhance multitasking skills. For example, action games require players to be observant and stay cautious at the same time. The players have to determine which strategy to use while controlling their protagonist and focussing on screen where their energy levels, enemies' status, the weapons

they hold, or time span are shown. All of these have great influence on whether they will win or lose the game.

8. As online games have a sense of community, players develop social skills while they interact with their peers, probably being in the same team or doing the same tasks. Continuous communication, as a result, forms and strengthens their relationship.

Studying and analyzing how effective digital games are in terms of enhancing learning, Clark, Tanner-Smith et al. (2016) mentions that, compared with other teaching approaches, game-based learning has greater influence on intelligence development as players are free to make a decision and feel free try: children are free to defeat their enemies and conduct self-experiment. Moreover, they learn to overcome fear and cope with failure since digital games give them chances to try, fail, and keep trying. (Groff, Howells et al. 2010)

Games have clear objectives and require players to respond immediately: such games have rules, unnecessary obstacles, components for particular goals (Dickey 2005), which encourage the players to focus on the game goals while calming their anxiety to multitask.

Enthusiastic learning: digital games can be effective tools for education when used to generate and retain students' enthusiasm (Klopfer, Osterweil et al. 2009) Moreover, students can access games, as learning resources, at their convenience. (Chang, Wang et al. 2016)

Challenges: good games often refer to those with a range of difficulty and complexity that players can overcome with minimal effort (Gee 2003). Obstacles to assess players' skills and motivate them further once they achieve the tasks challenge the players to investigate the solutions or formulate strategies to overcome their weaknesses (Dickey 2005). In the design process, game obstacles need to be carefully designed as imbalance between game difficulty and players' skills can adversely affect their attention and demotivate them.

Participation: students are intrigued and become more motivated to learn when smartphones are used as learning tools (Hwang and Chang 2011) Likewise, Sung, Hwang et al. (2017) states that educational games are highly effective in generating student motivation and maintaining their attention.

Assessment: according to Ash (2011), any obstacles in a game that face its players are designed to test their ability and knowledge. Shaffer (2006) and Rupp, Gushta et al. (2010) share the notion that the use of computer games for education purpose, especially for learning and evaluation, is growing worldwide. It is, therefore, obvious that games are practical tools for knowledge and skill assessment.

2.4 The Significance of Digital Game Application in Promoting Lanna Cuisine

Arts

Game is a medium with easy accessibility and the number of worldwide players in 2013 was over 2.5 billion, while that of Thailand was approximately 27.5 millions, according to Statista Global Consumer Survey, October 2019 (Statista 2022) In October, the age range of game players were between 18 and 64 while those aged 25-34 accounted for the largest proportion, or 37.1% of all the players in Thailand. Dominant features of the game include 1 . Graphics, characters, story, audio, objectives, obstacles, rules, and rewards, all of which keep the players motivated. 2. immediate responses under the game rules, resulting in the players knowing what they are expected to do 3. A sense of independence, allowing the players to act or make a decision by themselves. With all the features mentioned, digital games have been applied to suit different purposes, including teaching and learning. This is because digital games have the potential to enhance the learning environment and benefit learners. (Hava, Guyer et al. 2020, Adipat, Laksana et al. 2021). Another use of digital games in education is assessing students' knowledge after finishing a lesson, helping them review what they have learnt in a more effective way. (Aljojo 2018, Daungcharone and Panjaburee 2019). In addition to this, the game can be used as virtual training or practice particular skills in a computer-generated environment. (Hanisch, Birner et al. 2017).

As a result, the design and development of a digital game to promote cultural content, cooking in particular, will be able to generate interest and attract more young people to the key content and ultimately transfer the cultural knowledge. (Chai-Arayalert and Puttinaovarat 2021). Since people in modern society have become more dependent on digital devices, along with the prominent characteristics of digital games that can be applied to serve a wide range of purposes, the games are powerful tools to be used in promoting culinary culture to the younger generation.

2.5 Motivation theory (Zubek 2020)

2.5.1 The Bartle Model

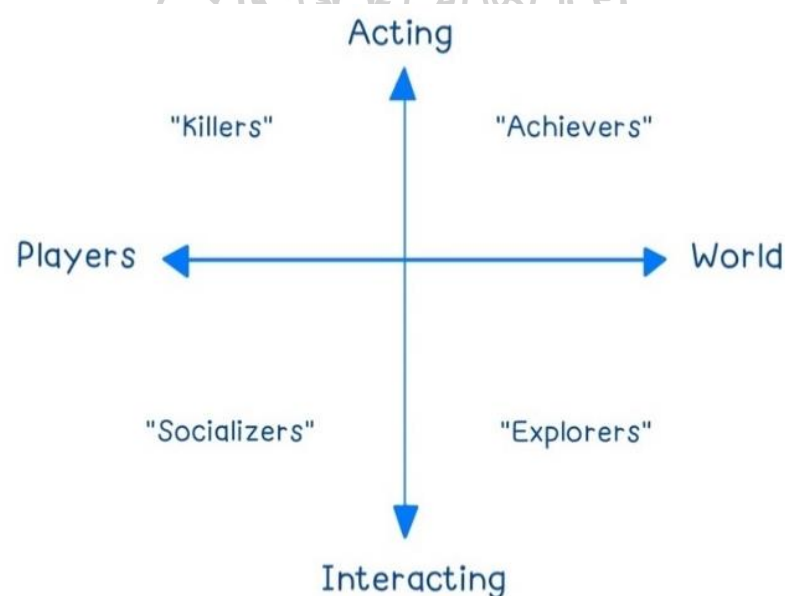


Figure 16 Bartle Model. (Bartle 1996)

The Bartle model demonstrates that players of all kinds find games enjoyable in different ways. Achievers, for example, enjoy playing more when the game focuses on its goals and player rankings while socializers might not have fun doing so, but disrupt other players while they are enjoying the game instead. In fact, this infers that players with poles apart characteristic are likely to have arguments. To illustrate,

achievers often find it annoying to join socializers because they are not enthusiastic about winning the game. As a result, when designing games with multiplayer, it is vital to ensure that game components are thoroughly made to suite all types of players in order to sustain the balance in the game.

2.5.2 The Koster Model

Raph Koster's book (Koster 2004), *A Theory of Fun* (2004) created a model with regard to players' motivation to increase their excitement and be more willing to learn. The result reveals that as long as the players find game obstacles challenging, they will continue to learn and successfully achieve game goals. To sustain their attention and motivation, the challenges ought to harmonize with their ability and interests. In other words, the games themselves need not to be too easy or too difficult for the target players.

The pleasures and enjoyment while learning are described in the psychological theory of flow and personal motivation, which cover different types of attempts including those made when players pursue the game goals (Csikszentmihalyi, Abuhamdeh et al. 2005). The theory states that the feelings of happy satisfaction and enjoyment occur when humans are facing challenges that attract them, knowing that chances are they will be able to overcome such difficulty by some means.

The fact that this sense of pleasure is influenced by players' interests, skills, and the game challenges themselves explains why players' experience vary even after playing the same game. For example, a game called *Civilization*, one of the most complicated games which requires critical thinking competency, tends to be more favorable among players with experience in formulating strategies than novice players though both of them share similar interests. Humans feel a sense of pleasure and satisfaction once they realize how their decisions impact the outcome of each character or the game. This means the players will lose interest in playing a game if the results are either too predictable or unpredictable.

2.5.3 Yee's Gamer Motivation Profiles

Aside from studies concerning players' characteristics, some research aims to examine factors that motivate players to play games. Nick Yee from Quantum Foundry conducted a questionnaire survey asking players to assign number value in response to questions of what they favor when playing a game. The questions used in this survey are based on the 12 types of motivation, derived from different models.

Table 8 Yee's Gamer Motivation Profiles (Yee 2016)

Action Aspects	Destruction—the enjoyment of chaos, mayhem, guns, explosives.
	Excitement—the enjoyment of intense, fast-paced games.
Social Aspects	Competition—the enjoyment of competition with other players.
	Community—the enjoyment of interacting and collaborating with other players.
Mastery Aspects	Challenge—the enjoyment of overcoming challenges, preference for games of skill.
	Strategy—the enjoyment of games that require careful decision making and planning.
Achievement Aspects	Completion—the desire to complete every mission, get every collectible and hidden item.
	Power—the enjoyment of becoming powerful in the context of the game world.
Immersion Aspects	Fantasy—the desire to become someone else, somewhere else.
	Story—the importance of an elaborate storyline and interesting characters.
Creativity Aspects	Design—the appeal of expression and deep customization.
	Discovery—the desire to explore, tinker, and experiment with the game world.

2.5.4 Self Motivation Reports

Self-determination theory, also help shed light on the question of what motivates people in general, in their life, of which games are only one element. For self-determination in particular, Ryan and Deci (2000) describe this general

framework—grounding human motivations in the desire for competence, autonomy, and relatedness. Ryan, Rigby et al. (2006) proposes applying it to predict game enjoyment.

SDT stands for the Self-Determination Theory (Ryan and Deci 2000, Center for Self-Determination Theory (CSDT) 2021) that provides a comprehensive method for studying human drive and personality. A variety of fields of research, including athletics, culture, and recreation are results of the success of SDT implementation.

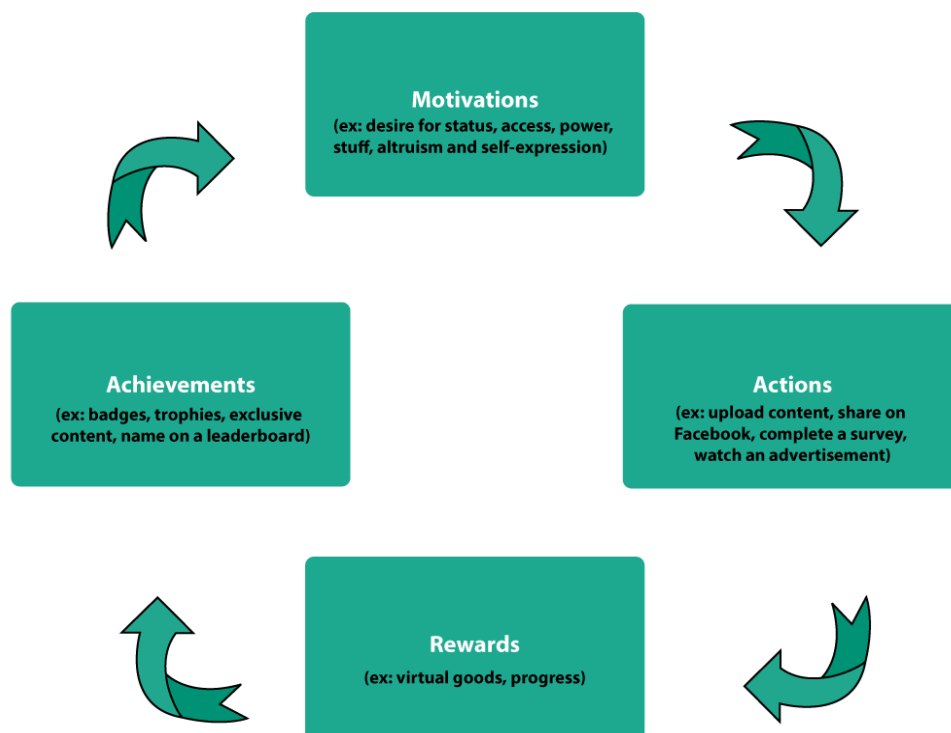
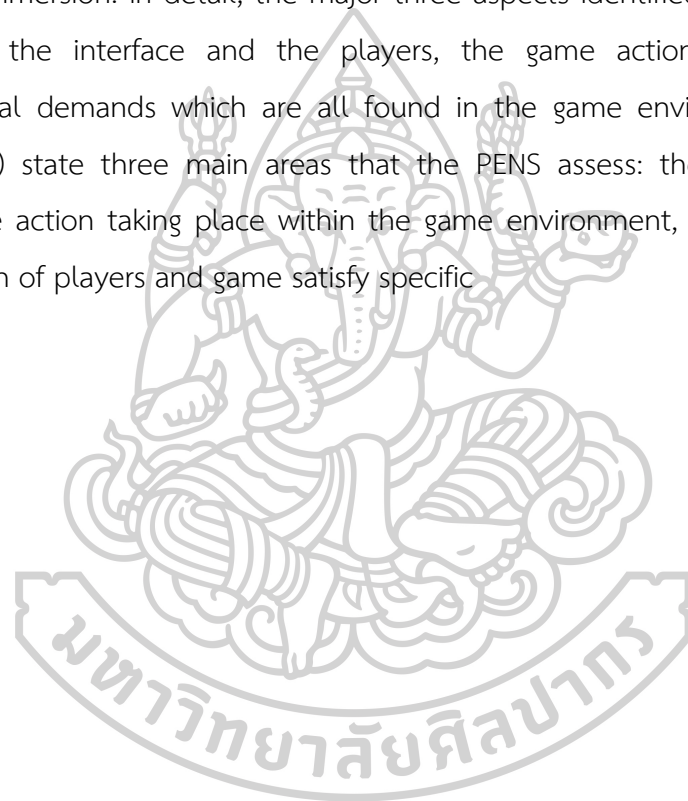


Figure 17 Game Engagement Loop. (Bankov 2020)

The power that drives people forward is self-motivation – it is our inner desire to accomplish, grow, evolve, and move forward. Similarly, when players interact with the game system to immerse themselves in playful activity in the game environment, the game gives some experience to players: enjoyable, exciting, challenging, etc., that affect their need to confront the next obstacle in the game. So, a self-motivation report is the resulting measurement of player experience. (Przybylski, Rigby et al.

2010) study player motivation when playing video games by applying the SDT to evaluate. A method of evaluating gaming experience from a game design standpoint is called the Player Experience of Need Satisfaction (PENS). The competency, autonomy, connectedness, control, and presence of PENS are used to rate the experience of players. This research also developed a measurement tool, the Player Experience of Need Satisfaction (PENS) which assesses the gameplay experiences in terms of competence, autonomy, relatedness, intuitive controls, and presence/immersion. In detail, the major three aspects identified by Rigby and Ryan (2011) are the interface and the players, the game action, and the players' psychological demands which are all found in the game environment. Rigby and Ryan (2011) state three main areas that the PENS assess: the interface and the players, the action taking place within the game environment, and how the action and reaction of players and game satisfy specific



Chapter 3

Methodology

This research aims to study game design for promotion of Lanna culinary art targeting visitors aged between 16 to 18. The conceptual framework consists of three main areas: digital game design, motivation theory and traditional heritage. The methodology being used is mixed method as the goals are to obtain both qualitative and quantitative data. The process in research and data accumulation is divided into 2 phrases.

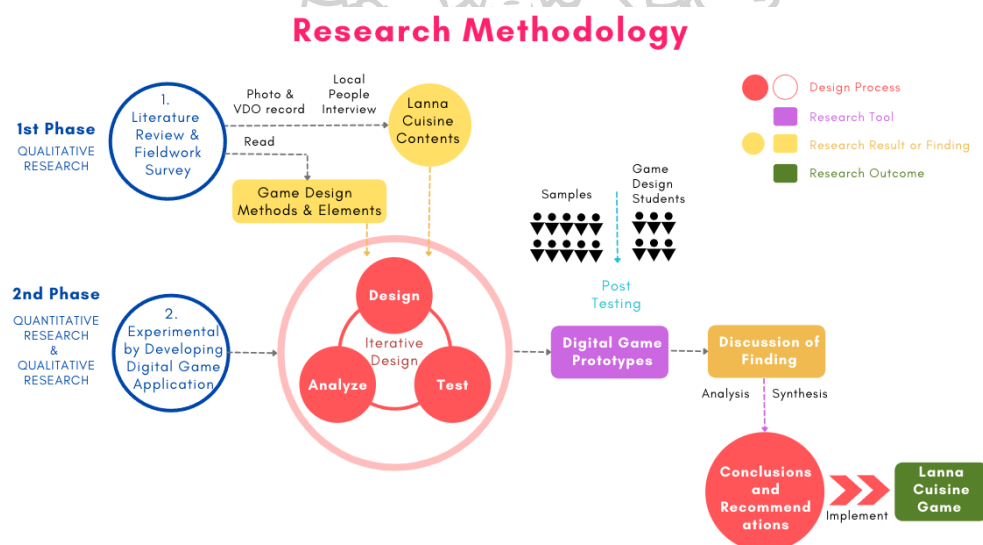


Figure 18 Research Methodology.

The First Phase – To fulfill the first research objective: Fieldwork of Survey.

Researchers have reviewed Lanna local food documents, observation, and interviewed peoples that relates with the Lanna Cuisine Arts and entered the local area. All the data in this initial stage is collected with the process of qualitative

research, by which it is gathered from collection of documents, photo, and video record.

The Second Phase - To fulfill the second research objective:

Part 1 - Develop by Design Digital Game Application

Starting with making a prototype and testing and questionnaire forms, the process in this stage applies methods of quantitative research. Once the target audience for the test is determined, further qualitative and quantitative data will be gathered and analyzed. When collecting data at this stage, the process is divided into 2 parts. The first part involved observing the audience while they were engaging in activities while the second undergoing the test and completing a questionnaire. The final results obtained in this stage will be to develop the Lanna cuisine game.

Part 2 - Post Testing

The results from both the experiment by developing digital game application are synthesized to create the practical game design approach for a digital mobile game application to enhance children's learning about Lanna cuisine arts content. Then put to test and experiment on the standard level to get a mobile game with quality studio production. The evaluation tool is game usability questionnaires and satisfaction questionnaires for sample groups and experts.

Research Methodology: 1st Phase

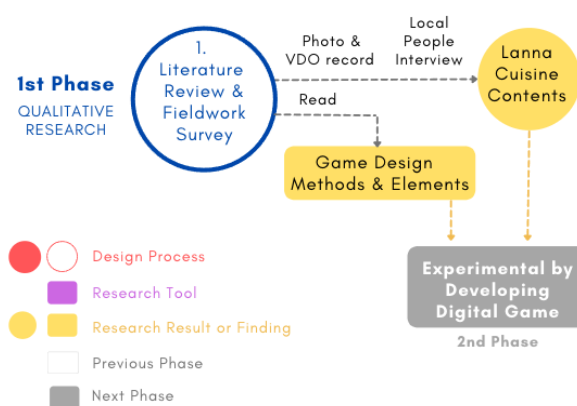


Figure 19 The First Phase of Research Methodology.

3.1 First Phase: Fieldwork of Survey

The researcher divides the data needed to be collected at this stage into 2 areas:

Data collection and analysis of Local Lanna cuisine.

Data collection and analysis of game design based on existing literatures related to the topic and study cases of popular cooking games in 2021.

3.1.2 Lanna Cuisine Art Analysis First Phase:

To gather information related to local Lanna cuisine,

3.1.1.1 The researcher studied from currently available literature.

3.1.1.2 Visited local villages in Chiang Mai province to conduct interviews, record videos and audio, as well as take photos of the ingredients and cooking methods of certain local dishes.

3.1.3 Game Design Elements Analysis:

Data collection with regard to game design from relevant documents.

- (1) To explore the game mechanisms used within the games.
- (2) To investigate the factors of productive play that emerged from player interactivity.
- (3) To identify the common elements used to engage a player.

The researcher investigates the study of Ludology, which is the study of games and game design as Ludologists have recently suggested analytical framework to be used for understanding how games are constructs and what are considered fundamental components, as well as the effects of games on players and society.

Therefore, to analyze game components, the results of 3 dominant frameworks for ludology synthesis bring about game elements to be used as criteria in an analysis table. All the 3 frameworks are:

1. Mechanics Dynamics Aesthetics (MDA) (Hunicke, LeBlanc et al. 2004), first introduced by Robin Hunicke, Marc LeBlanc and Robert Zubek is the most common framework for game designers. It emphasizes the difference between how designers work and how players actually play games.

2. Formal, Dramatic, and Dynamic elements (FDD) (Fullerton 2008), presented by Tracy Fullerton and Chris Swain, focus on concrete analysis tools to help game designers improve the quality of their design.

3. Elemental tetrad (Schell 2020) by Jesse Schell is a framework that separate games components into 4 categories: mechanics, aesthetics, story and technology.

Studying all the 3 frameworks mentioned above, the researcher was able to identify 8 indicators to be used in game analysis in a more concrete way. The analytical results of cooking game elements and cooking game design are identified in the following table.

		Game A	Game B	Game C	Game D	Game E
Concept	Topics					
	Genre					
	Core Game					
	Plot					
Game Design Elements	1 Players					
	Age					
	Type (Killer, Achiever, Explorer, Socializer)					
	2 Rules					
	Goals & Challenge					
	Gameplay					
	3 Narrative					
	Character					
	Story					
	Game World					
	4 Visual Design					
	Graphic					
	Text					
	Style					
	Theme					
	5 Feedback					
	Achievement					
Reward						
Juicyness						
6 User Interface Design						
Information Architecture (IA)						
Progressive Disclosure (PD)						

Figure 20 Table of Game Design Elements Analysis.

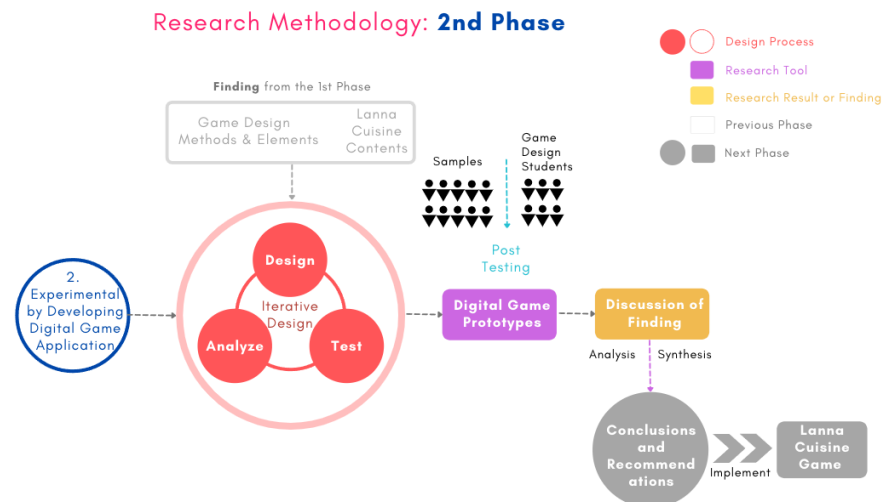


Figure 21 The Second Phase of Research Methodology.

3.2 Second Phase – Part 1: Develop by Design Digital Game Application

3.2.1 Game Design Workshop

Sharing the analyzed information with a group of undergraduates of game design, the researcher held a workshop to create the game design concept and game prototype of the Lanna cuisine cooking game. The workshop took place on 25th February 2019 and there were 30 participants, all of which are junior or third-year students from College of Arts, Media, and Technology, deliberately chosen by the researcher.

1. The researcher divided all the participants into groups of 5 people to take part in a workshop.
2. Explain workshop contents and objectives (to create concepts of a cooking game)
3. Have each group select one game from a list of documented case studies and give the reasons why they like and dislike the game.
4. Have them name 5 games which they have played and explained what make them interested in playing them.
5. Hand out an analysis table to identify game design elements and explain how to use it before allowing them to analyze the games mentioned earlier and put them in the table.

6. Have them create a concept for a cooking game prototype based on Lanna culinary arts and the game design elements.

3.2.2 Group Discussion

After the workshop, a group discussion was conducted so that all the participants had extra time to exchange ideas and make a decision on approaches to be used in game design elements.

The second one is to create the game prototype by using game design thinking to develop appropriate playing and learning activities that motivate the children.

3.2.3 Experimental by Using Iterative Design

The researcher integrated the results from phase 1 and the workshop into iterative design (Fullerton, Swain et al. 2004), respectively.

Step 1: Brainstorming

- Set player experience goals.
- Come up with game concepts or mechanics that achieve player experience goals.

Step 2: Physical Prototype

- Create a playable prototype using pen and paper
- Playtest the physical prototype

When the physical prototype demonstrates working gameplay that achieves player experience goals, write a gameplay treatment describing how the game functions

Step 3: Software Prototype

Creating rough computer models of the core gameplay. Often there are several software prototypes made, each focusing on different aspects of the system. Playtest the software prototype, to conduct usability tests, at least 10 testers (undergraduates in game design) are required to repeatedly play the prototype to identify any flaws and errors. All the comments and suggestions were listed and used to improve the gameplay before conducting experience testing with another group of testers, the research subjects. When the software prototypes demonstrate

working gameplay that achieves player experience goals, move on to the documentation step.

Step 4: Design Documentation

Use the knowledge that gained during this prototyping stage to write the first draft of a document that outlines every aspect of the game and how it functions.

3.2.4 Conducting Player's Experience

The first model prototype will be tested with sample groups are users aged 16 to 18. All of them have met all the criteria: high school students in public schools located in Muang district, Chiang Mai. There were 34 participants. They are randomly selected from 3 different schools as follows:

- Chiang Mai University Demonstration School.
- Yupparaj Wittayalai School.
- Dara Academy.

Once the target audience for the test is determined, further qualitative and quantitative data will be gathered and analyzed. When collecting data at this stage, the process is divided into 3 parts. The first part involved observing the audience while they were engaging in activities. The second part undergoing the test and completing a questionnaire. The third part is an unstructured interview with participants. The results obtained in this stage will be to develop the Lanna cuisine game in the final phase.

The researcher created testing and questionnaire forms, the process in this stage applies methods of quantitative research. The questionnaire forms adopt the assessment method used by The Player Experience of Need Satisfaction (PENS) (Rigby and Ryan 2011) to evaluate the target player experience, which will play an essential role in the final phase of the research.

PENS Instrument : Player Experience of Need Satisfaction model (21) Scales : competency (3), autonomy (3), relatedness (3), presence/immersion (9), and intuitive controls (3) To cite : Ryan, R. M., Rigby, C. S., & Przybylski, A. K., Motivational pull of video games: A self-determination theory approach. Motivation and Emotion, 2006, 30, 347-365. Scoring Key/Scales Items To assess game experience, we used the 21-item PENS survey that consists of five dimensions: competency, autonomy, relatedness, presence, and intuitive controls. For this study we focused on In-game competency, In-game autonomy, In-game relatedness and presence subscales.	Strongly disagree	Disagree	Neither agree or disagree	agree	Strongly agree
	1	2	3	4	5
C1 - I feel competent at the game.					
C2 - I feel very capable and effective when playing.					
C3 - My ability to play the game is well matched with the game's challenges.					
A1 - The game provides me with interesting options and choices.					
A2 - The game lets you do interesting things.					
A3 - I experienced a lot of freedom in the game.					
R1 - I find the relationships I form in this game fulfilling.					
R2 - I find the relationships I form in this game important.					
R3 - I don't feel close to other players.					
P1 - When playing the game, I feel transported to another time and place.					
P2 - Exploring the game world feels like taking an actual trip to a new place.					
P3 - When moving through the game world, I feel as if I am actually there.					
P4 - I am not impacted emotionally by events in the game.					
P5 - The game was emotionally engaging.					
P6 - I experience feelings as deeply in the game as I have in real life.					
P7 - When playing the game I feel as if I was part of the story.					
P8 - When I accomplished something in the game I experienced genuine pride.					
P9 - I had reactions to events and characters in the game as if they were real.					
I1 - Learning the game controls was easy.					
I2 - The game controls are intuitive.					
I3 - When I wanted to do something in the game, it was easy to remember the corresponding control.					

Figure 22 Questionnaire for Samples about Player’s Experience.

3.2.5 To Analyze Data From Player’s Experience

The researcher summarizes and gathers all the results from tools mentioned above for data synthesis and analysis which will contribute to a practical cooking game design with Lanna culinary art, particularly suitable for the players aged 16-18 years old. All the tests and experiments meet the game testing standards

to reach playability values in digital game development. The results will be formulated by Elemental tetrad framework, which divided game elements into 4 aspects: mechanics, aesthetics, story, and technology, to provide a more concrete and understandable guideline for researchers in the following game design stage.

	Mechanics					
	Rules	Objective	Procedures	Resources	Boundaries	Outcome
Playyer Feedback						
Solution						
	Aesthetics					
	Visual style	Character	Graphic	Sound		
Playyer Feedback						
Solution						
	Technology		Story			
	Hardware	Software	Narrative	Character		
Playyer Feedback						
Solution						

Figure 23 Table for Analyze the Feedback from player.

3.2.6 Game Development and Production

At this stage, the researcher developed a concept and an approach to design a Lanna cooking game, using the conclusion derived from the second stage. Game development process started with making artwork and programming, while game elements are also being developed. The process is divided into 4 segments, according to Elemental tetrad framework as follows:

Mechanics refer to the use of programming for game production and development to build a game system with rules, objectives, procedures, etc. that cannot be seen or directly interacted by players.

Aesthetics is a more creative method to create and develop games as it involves visual style, character, environment, graphic interface, sound generated by computer software to display concrete elements with which players can interact through the game system.

Story integrates cooking contents into game production and development by creating a storyline like visual storytelling in comics.

Technology concerns hardware and software selection for the final game product, as well as its efficiency improvement. This research opts for smartphones or tablets.

During the development process, the researcher investigated all the 4 elements by having groups of undergraduates in game design play the game being developed to finally complete the development of a culinary art game.

3.3 Second Phase – Part 2: Post Testing

3.3.1 Evaluation by Samples

Once the game production finished, the game was presented to a group of target players to conduct usability testing. Population and sample groups in the third phase of research are users aged 16 to 18. All of them, aged 16 to 18, volunteer to participate in the research through an online registration system. There were 30 participants.

The assessment stage starts with explaining the key content and objectives of this research followed by a 15-minute usability testing period where players are allowed to play the game by themselves. While they were playing, the researcher observed their reactions and took notes. Once the testing ended, all the participants were asked to complete an online questionnaire. The evaluation tool is game usability questionnaires for sample groups.

Usability Evaluation	Poor	Fair	Good	Very good	Excellent
The evaluation form of Lanna cuisine game	1	2	3	4	5
1. Game interface is consistent and easy to use.					
2. Game 3D technology is suitable for the target group of player.					
3. Game mechanic are standard and easy to learn.					
4. Feedback (status, score, and outcome) are clearly					
5. Rules or rewards are meaningful to player.					
6. Game terminology and language are easy to understand.					
7. Game content is provided suitably and sufficiently.					
8. Learning objectives are integrated into the core game design.					
9. Level game challenge is appropriate.					
10. Game story support gameplay and is meaningful.					
11. Prior knowledge or skills is needed to play.					
12. Game encourages players to understand knowledge.					
13. Get the player involved quickly and easily.					
14. Game is balance player's current skills and challenges.					
15. Player is able to understand how might act to achieve game.					
16. First-time experience in the game is as pleasant and encouraging.					
17. Game makes more interesting than the traditional materials.					
18. Game makes more fun atmosphere for learning.					
19. Game makes immersive and absorbed involved in each gameplay.					
20. Game is new media of self-learning.					

Figure 24 Questionnaire for Samples and Stakeholder about Usability.

3.3.2 Evaluation by Experts

The game then was presented to experts and specialists, followed by an interview for any recommendations to be used in the research summary. Experts and specialists in the third phase of research, categorized into 2 groups as follows

- Game Development Specialists

Keattikorn Samranggoon, Ph.D. Lecturer of Digital

Game, CAMT, Chiang Mai University (Mobile Game, Mobile Application, J2ME and Programmer: C#, C++).

Patison Palee, Ph.D. Lecturer of Digital Game, CAMT , Chiang Mai University.

- Educational Technology Specialists.
Asst.Prof. Manissaward Jintapitak, Ph.D. Certificate in Facilitating and Designing Workshop with the LEGO® SERIOUS PLAY® Method, Educational Technology and Intelligent Learning Environment.

- Experts in Lanna's cultures with academic background in this particular culture experience (including work experience) in museums, or exhibition designs related to Lanna's cultures.

Mrs. Thitinadda Chinachan, Researcher of Social Research Institute, Chiang Mai University.

Once information from all the 3 research stages was collected, the researcher wrote a summary on each phase and narrated the analyzed outcomes.

3.3.3 Discussion of Finding

3.3.4 Conclusion and Recommendation

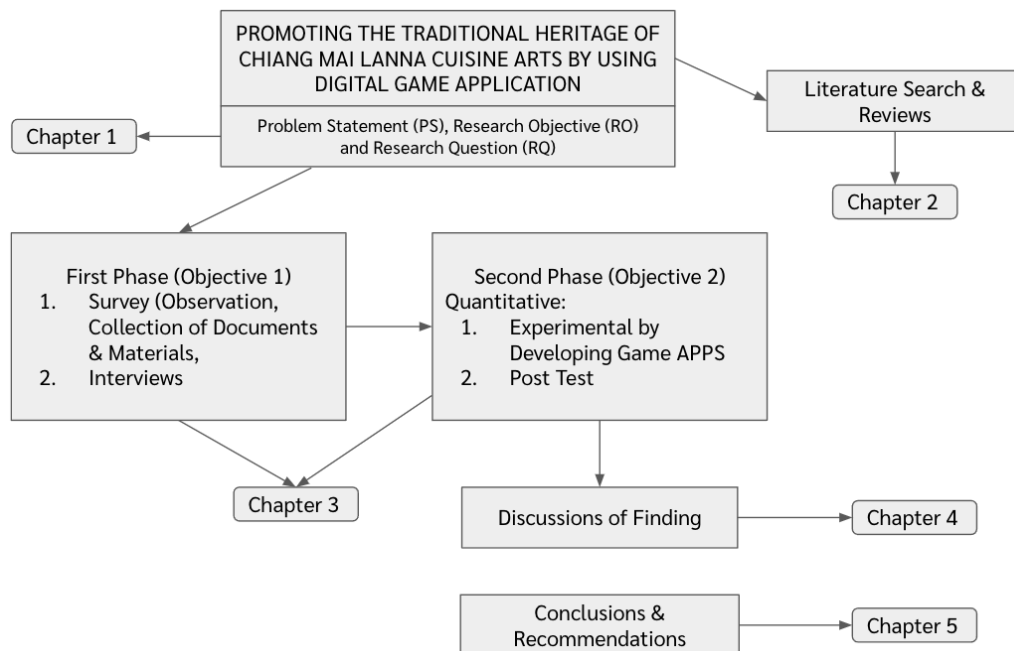


Figure 25 Methodology Diagram.

3.4 Chapter Summary

This research study is a mixed method aimed to develop a concept and a digital game design approach to create cultural-based games with culinary art, in particular. The research process is divided into 2 stages.

The initial stage is separated into 2 parts. The first part involves obtaining sources of information for Lanna cuisine art and studying relevant documents, conducting interviews with local people and specialists, and paying a visit to the community. The second part concerns information accumulation in digital game development and the analysis of relevant documents, including the information derived from the previous stage. As a result, the researcher was able to identify characteristics of Lanna cuisine arts and common cooking method.

The second stage started with a game design workshop which involved undergraduates in game design. The workshop activities included sharing information, playing and analyzing games, designing a cooking game, and discussing the results from this workshop. Then, concepts and approaches to creating a Lanna cuisine game were determined. Following this, all the outcomes were adapted to iterative design to develop the game prototype. During the development process, the prototype was tested by 10 undergraduates in game design. They then were interviewed to identify what needs to be improved and what the players experience and learn from playing it. After the prototype was completed, it was tested by a target group of players, Thai teenagers aged between 16 and 18 years old. All the participants were observed while playing and asked to complete a survey (The Player Experience of Need Satisfaction (PENS) (Rigby and Ryan 2011) once they finished testing.

Some of them were randomly interviewed for more detailed information. As a result, all the comments and information derived from this stage were used to develop a guideline and a design approach for a cultural-based cooking game as a tool to promote Lanna's culture.

The development of a digital game application, based on Lanna cuisine art, in consideration of mechanics, aesthetics, story, and technology. During this stage, 5

undergraduates were selected to perform usability tests until the final version of the cooking game was reached. The game then was presented to a target group of 30 Thai teenagers, aged between 16 to 18 years old. The result from this stage was used to analyze further possibilities of game design concepts to deliver new experience in learning and receiving information with regard to Lanna cuisine art through digital



Chapter 4

Discussion of Findings

Once the literature review was done and after all the relevant study cases were analyzed, the researcher was able to identify crucial elements and how to design the cooking game that would affect the players' perception and enhance their experience. The design and development in this chapter adopt an approach of iterative design includes 2 stages.

4.1 First phase: Finding of fieldwork of survey

The first part of the process begins with content analysis of Lanna food culture from articles and other related documents. In addition to this, the researcher carried out an interview with one of the well-known Lanna tradition and local food experts, Mrs. Thitinadda Chinachan, 20 November 2018 at Social Research Institute. Chiang Mai university. The results from this stage are classified into 5 topics:

- The source of both local ingredients and condiments
- Types of dishes according to seasons, traditions and tribes
- The Lanna cooking style or food preservation
- Food beliefs and related traditions
- Nutrients and the relationship between diet and health

A visit to local villages to take photo and record videos of the location on which the villagers rely to find the ingredients to be cooked in traditional ways and used in their everyday life. The villages are located in Banluang Subdistrict, Chom Thong District, Chiang Mai, the areas covered with thick vegetation as it is part of Doi, the highest mountain in Thailand. Many of the villagers, in fact, make a living from finding and selling local ingredients at the fresh market nearby.

The visit, along with all the records, allows the researcher to understand the context of local culture, food in particular, and provides reliable information to be analyzed for each cooking process.



Figure 26 An Example of Lanna Seasoning Ingredients.



Figure 27 An Example Recipe of Lanna Cookery.



Figure 28 Categories of Lanna Cuisine by Cooking Style and Season Criteria.

4.2 Second phase: Finding of game development and post testing

This phase involved conducting a workshop with a group of undergraduates in game design to brainstorm and create a physical prototype, which would be used to develop a software prototype. The final version of the software prototype was expected to be tested by a group of the research subjects and groups of experts and specialists. They were asked to complete the questionnaires concerning the game usability.

The workshop, held on 25th February 2019, adopted the cooking game design method and elements derived from the analysis of case studies, along with the Lanna cuisine game design concept to create the concept of game design, and the sketch design of the prototype as game design document. There were 30 participants, all of whom were undergraduates who majored in game design, and they were divided into 6 different groups of 5 people. Before the workshop started, the researcher explained all the key points and objectives of this study and then the activities started according to plan.

1. Have each group select one game from a list of documented case studies and give the reasons why they like and dislike the game.
2. Have them name 5 games which they have played and explain what makes them interested in playing them.
3. Hand out an analysis table to identify game design elements and explain how to use it before allowing them to analyze the games mentioned earlier and put them in the table.
4. Have them create a concept for a cooking game prototype based on Lanna culinary arts and the game design elements.
5. A group discussion is conducted after the workshop has ended (Ranjit Kumar, 2014) so that the participants had a chance to reflect on their ideas and finally make a conclusion as guideline instruments and summarize the advantages and disadvantages of the cooking game design method and elements after they were implemented in the design stage.



Figure 29 Game Design Workshop and Group Discussion by Game Design Student.

4.2.1 Results of the Workshop

4.2.1.1 Game Tester Activity

The result of this game tester activity shows that after all the undergraduates carried out the experiment by playing and reflecting on their experience and discussed with each other, the types of games they find enjoyable vary according to their preferences. Some prefer a cooking game with fighting scenes such as Battle Chef Brigade Deluxe while others enjoy playing hyper-realistic cooking games like Cooking Simulator. In fact, even among those who favor the same game have different reasons why they like it. Some of those who played Cooking Mama mentioned that they like the game graphics and are keen to discover all the dishes so they are enthusiastic in completing all the cooking quests. Others, meanwhile, are more attracted to minigames

4.2.1.2 Game Analysis Activity

Another activity in the workshop required the participants to briefly explain game elements that make their favorite game interesting and enjoyable and give the reasons why they like to play it. They had to come up with the game they played when they were young as the objective of this research is to develop a digital game for teenagers. Obviously, there are many kinds of games mentioned during the discussion, and some undergraduates shared the same preferences.

All the games being discussed were categorized in the tables below with regard to most dominant features described by the participants: Visual Style, Fantasy, Gameplay, or Story. Together with the group, the researcher realized the importance of an analysis and classification of game elements in the stage of developing a game prototype so that the key elements to which players pay attention are disclosed.

Table 9 Lists of The Games Mentioned during The Discussion as The Participants' Preference.

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
- Super Mario Bros.	- Final Fantasy	- FIFA	- Need for Speed	- Bejeweled	- Harvest Moon
- Plants vs Zombies	- Super Mario Bros.	-	- Grand Theft Auto	- Run	- Dance
- Harvest Moon	- Cooking Mama	- Civilization Revolution	- Resident Evil	- Angry Bird	- Dance
- Sim City	- Angry Bird	- Counter-Strike	- DOTA 2	- Zelda	- revolution
- Street Fighter	- Cookie Run	- Grand Theft Auto	- Super Mario Bros.	- Plants vs Zombies	- Sim City
					- FIFA
					- Zelda

4.2.1.3 Game Tester Activity

The activity of analyzing game design elements is also beneficial for undergraduates as they are guided by the principles of game design throughout the analysis process. At the beginning of the workshop, the elemental tetrad framework is described so that they understand what need to be filled in each row and column of the analysis tables.


Mechanics					
Rules	Objective	Procedures	Resources	Boundaries	Outcome
the player must balance between attending to the farm and interacting with other characters to maintain friendships.	The goal is to restore the farm to its former glory and fit in with the townsfolk within three years.	To interact with the townsfolk and have a family	flowers, grass, wood, a hoe, a sickle, a hammer, an axe, etc.	Mineral Town	
		To work the land and care for livestock			
Aesthetics					
Visual style	Character	Graphic	Sound		
Cartoon / Cuteness	A man wear farmer costume	3D Graphic			
Technology			Story		
Hardware	Software		Narrative	Character	
Console (Playstation-1)			A Man come to inherit a farm after his grandfather's passing. However, in this game, it has been decided by the residents of Mineral Town that he can only inherit the farm if he restore it to its former glory and fit in with the townsfolk within three years.	Avatar 	

Figure 30 An Example of The Analysis Tables used to Identify Game Design Elements by Undergraduates Taking Part in The Workshop.

4.2.1.4 The Activity to Create the Concept of Lanna Cuisine Game

In the initial stage of the game design, it is important to establish the idea of the gameplay so that it meets the game's objectives. The idea, therefore, is determined by 3 considerations: Core game or Core Mechanics, Gameplay, and Story or Theme.

Core game or Core dynamic is vital to gameplays and, therefore, game designers have to work hard on how to present it with the players while they play the game. (Brathwaite and Schreiber 2009) That is to say, it is the fundamental idea of a game. In fact, game goals or a final destination for which the players are bound to win the game, are also included in the core dynamic. For example, the goal is to put the dragon to death and help the princess. Goals are fundamental to gameplay that defines what actions the player should take in order to win the game and contribute to the senses of success and progress. (Weitze 2015)

To illustrate, the core game of chess is that the players come up with strategies to avoid the attack by the opponent's piece and the goal is to place the other player's king in checkmate in chess.

The results from the workshop and the conclusion after the literature review indicate that there are 2 types of core game that suit the game design framework as follows.



1. Building is the main mechanism of constructing such game elements as cities, houses, items or even the protagonist being played by the player. For instance, the player can develop the main character's ability by improving the capability of their weapons. (Brathwaite and Schreiber 2009). By employing building core games, the players are required to improve the protagonist's ability and cooking skills to make all the Lanna dishes until they become a sage with competency in folk wisdom.

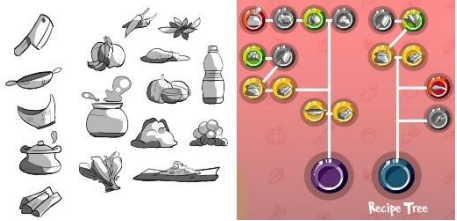
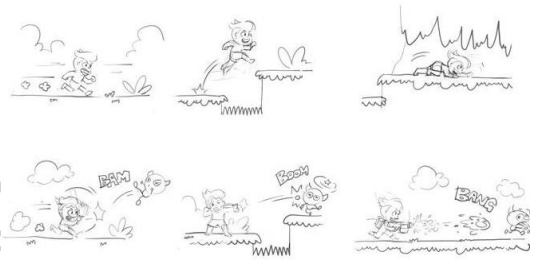
2. Collecting (Find and get specific objects or people) resources or items to be used and finally reach game goals. For example, Pokemon is a game that involves a journey in which the player comes across monsters as they travel. To conquer the monsters, the players have to accumulate their own monster and fight against those blocking their ways together. (Kapp and Boller 2017) This kind of core

game tends to have potential to enhance the players' motivation to collect all the Lanna recipes hidden in the game. To achieve this, they have to cook all of them (complete all the quests).

Gameplay includes game-related activities controlled by players according to game rules and challenges within the game. The players take effective actions in order to overcome the challenges and win the game. (Adams and Dormans 2012, Guardiola 2019). With this stated definition of gameplay and the game design created in the workshop, a conclusion of the gameplay has been reached and shown in the following table:

Table 10 The Result of Gameplay from The Workshop.

Description	Sketch design
<p>To contain or record</p> <p>A player collects ingredients, condiments, and cooking equipment in their bag, or records information and make a choice of particular information from multiple pictures or words.</p>	
<p>To cook</p> <p>With the ingredients in their bag, the player follows a recipe to cook.</p>	

Description	Sketch design
<p>To mix or combine</p> <p>The player mixes the ingredients with condiments, according to the recipe, as stated on the screen.</p>	
<p>To fight and avoid</p> <p>The player can make a decision whether they will fight against their enemies or run away from them.</p>	

4.2.1.5 Story and Theme

Table 11 Story A from Game Design Workshop.

	
	<p>Story A</p> <p>The story of an ordinary boy who accidentally found a cooking book written by his long-lost mother. Reading the book, he noticed mysterious clues which could help him find his mother. He then decided to set off on a journey while using her notes as a guidance (fantasy).</p>

Table 12 Story B from Game Design Workshop.

	
	<p style="text-align: center;">Story B</p> <p>The story of a little girl who spends most of her time in the kitchen, helping her mother prepare meals. She lives in a retro world and has to deal with different situations every day.</p>

Table 13 Story C from Game Design Workshop.

	
	<p style="text-align: center;">Story C</p> <p>The story of another little girl with an ambition to become the best chef in her region, the North of Thailand. She has to compete with other chefs and the story happens in the 21st century so the design of the game world looks similar to that of this era.</p>

Table 14 Story D from Dame Design Workshop.






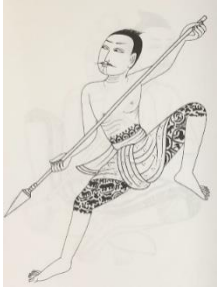





	
	<p style="text-align: center;">Story D</p> <p>The story of a boy who embarks on an adventure to form a team with his tribal fellows. They have to find ingredients and cook so that they have greater skills to defeat monsters.</p>

Table 15 The Inspiration of Character Design.

Reference	Sketch Design	Description
		<p>1. Inspired by Ethnic Costume Patterns.</p> <p>The design of the protagonist (girl) was inspired by Lanna people's costumes.</p>
		<p>4. Inspired by Lanna Local Ingredient</p> <p>The protagonist's inspiration for the design comes from a local Lanna vegetable called "Phak Wan," using distinctive features and artistic elements as a framework to extract the physical elements of the food and bring them to the design.</p>

Reference	Sketch Design	Description
		<p>3. Inspired by Lanna Cuisine</p> <p>The protagonist's inspiration is from a local food dish called Khao Soi, using distinctive features and artistic elements as a framework to analyze and apply the physical elements of the food to a character.</p>
		<p>4. Inspired by Lanna Local Ingredient</p> <p>The protagonist's inspiration for the design comes from a local Lanna vegetable called "Phak Wan," using distinctive features and artistic elements as a framework to extract the physical elements of the food and bring them to the design.</p>

4.2.2 The Result of Discussion After Game Design Workshop

After the workshop, the researcher conducted a group discussion to gather the game concept design method.

- The game objective is to train the protagonist so that he obtains the highest skills in cooking or gather all the Lanna recipes to win.
- The gameplay system includes collecting ingredients and condiments, recording or showing the cooking instructions and cooking methods, mixing the mixtures, and fighting against enemies or escaping from unnecessary obstacles.
- The protagonist can be either a boy or a girl who has to make use of their cooking skills in order to overcome unnecessary obstacles in a retro or fantasy world.
- Student groups start with designing the gameplay and the story at the same time, as these two elements influence directly the goal of character and game.

- The protagonist is designed as a girl and a boy in order to connect with the player who plays the role of that character in the game's story.
- The inspiration for the character design comes from a characteristic of traditional drawing style that found on the wall in Lanna temple, Lanna costume, each Lanna cuisine, or any local ingredients.

4.3 To Create a Prototype of Lanna Cuisine Game as Virtual Cooking

4.3.1 Setting Player Experience Goal

Player experience goals are goals that the game designer sets for the type of experience that players will have during the game. (Fullerton, Tracy. 2008). The researcher intended to design the game that allows players to feel as if they were the protagonist in the game and perceive a playful and enjoyable experience rather than a sense of competition while playing. Also, they are free to make a decision on choosing the ingredients to complete the assigned tasks.

4.3.2 To Create Scenario of the Game

Regarding Lanna cooking methods and the conclusion of game concept, story and gameplay from the workshop, the researcher decided to develop a simulation game, simulating each cooking process of Lanna cuisine. This way, players will be able to obtain simulated experience in preparing meals and learn to make certain types of Lanna dishes such as Nam Prik Ong (Spicy Northern Thai Pork and Tomato) which is made with the process, ingredients and equipment as shown in the table below.

Table 16 Nam Prik Ong: Ingredients, Utensil, and How to Do

Ingredients and Raw Materials	Cookware and Kitchen Utensils	Action
Tomatos, lemongrass, shallots, garlics, fermented soybean sheet, salt, oil, water, pork	Knife and chopping board, mortar and pestle, pan and flipper	Select Chop Pound Fry

According to the table, scenarios are separate into:

The first scenario, where players have to choose all the ingredients correctly as stated on the screen.

The Second scenario, where the players perform each cooking technique, such as chopping, pounding or frying the ingredients, accurately.

The third scenario, where the players mix all the ingredients from the 1st and 2nd scenario. The order of how they select the ingredients affect their scores as, in real life, ingredients hold different states of matter and have unique characteristics. Some are thicker or softer than others.

The fourth scenario, where the players have to cook and focus on temperature control, the sequence when adding the condiments, as well as determine whether the dishes are well-cooked and ready to be served.

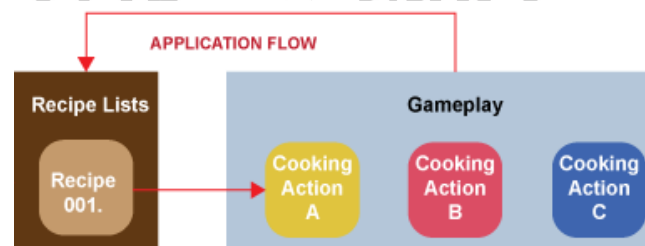


Figure 31 An Examples of The Scenario Flow.

4.3.3 To Design the Game

The principle of Formal, Dramatic, and Dynamic elements (Fullerton, Tracy. 2008) was used to specify each game element for further details.

Table 17 Formal Elements of The Game

Player	Single player
Objective	Complete each meal in high score.
Rules	<ul style="list-style-type: none"> - choose the ingredients correctly - prepare the ingredients perfectly - add the ingredients as stated on screen - a combination of the ingredients is right, or they are well-cooked.
Procedures	Select, chop, cut, mince, slide, pound, stir, fry, boil, steam, grill, roast, ferment, and other Lanna cooking style.
Resources	Ingredients
Boundaries	a preparation and cooking stages in a Lanna style kitchen
Outcome	complete the given tasks successfully and unlock all the dishes in the game story

4.3.4 Lanna Cuisine Game Structure

This part of the study emphasizes the design and development of the Lanna cooking game, as well as the simulation of each cooking method of particular dishes. The objectives of the game are to enhance the students' learning and have positive attitudes towards local food. (Sung, Hwang et al. 2017) In addition, this activity has potential to promote independent learning. (Merikivi, Tuunainen et al. 2017).

This cooking game, in brief, encourages the players to notice details, practise and understand the process of Lanna cooking culture in a virtual kitchen. The game also offers them a chance to learn from trial and error as they play through each cooking process.

The design team starts to create the game structure that illustrates all game system consists of three main parts: 1) The game interface 2) The database 3) The game's report.

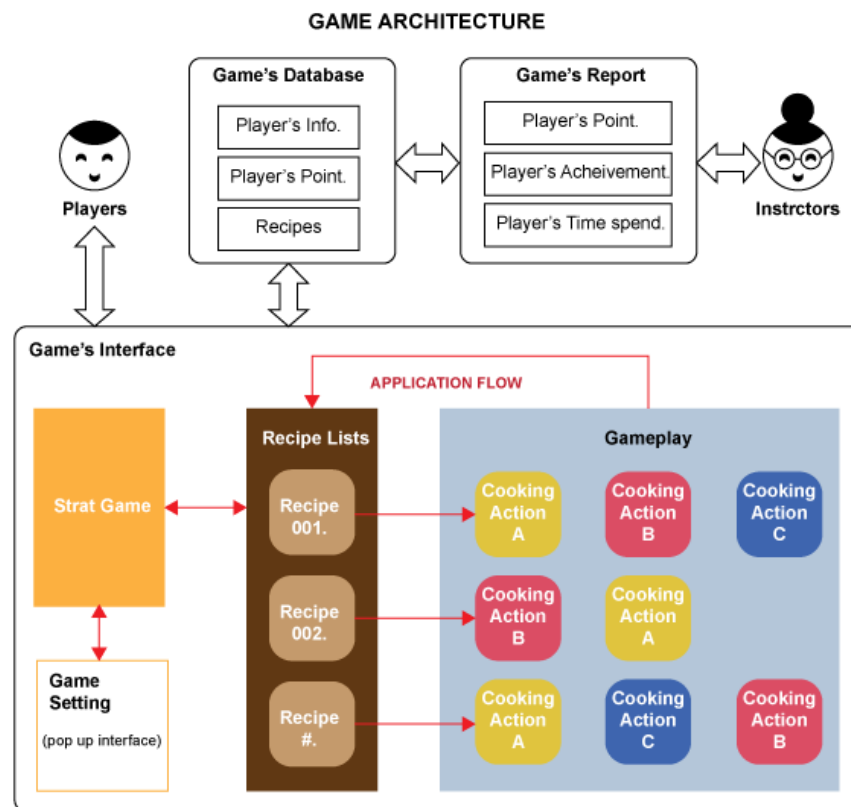


Figure 32 The Lanna Cuisine Game Structure.

The researcher based all the activities in the core game on authentic Lanna cooking methods and made a modification to some cooking process to challenge the players. In other words, the players have to adapt their experience from previous cooking quests to the new ones, which means game difficulty increases along the course of the game. As the players gain more experience, the cooking methods become more complicated.

4.3.5 Game as a Learning Tool

The researchers isolated the elements of the underlying game and used Activity Theory-based Model of Serious Games (ATMSG) models (Carvalho, Bellotti et al. 2015) as a tool to understand the relationship between game methods, tools and objectives and learning.

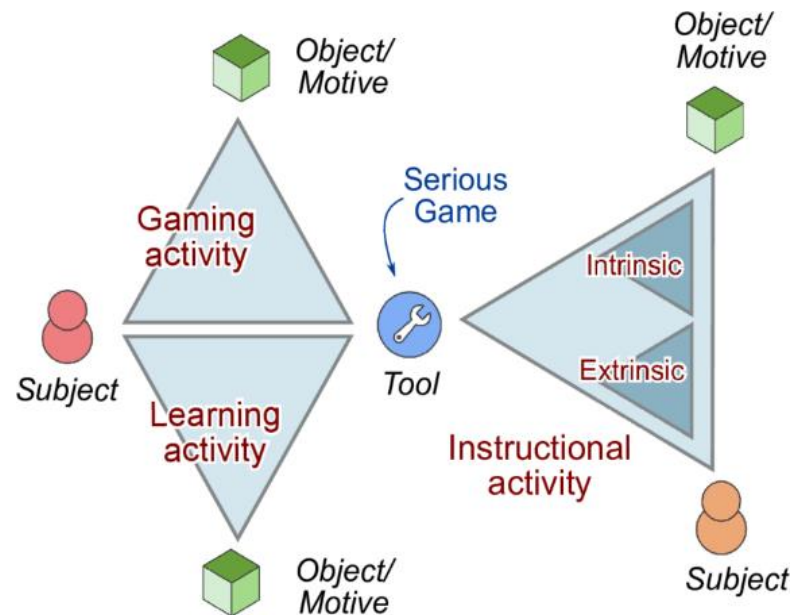


Figure 33 Activity Theory-Based Model of Serious Games (ATMSG) Models. (Carvalho, Bellotti et al. 2015)

For example, the objective is to be able the player to remember the ingredients used to cook food. Therefore, the raw material is designated as a gaming tool and the graphics of the raw material, and its details are the learning tool. The goal is to collect those ingredients (gaming goal) and the player selects the ingredients when cooking (gaming action). in which the player must remember the properties of that material (learning action and learning goal).

Table 18 An Example of Gaming and Learning in ATMSG Models.

	Tool	Action	Goal
Gaming	Item	To select	To cook
Learning	Mushroom image	To read and memorize	To understand

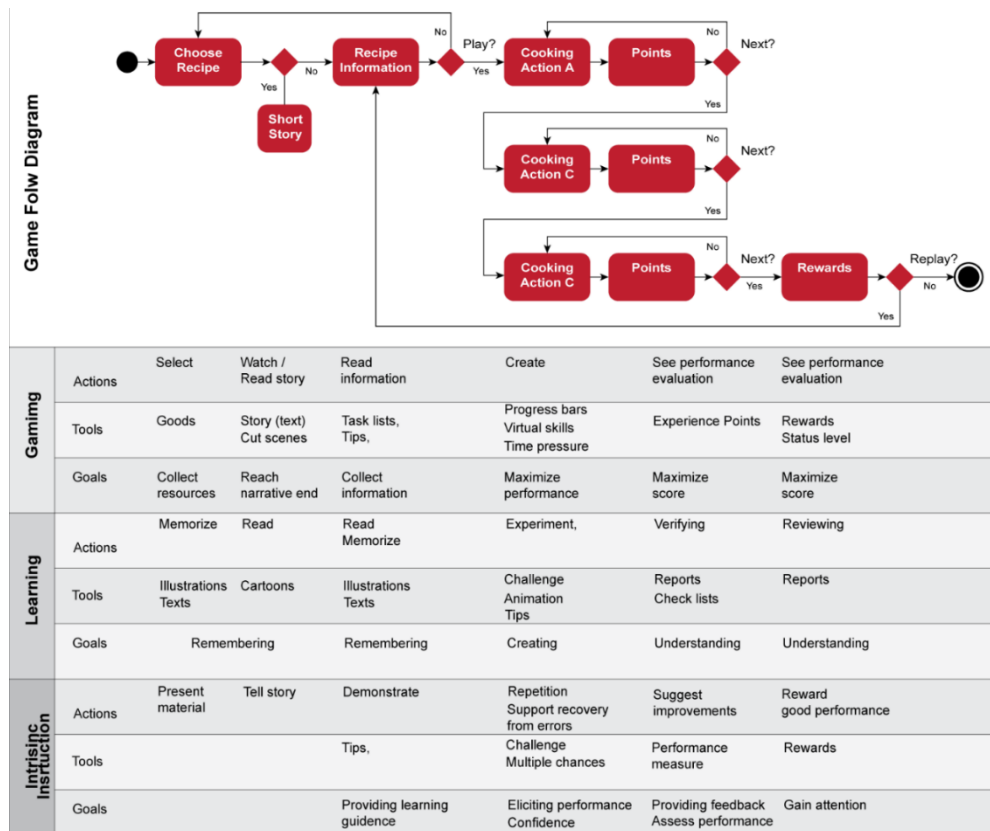


Figure 34 Using Activity Theory-Based Model of Serious Games (ATMSG) Models to Extract Game Flow Diagram.

4.3.6 The Software Prototype



Figure 35 Three-Dimensional Graphic Design of Game Prototype.

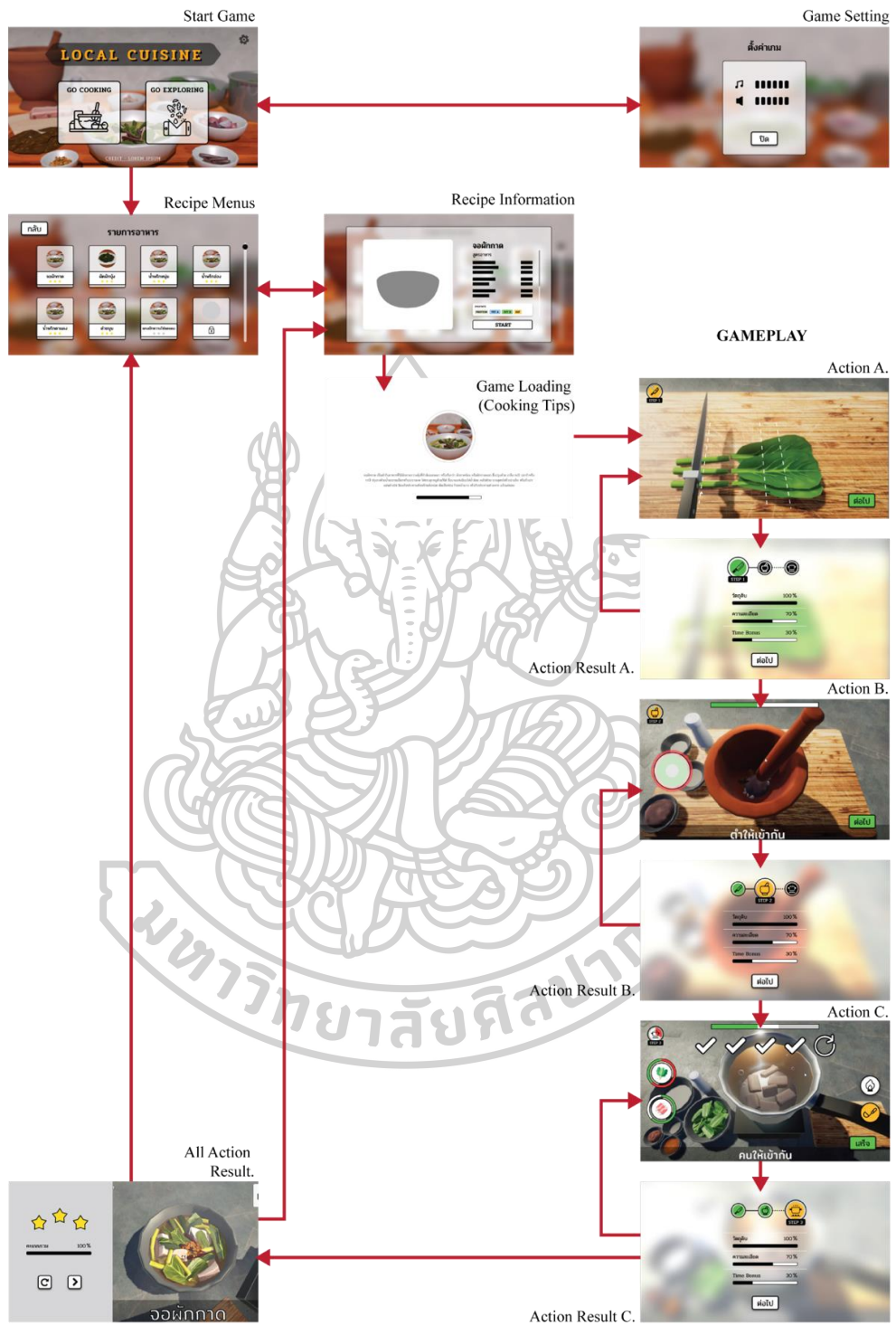


Figure 36 The Flow of LannaCuisine Game (LCG) and User Interface.

4.3.7 The Game Testers

During the development process, once a new version of the game was created, the researcher chose 5 undergraduates in game design to be playtesters, playing the game and share their opinion on the experience they had while and after playing it. The researcher actively observed them and take notes with regard to their reaction and comments made during the testing period. Interviews were also conducted. After that, the raw data were analyzed to classify game elements with the use of elemental tetrad framework before the outcomes were used to improve the game.



Figure 37 Undergraduates in Game Design to be Playtesters.

4.4 Prototype Testing

4.4.1 Measurement Tools

The researcher decided to use the tool “the Player Experience of need Satisfaction (PENS) survey (Przybylski, Rigby, and Ryan 2010) to evaluate the players experience after playing Lanna Cuisine Game for 2 times. The survey used in this stage consists of 21 questions, each of which offer choices referring to the concept of a Likert Scale (Vagias, Wade M., 2006).

Table 19 The Five Subscale of PENS Model

Scale	Description
Competence	To evaluates players' impression of their ability to do something in the game
Autonomy	To measures the player's value of freedom and their chances of pursuing activities they like.
Relatedness	To capture the desire to communicate authentically and supportively with others.
Presence (physical, emotional, and narrative.)	To measures the experience of immersion in the gaming environment.
Intuitive Control	To evaluates players' control over their character's actions.

4.4.2 Evaluation Procedures

Table 20 The Evaluation Procedures

	Time	Procedures	Number of Participants
1.	15 mins	The instructor introduces the information of the Lanna Cuisine Game (LCG) to participants	30 participants
2.	5 mins	The instructor divides the participants into groups	5 people per group
3.	30 mins	The participants play two rounds of the game.	
		- The first round (play freely)	
		- The second round (need high score)	
4.	15 mins	The participants answered an online questionnaire	
5.	5 mins	To short interview participants (qualitative data)	



Figure 38 Students (Aged 16-18) play Lanna Cuisine Game Prototype.

4.4.3 Results of Motivation (PENS)

The result of PENS evaluation reveals that most of the participants are satisfied with the game Local Cuisine Game and details are shown as follows:

In terms of competence, players share the opinion that Local Cuisine Game has defining features that allow them to play (C1 and C2). They also agree that they are competent in playing the game Local Cuisine Game

With regards to autonomy, game attractiveness is evaluated by the players. The majority of them agree that the game Local Cuisine Game has significant potential in retaining players interest and is full of attractive options that spontaneously generate their interest. (A1, A2, and A3)

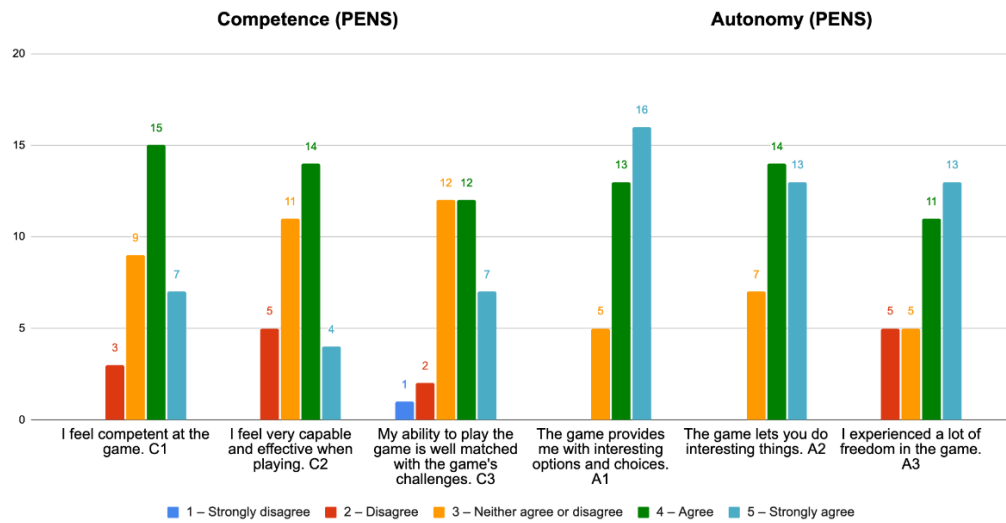


Figure 39 The Data of PENS Survey (Competence and Autonomy).

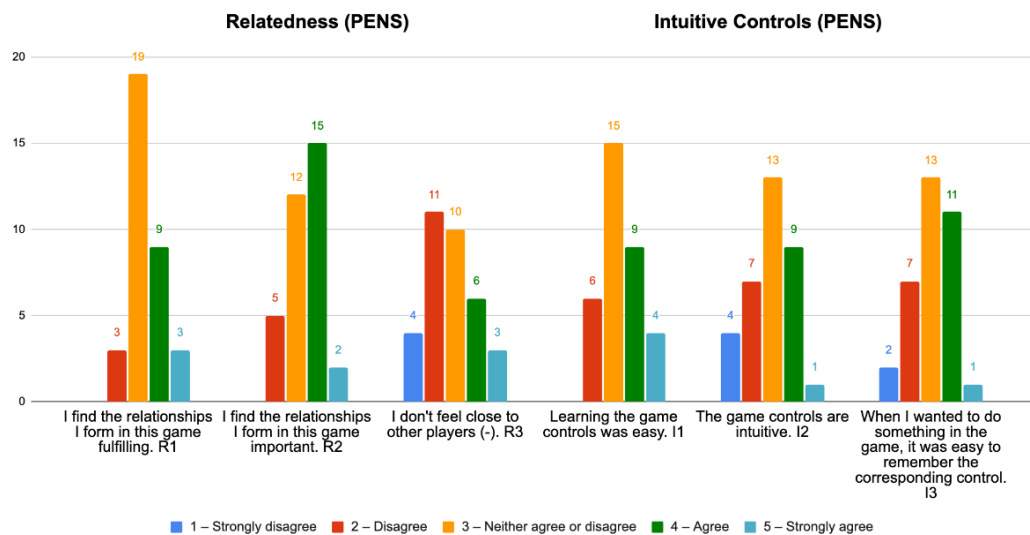


Figure 40 The Data of PENS Survey (Relatedness and Intuitive Controls).

According to the Figure 40, most of the players feel no connection between themselves and the game Local Cuisine Game, and the game, in fact, does not seem to meet their expectations, as shown in the relatedness (R1, R2, and R3) with middle scores of the criteria: I find the relationships I form in this game fulfilling, I don't feel close to other players, and I find the relationships they form in this game necessary.

The assessment of Intuitive control suggests that an improvement is needed as most of the players find it difficult when controlling the game (I1) and controlling while playing (I2). Moreover, they notice some delays when the game responds to certain commands.

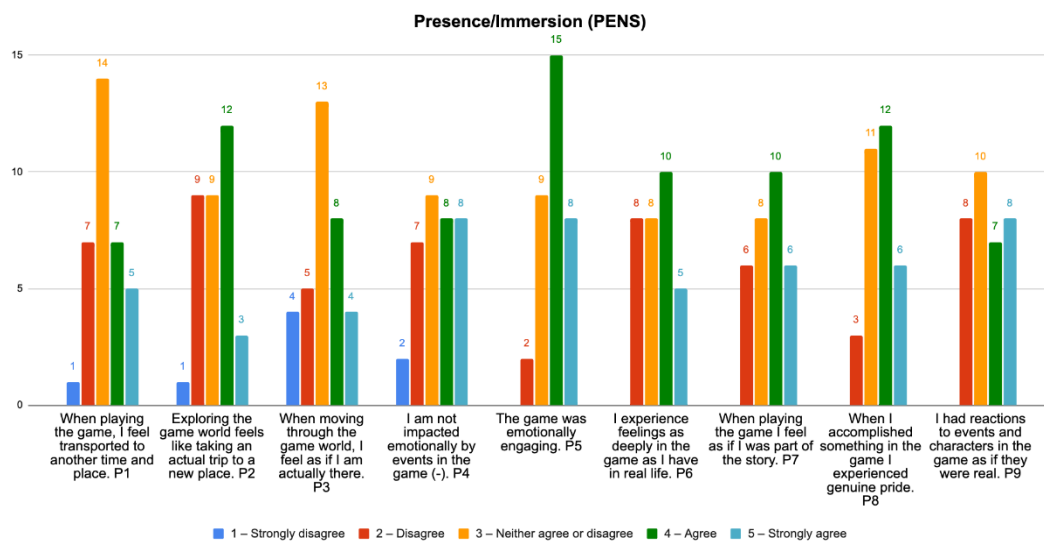


Figure 41 The Data of PENS Survey (Presence/Immersion).

In aspect of the Presence and Immersion, the scores are relatively high as players are able to perceive cooking experience while playing the game as if they were in the Lanna kitchen (P2, P5 and P6). In addition to this, the players feel the sense of immersion as they could solve problems in the game (P5 and P8)

4.4.4 The Player Feedback

Aside from the quantitative assessment of players' experience, the researcher included feedback and suggestions from the participants by conducting interviews. Most of the participants stated that the simulation game Lanna Cuisine Game is captivating, with fascinating 3dimensional graphics that allow them to notice the ingredients at a glance, identify kitchen tools and experience the uniqueness of Lanna culture. The players even mentioned that they were keen to get perfect scores or the highest ones while playing (cooking) to compete against their peers, making it more fun. The researcher also noticed that, while playing, the players often

take turns to share new information or what they have just learned with others so that they achieve a higher score. Some of them even said that the game was so realistic that they wanted to use it to gain confidence before preparing real dishes. This is because the game has lists of ingredients and the amount needed for each dish, cooking order of preparations, and authentic techniques. Another information collected after interviews is players suggestions for expectations in game features for the next version of Lanna Cuisine Game, which include improvements in a more lively animation, redesigns of characters, and an addition of food tasting scores as it also shows how well the dish is prepared.

4.5 Summary of the Assessment Lanna Cuisine Game Prototype

From the analysis and synthesis of test results of the Lanna food prototype game, conclusions for game development can be divided according to game design elements as follows: (1) Game system (2) Content (3) Narrative (4) Motivation (5) Game feedback (6) Visual and Sound (7) User interface.

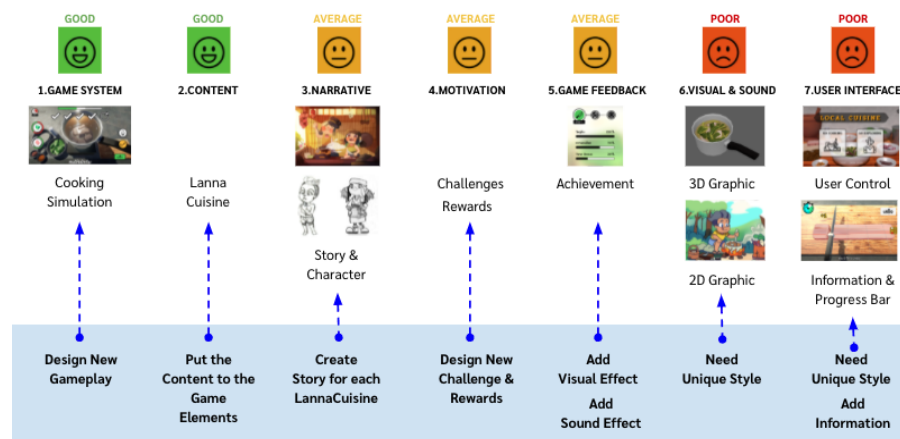


Figure 42 The Diagram Summary of The Evaluation for Lanna Cuisine Game Development.

4.6 Visual Design and Development

The team of designer gather information by taking a photo and reviewing literature to create a certain imagination. In digital games, especially fantasy games, designers cannot use Lanna traditional houses or other items from the real world to

put everything in the game but using some cultural elements from them becomes a practical idea. The method for designing the environment of the Lanna Cuisine Game is adding cultural elements such as ancient kitchen tools, patterns, paintings etc. into the design process.



Figure 43 Lanna Folk Style House (The Center for the Promotion of Arts and Culture Chiang Mai University 2021)

The inspiration to design game graphics comes from Lanna folk style house and environment. The Lanna folk style house was built mainly from hardwood. Lanna kitchen area, which the Lanna people call "Krua Fai." From the inspiration as mentioned, the players will experience cooking Lanna cuisine in Lanna kitchen, including details such as kitchenware, utensils, and local ingredients.



Figure 44 Kitchen Area in Lanna Folk Style House. (The Center for the Promotion of Arts and Culture Chiang Mai University 2021)

For creating game graphics, the researcher uses three methods to design the environment in Lanna Cuisine Game, designer study documents and follow photographs and real data: to design kitchen scenes and items, including some cultural elements for decorating. The steps of development are:

1. Determine the art style of the game environment and objects.

In this step, designers choose a graphic style from a certain folk house and kitchenware which is recommended by the expert of Lanna study and list all the distinctive cultural characteristics.

2. Study

Following the list, designers do research, collect information and images. The researcher uses the Moodboard technique to determine the mood and tone of the game



Figure 45 Moodboard of Lanna Cuisine Game.

3. Draw drafts

In this step, designers draw drafts and take them to group discussion and determine the original painting design.

4. Original painting

In this step, designers draw the original painting and revise the paintings according to feedback.



Figure 46 Concept art of Lanna Cuisine Game.

5. Make 3D models

After paintings have been accepted, designers need to complete 3d models, texture painting, and lighting effects according to the original paintings.

Table 21 The Three Dimensional Model

Reference	3D Model	Game Object
		
		
		

In the Visual Style design, the researcher used the concept of Pictorial vocabulary (McCloud 1994) describing the relationship between reality language and the picture plane to develop a three-dimensional graphic model of a Lanna cooking game. The results of developing all three visual styles are Realistic Style, Geometry Style, and Cartoon Style.

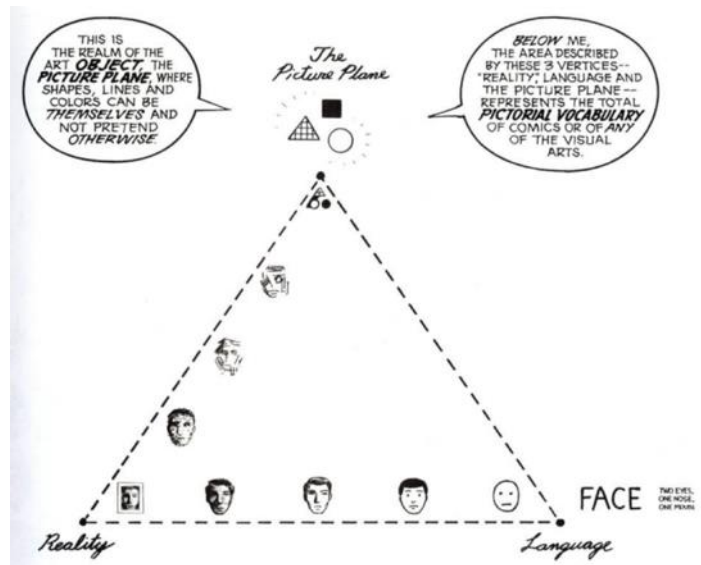


Figure 47 The Concept of Pictorial Vocabulary. (McCloud 1994)

Table 22 The Visual Style from The Concept of Pictorial Vocabulary.

	<p>Realistic Style</p>
	<p>Geometric Style</p>
	<p>Cartoon Style</p>

6. Upload updating packages in the Game System.

In this step, the new game graphic is online. Designers need to test the Lanna Cuisine Game, to get feedback from players, and write data analysis as references for next production.



Figure 48 Color and Light of Lanna Cuisine Game.

4.6.1 Character and Story Development. Visual Design and Development

The researcher makes hundreds of different character drawings which are inspired by Lanna Traditional Drawing and selects the characters that consist of Lanna traditional elements. For creating these characters, the researcher uses three methods.

1. Study

Following the list, designers do research, collect information and images, travel to the location where exists similar kinds of architecture and map it if condition permits.

2. Draw drafts

In this step, designers draw drafts and take them to group discussion and determine the original painting design.

3. Determine the style of the character.

In this step, designers choose a style from a certain character which is practical drawing that has distinctive cultural characteristics.

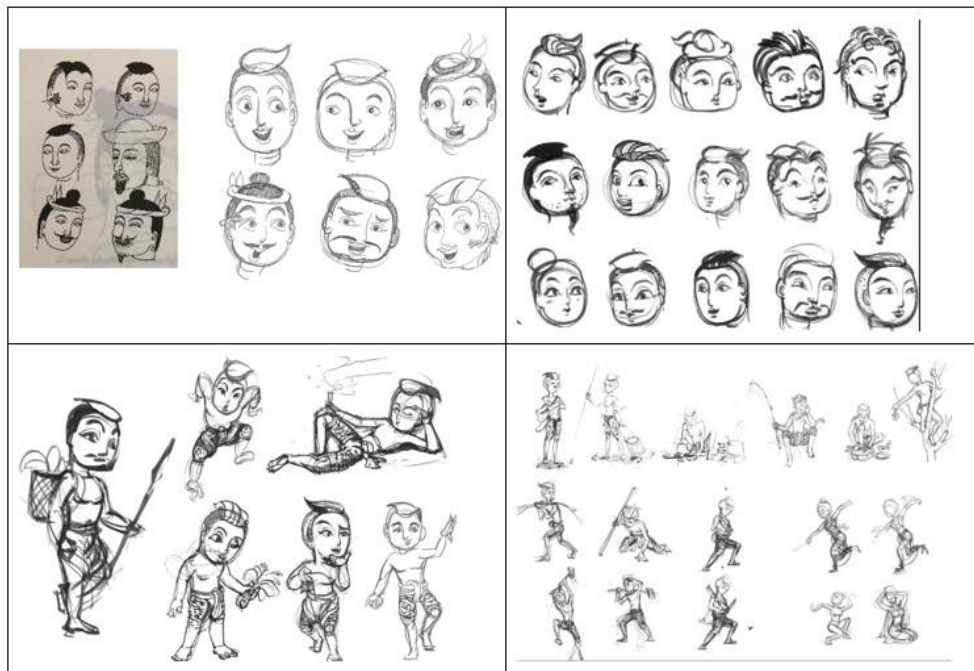


Figure 49 Lanna Traditional Drawing Practice to Create Character.

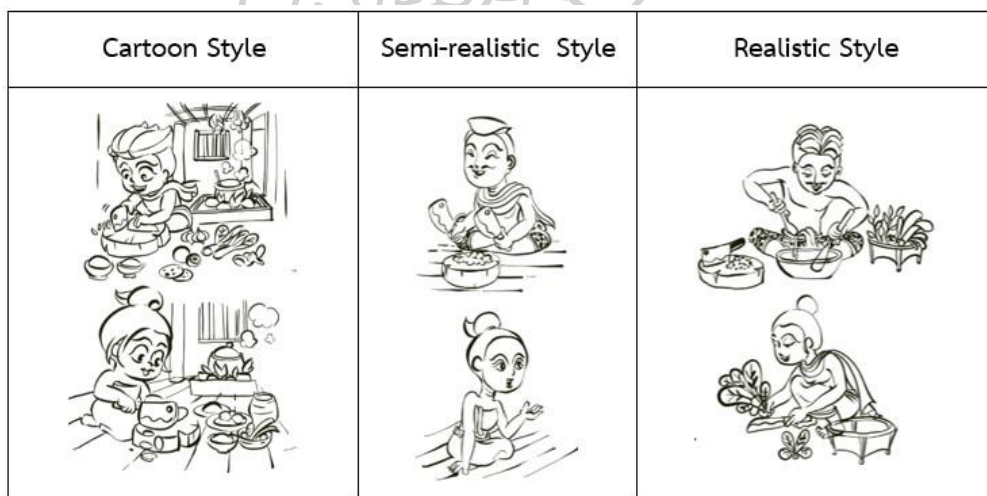


Figure 50 The Result of Character Style.

In this step, designers draw the original painting and submit it to production and marketing departments for feasibility research, then revise the paintings according to feedback.



Figure 51 Character Name "Por Wa".



Figure 52 Character Name "Ay Lah".



Figure 53 Character Name "Aui Chan".

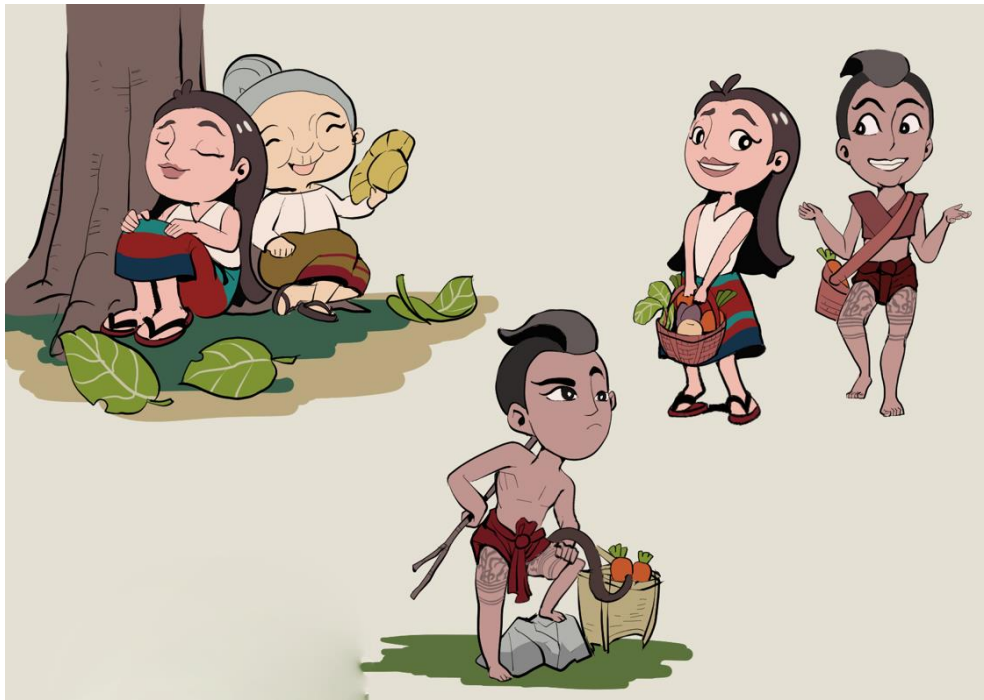


Figure 54 Mood and Tone of Character.






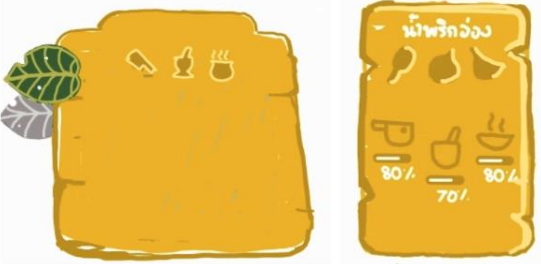

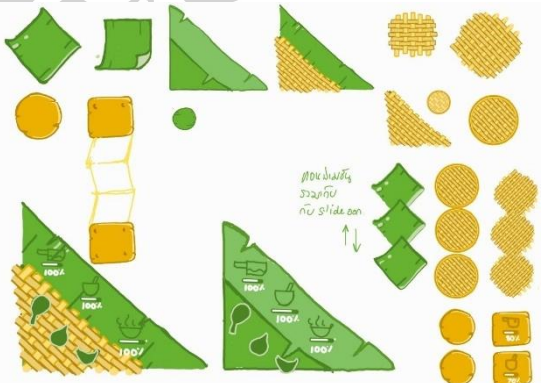


Figure 55 The Sketch of Lanna Cuisine Storytelling.

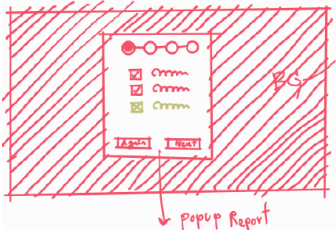

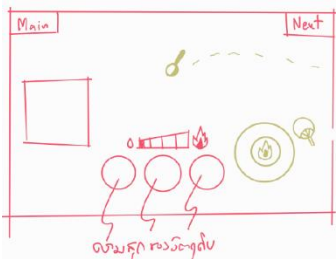

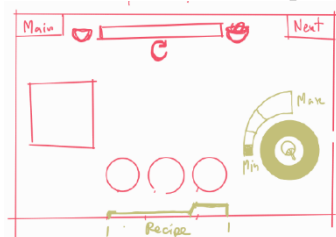







Figure 56 The Lanna Cuisine Storytelling in The Form of Comic Book.

4.6.2 Graphic User Interface Development

Table 23 Graphic User Interface Inspired by Shape and Materials of Lanna Environment.

Inspiration	Reference	Sketch Design
Inspired by Banana leaf and Pluang leaf		
Inspired by woodentray and Lanna kitchen Utensils		
Inspired by Lanna hand craft		
Inspired by Banana leaf bowl		

Sketch	Game Graphic Interface	Description
 <p>popup Report</p>		<p>Dashboard Feedback page</p>
 <p>ต้มสุก รอสุก</p>		<p>Graphic interface when player cook (boil)</p>
 <p>Recipe</p>		<p>Graphic interface when player cook (grill)</p>
 <p>GOOD ☆☆☆ Total Result Finish Dish Detail of Report</p>		<p>Total point of each cooking and step of cuisine</p>
 <p>Story to related that recipe</p>		<p>The story when player finish the Lanna dish.</p>

4.7 Evaluation. Graphic User Interface Development

4.7.1 Evaluation Procedures

Table 25 The Evaluation Activities

	Time	Procedures	Number of Participants
1.	15 mins	The instructor introduces the information of the Lanna Cuisine Game (LCG) to participants	30 participants
2.	5 mins	The instructor divides the participants into groups	5 people per group
3.	30 mins	The participants play two rounds of the game.	
		- The first round (play freely) - The second round (need high score)	
4.	15 mins	The participants answered an online questionnaire	30 participants
5.	5 mins	To short interview participants (qualitative data)	5 people



Figure 57 Samples play Lanna Cuisine Game and answer A Usability Questionnaire.

Usability Test

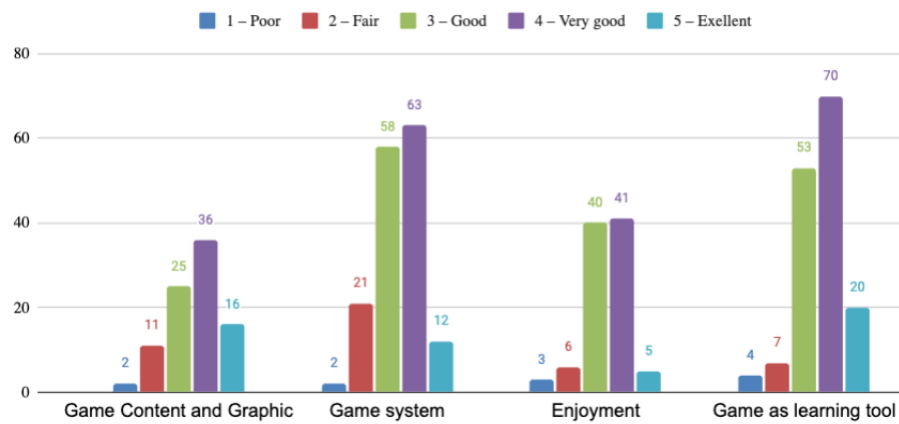
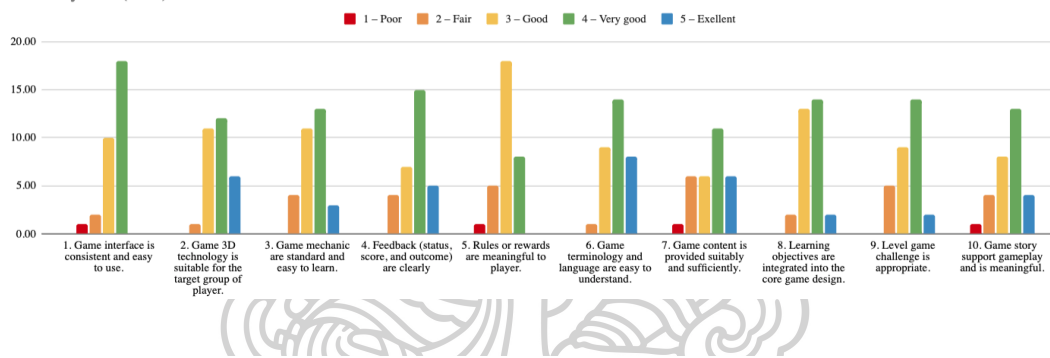


Figure 58 The Total Result of The Usability Test.

Usability Test (1-10)



Usability Test (11-20)

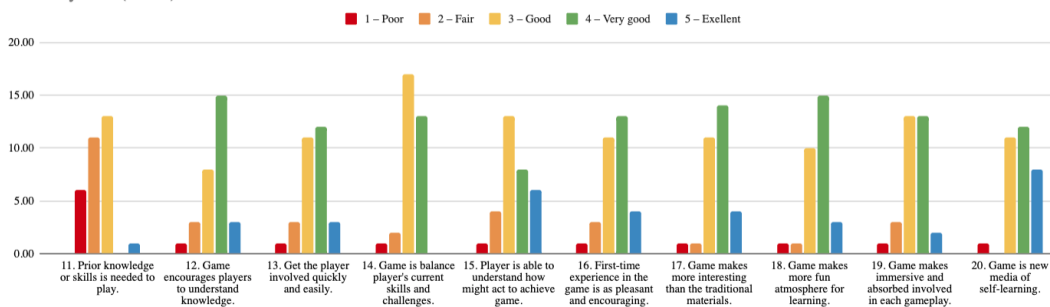


Figure 59 The Result of Usability Survey.

4.7.2 The Result of the Evaluation

This research study is to evaluate and data analysis with descriptive statistics. The assessment of players' satisfaction in terms of game usability is carried out with regard to the game content and its compatibility with the players' skills, for example a gradual increase in complexity and difficulty, the game contents is logically separated into chapters and integrated into the gameplay properly, the

system performance, rules, rewards, etc. The design principles for aesthetics are applied to deliver players a positive experience and suit the gameplay. This includes color, graphic and sound design, as well as technology and softwares to be used in the development process.

Most of the participants in the research subjects agree that the game is compatible with their background by numbering the value of 3 main aspects:

1. The game system is suitable for learning purpose.
2. The user interface can be understood at ease.
3. Game instruction and players' information (such as their status and score) are clearly shown on the screen.

The research findings suggest that most of the subjects were able to understand the game system and the game interface effortlessly. Moreover, the system also helps them understand the contents deliberately delivered effectively.

Player satisfaction evaluations regarding the benefits they obtained from the game, designed with a combination of story, key contents, the game goals, the balance between game challenges and the players' skills, resulted in top three highest scoring scales for:

1. The game literally help them learn about culinary art.
2. The key contents are sufficient for them to understand the story.
3. The game design integrate the use for learning support with the game design itself.

These results show that the players understood the game story and the game design is in harmony with the gameplay and the key contents to be learned while playing. However, some do not consider the game to be challenging. Either the game is too difficult or too easy could result in a decrease in attention span, often with annoyance or upset. This means, to design a playful game, the key contents according to the learning purpose and the right level of difficulty need to be taken into account.

For satisfaction after participating in the investigation, the evaluation focuses on a practical design that facilitates the players to understand the game system and become part of the game world within a short space of time. To help

them learn what the game expects them to do and how to complete the game quests, the game itself is developed to provide players with the first impression of a satisfying experience. Moreover, the game is actually a teaching tool in which the key contents have been modified to generate more attention and offer an entertaining game environment, leading to a playful experience. More importantly, this game is designed to be used as an independent learning tool.

The evaluation shows that the research subjects agree that they are satisfied with the game and the results are shown interim of average scores where the top three highest are:

1. The game is more interesting than traditional learning tools.
2. The game supports independent learning with new learning experience.
3. The players formed a good relationship with the game, or the game offers a more enjoyable experience in learning.

The research found that students have a positive attitude towards how the game retains their attention and keeps them motivated to some extent. The subjects were willing to use the game as a self-learning tool for Lanna culinary art. However, the game failed to challenge them as it lacks the balance between players' skills and the difficulty of assigned tasks. Therefore, the game should be redesigned by adding the analysis of how the target players would respond to the tasks and whether the game system is suitable for the new design.



Figure 60 To Interview Experts after They Play the Lanna Cuisine Game.

4.8 Discussion. Evaluation.

4.8.1 Definition of Game

Studying the definition of the term game (in Chapter 2), the researcher found that while game is defined differently (Salen and Zimmerman 2004, Fullerton 2008, Burgun 2012, Gibson 2017, Adams 2019) most of the definition refer to game rules as an essential part of a game. All the scholars agree that the rules determine the players' actions, what they are allowed to do and how the game responds to such actions. Keattikorn Samranggoon and Patison Palee, expert and researcher of digital game design suggest that Lanna Cuisine is designed to present a simulation world and activities in the Lanna kitchen. In the game designers' perspective, it should be classified into either a category of serious game or simulation game. The game elements of Lanna Cuisine are complete, as it comprises rules: (1) choosing the right ingredients; (2) preparing the ingredients perfectly; (3) adding the ingredients with correct order; (4) a combination of the ingredients is right, or they are well-cooked.

The game goals are that the players are required to follow the instructions shown on the screen to successfully cook each Lanna dish and reach the highest score and that the game reflects how well the players perform each task by calculating and showing them the score.

4.8.2 Lanna Cuisine Game can be Artwork

4.8.2.1 According to the theory of Art as experience by John Dewey (Lipman 1973), art is said to be a combination of methods which yields the outcome that artists are able to reap the benefits. The game LannaCuisine, too, is developed with the working experience in animation and game design of the researcher, combined with the experience after paying a visit to Lanna villages to gather information with regard to Lanna cuisine by taking photos and recording videos. Moreover, experts and specialists in game design, Lanna study and educational technology are involved in the data accumulation process. Along with first-hand experience after taking part in all the design process and the feedback provided by groups of research subjects who greatly influence on the game development and production, the game Lanna Cuisine is considered to be an artwork that successfully represents Lanna culinary art to its target players, Thai teenagers. In addition to this, this game integrates the knowledge in cultural science, education and media design to develop a digital game. As a result, the researcher has gained more experience to produce further meaningful work.

Regarding the players' experience, the game Lanna Cuisine is an interactive medium aimed to transfer the knowledge and experience of the Lanna cooking process where the players are allowed to learn by themselves. As the design team sets game rules in the simulation, the players receive different results while they play it by trial and error. This is because all the ingredients in the game have different characteristics, cooking methods need to be carefully chosen, the sequence of adding condiments and the cooking process is also important. These conditions are taken into account when the game calculates scores, which means the scores are indicators that inform how well the players perform and whether the dishes they prepare follow the authentic recipes. The game is compatible with smartphones and

can be used as an educational tool to promote students' motivation to learn about Lanna cooking culture in the classroom. That is to say this game benefits the community by promoting their culture.

4.8.2.2 With regard to the theory of Art as expression, by Collingwood (Lipman 1973), the game represents a sense of pleasure among Lanna people while eating in a natural and simple way of culinary art. Players are impressed by realistic graphics and sound used in the simulation world which mimic the features of Lanna traditional house as the kitchen is full of ingredients and utensils, as well as cooking equipment neatly kept and ready to be used. Also, as they are allowed to learn and play independently, the players find the game exciting and enjoyable. They start the cooking process by choosing the ingredients by themselves, cooking them with the right methods following the sequence shown in the recipe.

4.8.2.3 From organic theory, art is the combination of minor art elements to form a larger structure with unity. This also applies to game design. The researcher has learnt that games are the composition of minor elements, which otherwise will not be able to be considered as successfully completed games. This cooking game requires:

- Theoretical and practical knowledge in Lanna culinary art, which includes the source of both local ingredients and condiments, types of dishes according to seasons, traditions and tribes, The Lanna cooking style or food preservation, Food beliefs and related traditions, Nutrients and the relationship between diet and health all this information is used in the game design stage to identify the key contents to be delivered to the players and inspire in other related work in the stage such as game graphics for the ingredients. The more the designers understand the characteristics of each ingredient, the better their artwork communicates with the players.

- Knowledge in Lanna history is also important for the designer team. Once they know the history or the origins of the local culture, for example Lanna cooking culture is formulated with various tribal cultures derived from immigrants and settlers in the region. This kind of information plays an important role in in-depth design. The players also learn it while playing the game. To illustrate, the

designers can create a scene of traditional new year celebration where special dishes are cooked and served.

- Knowledge in game design is crucial for the designer team. They ought to know how to create rules that contribute to playful experience, how to design the gameplay and the players' experience is also needed to be considered. In addition to this, a good game design should be based on the player-centered approach so that the game suits their needs.

- Narrative design in transferring cultural contents is important as the story has to be told through the main characters. Game stories are often complicated, so they have to be carefully planned. The players should share the feelings of their protagonist when they are performing a task, especially the feelings that occur with respect to food and eating culture. The reactions of such characters have to convey their feelings once they taste the food.

- Technology is another important aspect in game development with the use of software or hardware in the production such as to create game graphics that allow the game to run automatically with programming or to fill the player with high performance or new experiences through controllers.

- The concept for game visual design - cartoon style - combines the uniqueness and dominant features of Lanna cultural heritage. All minor components in the game need to go through the development cycle, starting with a thorough design, quality test, and analysis so that the final design can deliver an excellent experience to the players.

All of these sub-assemblies go through the design process, testing, and analysis. The cycle is repeated until the most suitable combination is obtained to create a good experience for the players.

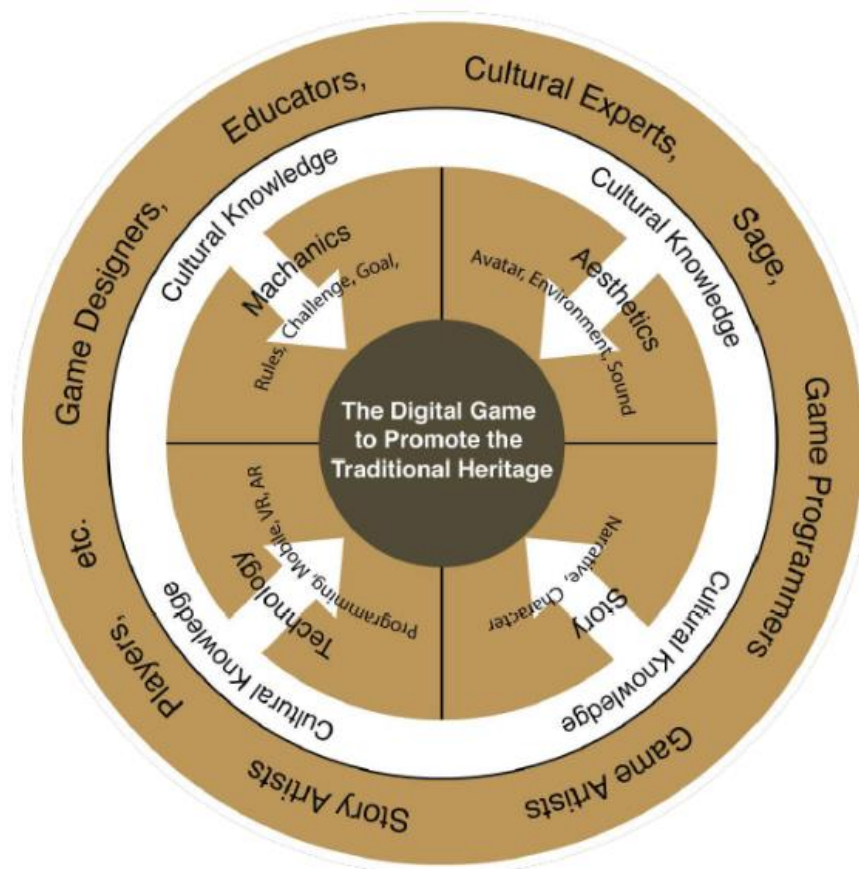


Figure 61 Framework of Lanna Cuisine Game Design

4.8.3 Layers' Experience

The players mentioned that not only did they learn something new, but they also felt as if they were in the game environment, which allows them to fully understand the cooking process and gain new experience. To illustrate, some players prefer boiling methods because the graphics made them feel like they were cooking in the kitchen. This means the game was able to capture their attention and effectively make them stay focused. However, when using interactive technology to convey cultural content in games, further developments are still needed for a higher quality of media.

4.8.4 Concept Model

In summary, most of the players agree that the design of Lanna Cuisine is suitable to highlight and transfer the importance of the local cooking

culture. They also stated that the content is represented in a lively, interesting and approachable way. As the researcher is intended to present the cultural content in an innovative way, the survey reveals that the game has changed attitudes towards food in some players who used to think that cooking methods, especially traditional ones, are difficult and complicated. Some even become so interested that they look forward to cooking them in real life.

Keattikorn Samarngoon shares an opinion that “we should embrace the idea that parents cannot prevent their child from playing games since smartphones and tablets have become an integral part of our lives in almost every aspect: study, work, and leisure. This is because games are available on all the portable device platforms as well as websites or social media sites. The Lanna cooking game is another significant development in utilizing gameplay as a tool to represent culture-based content with technology.”

The approach by which this particular information is presented is the use of new technology and innovative design approaches because it allows the players to understand the cultural content aimed to convey in the game. However, although this approach performs well in generating motivation and holding attention, it is important to maintain the balance between game challenges and the amount of information being represented. In other words, the gameplay itself, as well as graphics and effects, should not dominate the importance of target content or distract the player from learning.

4.8.5 The Implementation

According to usability assessment of cooking games, most users noted that the methodology adopted in this Lanna cooking game has potential to be used in game development for other cultures and provide players with virtual reality experience. They further stated that if the games are appropriately designed to utilize new technology, along with appropriate amounts of target content and gameplay, this kind of media tends to become successful in preserving local culture as more and more young people use it. This is because games allow players to express their feelings and learn at their pace which generates more curiosity about

their culture. This can also lead to sharing reviews of the game on social media sites, which can be interpreted as a good sign for culture awareness. However, game designers, undergraduates, culturalists, and those working in related fields should bear in mind that the same type of media cannot equally benefit everyone in the society. That is to say, familiarity with technology, attitudes toward technology, notions and preference need to be taken into account.

Mrs. Thitinadda Chinachan suggested while carrying out the assessment form that games, as a learning medium, have potential to support cultural study by making it more interesting. This could bring the presentation of local culture in Thailand to another level, and in the long run, more and more young people will become interested in the culture. However, it is vital to represent only authentic cultural values” That is to say, the notion of devising methodology has potential to promote cultural content and increase public interest in what was once forgotten.

Moreover, Asst.Prof. Manissaward Jintapitak emphasizes the roles of technology in media design that with an appropriate design approach, the audience will be more likely to perceive and understand the target content. This will enrich the content values, reflecting traditional beliefs, methodology and abilities that were passed from generation to generation. Obviously, games and modern technology have both positive and negative aspects; therefore, they should be used with good intention or with the purpose to benefit the society.

As for this Lanna cooking game, the way it represents cultural values with playful experience is advantageous to the public as it improves their understanding in the culture.

To conclude, all the 3 specialists from different fields and most of the participants agree that the notion to develop games as a supporting learning tool for other cultures should continue. However, the researcher still has to work more on the content before making a decision to pursue further design, as well as following concerns for maintenance and performance improvement if the game is launched.

4.9 Chapter Summary

In this chapter, the researcher employed a mixed method, collective raw data with observation and not taking, questionnaires, and interviews. Certain activities were formed, and the game prototype was developed in order to examine the design principles derived from literature reviews in Chapter 2, followed by the process of creating game concepts with regard to Lanna cooking methods. The results strengthen the notion why elemental tetrad framework should be implemented to analyze case studies as the undergraduates who participated in the research activities, working as game designers, were able to comprehend players' experiences when seeing game design elements in a more concrete way. The outcomes then were used to create game concepts (gameplay, story, character) effectively.

From the determined game concept, the researcher developed a prototype for a simulation game, simulating the cooking process of certain Lanna cuisine, starting with choosing the ingredients, preparing, mixing, and cooking. The rules are that players choose all the ingredients correctly and follow the instructions perfectly, as well as determine whether the food is well cooked and ready to be served so that they complete the tasks with great scores. Once the prototype was developed, it was tested by a group of the research subjects, aged between 16 to 18 years old. Then they were asked to complete a questionnaire concerning the experience they had while and after playing the game. Some of them were interviewed for further information with regard to what they like and dislike in the game and what they have learned during the test. Finally, the development of the game "Lanna Cuisine" began. The players should feel as if they were cooking in a kitchen of a Lanna traditional house.

This research concerns the development of a digital game with Lanna culinary art content called "Lanna Cuisine Game". The study aims to promote local culture with a digital game as it has potential in generating public interest in culture and local cuisine, especially among teenagers. Using technology for simulation is one of the most effective ways to revolutionize the way art and culture has been

presented to young generations such as visiting a museum or historical sites. Digital games are said to have a strength in establishing a connection between players and knowledge. In fact, the games can greatly motivate and challenge the players. Not only do they offer an enjoyable experience but also the key contents deliberately designed for facilitating the learning process.

The results of the game development and the evaluation reveal that the game effectively generates players' motivation to perceive information and learn about the culinary art. The results in terms of performance, usability, and participation in playing the game Lanna Cuisine suggest that players were highly satisfied. Similarly, in items of the situations in the game, the players are also satisfied with how the game story informs them about the local culture and history through the character design. They agree that the design definitely impacts their learning experience. Also, they mentioned that the scene and elements in the background are well-designed and suit the story of the Lanna region at that time. Likewise, they are highly satisfied with game system design as its performance allows them to keep playing in an environment that supports their learning process without being interrupted. They were able to retain their attention to the cooking practice in a simulation world to cook Lanna dishes.

Based on realistic Lanna cooking places, storytelling therefore plays an important role in game design and contribute to formulating a new learning approach that suit teenagers' behaviours and interests. As a result, "Lanna Cuisine Game" is another tool for promoting culture transfer with the use of the technology of digital games that transform the traditional existing approach into interactive media which allow players to obtain new experience from a simulation world of Lanna culinary art.

Chapter 5

Conclusion and Recommendation

The final chapter includes the summary of the study with analyzed findings to completely create a new game design methodology and provide suggestions for those who share similar goals to this research or look for recommendations for their study.

With mixed methods consisting of quantitative and qualitative data, the research framework includes 3 distinctive issues: the Lanna food culture, digital game design, and methods to enhance students' learning, and the development process is divided into 3 stages which include:

The first stage: data collection of Lanna cuisine and expert interviews.

To recognize the importance of the culture in education, further data accumulation and case study analysis are also involved in this stage, and to examine digital game design for cooking content. The comparison of cooking game elements are drawn by:

1. Gathering data on most-played cooking games in 2020-2021 before the researcher analyzed player experience in order to make comparisons and write a descriptive summary.
2. Forming interview questions to be conducted with experts and specialists for specific information.

The second stage: development of cooking game prototype

A workshop with 30 undergraduates in game design from Chiang Mai University was held to create the first design of this cooking game, followed by the process of prototype testing with 34 research subjects (Thai teenager aged 16-18 years old from 3 different high schools) to improve the gameplay with an objective of enhancing students' learning. The tools being used in this stage include:

1. The workshop agenda related to cooking game design and questionnaires for workshop participants.
2. Another questionnaire for research subjects, which are used to acquire qualitative data for statistical softwares.
3. The prototype of cooking games for another group of game testers.

The third stage: design and development of a culture-based cooking game for Lanna cultural studies for Thai teenagers (16-18 years old).

Participants in this stage include 30 students from different high schools in Chiang Mai, 2 game design specialists, 1 educational technology specialists, and 1 expert in Lanna food culture. Research tools include:

1. The prototype of digital Lanna Cuisine cooking game.
2. Assessment forms of game design to be used after all the participants play the game.

5.1 Conclusions

5.1.1 Conclusion of Cooking Game Analysis

To study the fundamentals and elements of cooking game design (the gameplay, player motivation, content, types of graphics, and so on), 10 case studies were analyzed before 5 main elements were identified:

1. Game genre, which can be simulation game: simulating each cooking method with clear and correct sequence, adventure game: connecting the storyline and gameplay to cooking content. For example, a game character cooks to obtain new skills or eat to boost their energy. Casual game: simplifying cooking methods with easy gameplay like picture matching or rhythm games.
2. Player type: most cooking game players are achievers, who focus on completing all the game quests or collecting all the items.
3. Game system: cooking goals are often to achieve the highest scores according to the challenges, such as time limits or completing all the checklist. With regard to the cooking gameplay, game challenges are developed from real cooking methods or technique, starting from preparation to serving. While they refer to

processes in recipes, the game challenges can be modified so that players enjoy the game effortlessly.

4. Visual design: semi-realistic or cartoon style is widely used in cooking game and it is considered to be most effective in attracting players. Medium shot and first-person perspective are also common in this kind of game. The frame is always set to the center of the screen so that players have a clear vision of the cooking methods they are performing, which contributes to kitchen management as well. The warmth and softness of tone and mood in cooking game graphics plays an important role in creating the playful experience. Also, the colors used in games should be warmer and more vibrant than realistic ones. Therefore, cartoon style is most suitable for a lively environment in games. Texts in game, also, should contrast the background for readability.

5. Narrative: there are 2 styles of narration: narrating through the actions of the protagonist in one particular scene, and the goal is to complete all the dishes with endless play though all the dishes are unlocked and narrating the story with unnecessary obstacles which players have to overcome by cooking in order to reach the end of the story.

5.1.2 Conclusion of the Cooking Game Prototype

The development of game prototype and the testing stages facilitate in finding answers and the purposes of this research are explained as follows:

1. There are 5 main aspects of the knowledge in Lanna food culture: the source of both local ingredients and condiments, types of dishes according to seasons, traditions and tribes, the Lanna cooking style or food preservation, food beliefs and related traditions, and nutrients and the relationship between diet and health.

2. The conclusion from the workshop and the following group discussion brings about various ideas for possible types of the game, and gameplay which are expanded from storytelling approaches, and character designs.

3. The design of Lanna cooking game, with culture-based content, benefits the local community as it can be used to highlight the importance of the

culture, especially with Thai teenagers. After the teenager testers played the game and completed the questionnaire, while being observed by the researcher, the strengths and weaknesses of gameplay, and particular requirements in terms of content were disclosed. Observing the testers, the researcher found that women showed more interests and reactions when compared to men counterparts. Unexpected failures in the quest, for example when the mixture splashed out from the mortar while the player was preparing the ingredients contribute to a hilarious mood. Players who sat together were likely to compare the scores and mostly focused on the taste. Overall, they responded to the questionnaire with positive attitudes and satisfaction. This is because the gameplay itself is simple, and the players can make a decision on their own. That is to say they were not forced to follow all the cooking steps. More importantly, the players were satisfied with the use of technology on smartphone features such as shaking the phone to control movement of the pan. While most of the testers found the game enjoyable and likable, improvements in game performance, further details of Lanna dishes are still needed for a better experience. In terms of game graphics, 3D is more preferable as it can generate a more realistic mood and tone of Lanna culture. Finally, it is suggested that gameplay instruction should be included or shown before the game starts.

4. To develop a game as a support tool for education, the researcher drew a conclusion from all the experiments mentioned above and integrated the results into the production of “Lanna Cuisine”. A cooking game with the story of a little girl and a mysterious cooking book. With the help of her grandmother’s spirit, the girl learns and explores more about her local food culture. The design of game graphics adopts a unique style of wall painting found in temples for creating the visual design similar to those in cartoon books that teenagers are familiar with. Moreover, gameplay instruction has been added so that the players find it easier to play the game. Details in each scene have been improved with the inspiration from ancient Lanna’s way of life, architecture and cooking equipment in cartoon style. In addition, AR technology has been implemented and tested with 30 Thai teenagers aged between 16-18 years old. The result shows that they were satisfied and the

game has potential to be used as a cooking culture learning tool. All things considered, the game is efficient in both game design and performance. The interviews with the testers reveal that they learn how to play the game by trial and error, comparing the scores after repeating the same task (dish). This, indeed, helps them memorize the ingredients used for that dish and the methods used in local food preparation. As a result, their scores were likely to increase. The results from specialists show that the game is well structured as it conveys Lanna cooking culture in a refined scene. To conclude, most participants agree and support the idea of this game prototype with particular culture-based content as it effectively enriches the understanding of local culture, especially among the target players, while providing lively and enjoyable cultural learning experience.

5.1.3 Conclusion of Research

This study investigated the mobile game design principles to promote intangible cultural heritage, Lanna culinary art, and it was supported with the design principles as each game element was integrated with cultural content to identify if the game successfully attracts the player while transferring the knowledge in culture. Questionnaires (PENS), observation and note taking, and interviews were the methods used to gather relevant information and identify what is on the players' mind while they are playing the game and what actions they decide to take. The objective of this study is to determine key elements that contribute to generating positive experience while the players play and learn about the culture. This also includes identifying their characteristics and needs for this kind of game.

The design concept resulting from the study shed a light on the importance of using games for cultural promotion and disclose what is needed for the development so that the final result benefits in the process of learning for new generations. This kind of game can be used as a learning tool, sharing the history through storytelling and interacting with its players.

1. To identify the key content with regard to Lanna culinary art to be integrated into the game elements

In Terms of Lanna culinary art, the importance of learning aspect is classified into 5 areas: origins and uniqueness of ingredients, types of Lanna cuisine according to seasons, festivals, and ethnic groups, Lanna cooking methods and food preservation, and nutritional facts for Lanna dishes

The game designers based the game structure and story on types of Lanna cuisine. The story is told in a series of mini games and the players are free to select the part in which they are interested on their own.

Knowledge in the origins and uniqueness of ingredients and types of Lanna cuisine is used in gameplay design, as well as stage design, where the players are assigned to prepare the dishes as guided on the screen. They are then able to learn the game system and its rules. The levels of difficulty depend on the complexity of the cooking process of each dish.

Knowledge in tradition, beliefs, and nutritional facts are included in the storyline, game characters, assigned tasks for the players to complete, or the gameplay. This allows the players to learn about the importance of each dish once they cook it.

In addition, the researcher expanded the study into Lanna architecture and painting to design a more realistic environment in the game to improve the experience being delivered to the players through game graphics and music.

2. To identify which game elements of cooking simulation games contribute to creating engaging and meaningful experiences in traditional heritage

Selecting critical game elements to suit the game objective in a balanced design requires the designer to take the gameplay in the player's perspective into account. A meaningful gameplay should include game tutorials and feedback. Tutorials, the introduction of graphic user interface (GUI), gamesystem (skills required) and usability, is one important element to create a positive first impression as it

helps players to understand the game and its goals, as well as the story. While tutorials should appear on the screen regularly to guide the player, immediate feedback has a more indispensable role in retaining the player. A lack of or delay in feedback is said to be an unpleasant experience and some players quit the game for this reason. However, the key to thorough game design is a balance between all these factors, player-compatible skills and challenges, viable options, all of which provide the player with worthwhile experience. Moreover, the players themselves should choose the correct option, complete all the tasks accurately, and have all the qualities as the rules defined in order to overcome unnecessary obstacles and gradually feel a sense of achievement and, as a result, fully participate in the game. To conclude, players are more likely to take part in the game when the game system is clearly represented and can be understood with ease.

3. To identify individual player experience that impact the design of game elements based on Lanna culinary art

Players' experiences are essential for game designers to create the game concept. The target audience, along with the experts and specialists involved in the research, shared their personal experience while playing the game Lanna Cuisine in different ways, with regard to different concerns: the search for particular ingredients, the cooking practice, the content being taught while playing. According to the process of information analysis, the players' experiences are influenced by real-time sensory and emotion processing, which change accordingly as the gameplay and the elements change. Most of the players mentioned that they perceived a positive experience as the game served as a learning tool to raise awareness of cultural values, connected to their personal need with the gameplay and keep them motivated.

The sense of taste and smell are among the most significant factors that influence personal dining experience. However, under limitations on gaming technology, it is now impossible to directly offer the players the olfactory and gustatory senses. Instead, the game was designed to give feedback to the food

through the character's facial expressions and body language with a concrete narrative and comparative form.

As a result, extensive experience perceived while playing the game was designed with culinary art, which include preparation, cooking and presentation, allowing the players to learn through the process of making different kinds of Lanna dishes with simulation software. They can also learn at their own pace with trial and error methods to successfully cook all the dishes, following the game rules. This way, the players are able to learn about Lanna culinary arts while practicing their cooking skills in a simulation world specially designed to enhance their motivation.

This research is to devise methodology in media production to support cultural learning approaches by utilizing the design elements of game and storytelling of the protagonist with cartoon style, so that the game captures young players' attention to Lanna cooking methods. The game components that contribute to players' learning experience include:

1. Roles of the game characters and the story plot with cartoon style is appropriate for Lanna cuisine culture representation to Thai teenagers.
2. The design of Lanna kitchen inspires the feeling of being in the virtual world.
3. Cooking simulations attract players' attention.
4. Trial and error allow people to subconsciously learn and memorize the cooking process.
5. The scores for taste and competitions among players challenge them and meanwhile keep them playing.
6. Unexpected results responding to the player's actions generate a sense of enjoyment, which without the simulation world would not have happened.
7. Different Lanna dishes are suitable for different gameplay, depending on their history, type and cooking methods.
8. The gameplay that employs sequence in cooking methods for particular dishes contribute to well-organized game system where

students clearly understand what they should do, what is needed to memorize. However, if they are allowed to play independently, the game will contribute to their imagination development, resulting in new recipes from the existing local ingredients.

9. As there is no Lanna cooking game for Thai teenagers aged 16-18, this research will increase access to knowledge in arts and culture. Especially the art of Lanna cooking by focusing on teenagers in particular Studies have shown that games are practical, easy to use, and a suitable medium. The game helps the audience to learn about food culture more fun.

10. Rating evaluation in cooking games should be presented in a visual or symbolic speech rather than a numerical rating.

5.2 Recommendation

5.2.1 For research, preservation, and promoting

If a government or private organization especially higher education institutions Supporting the creation of games based on Thai culture will have two benefits: it can stimulate education and research on Thai arts and culture, and it can stimulate game design and research. Because game design is a science, it has to integrate knowledge in many areas such as game design, script writing, programming, etc. And even more so, the game reflects Thai culture. It is very important to have knowledge and expertise to participate in the design as well. and if a cultural game competition is held the researchers saw this as a good signal to spread Thai culture throughout the country.

5.2.2 For any further study

A wider range of target audience, such as young children, culinary students, tourists (both Thai and foreign travelers) should be taken into account. Another consideration is that local or traditional clothing, Thai architecture elements can also be applied to the game graphic design for a more extensive cultural promotion. Finally, the objectives of the game can also expand to cover activities in museum tours or sightseeing tours in particular areas.

5.3 Contribution

This study provides comprehensive information about a player's motivation. The result found that the players are motivated when they explore and disclose hidden information in the story by trial and error method (knowledge) and game graphics that reflect traditional Lanna's culture.

This research study is supported by the principles of game design as the players learn to cook via the game simulating system, contributing to cultural experience and promotion and retaining their attention at the same time.

The first action is to acknowledge the importance of the game instruction or a game tutorial since they play an important role in guiding novice players to understand the gameplay and stay motivated to gradually take part in the game. The game tutorials, in fact, explain what they can do, how to play, and what is expected (along with options available), as well as the game goals, so that the player understands the game better.

Second, empirical knowledge regarding presenting the game story before, while, and after the player plays the game. Although it is true that storytelling is considered the oldest form of human communication, it is essential for game design to deliver a particular experience to game players. Converted into graphic novels, the game story is expected to convey the game content to groups of teenagers to create and transfer meaningful abstract ideas of Lanna culinary culture such as cuisine for traditional ceremonies.

Third, this research has potential to enhance players' motivation to participate in the game as it employs playful interaction methods, generating players motivation with goals and rewards, feedback, challenges and positive experience in discovering new recipes and adding values to the cultural content learnt while playing the game. Unknown recipes successfully retain their attention.

Moreover, this research is among the first studies to identify the definition of playful interactive activities and intangible cultural heritage promotion, particularly for culinary art. It can be applied in learning experience design by integrating playful experience into mobile phone technology in order to create learning tools for

educators in schools or in museums, culture experts and the cultural tourism industry. As a game application with cultural content, it offers new experience in learning a new culture to the users. More importantly, this learning method is considered independently-learning as the users or players learn about the content on their own, making decisions which later affect their feelings on their own and improving themselves as they are learning about the cultural history.

5.3.1 To Provide the Method of Cultural Content Extraction

That is integrated with the game design element for the promotion of traditional heritage:

To develop a game for cultural promotion, the main purpose of the development is to present the players with cultural content in a playful manner. Therefore, it is important to analyze and apply relevant information to identify the key content and determine learning objectives, and, as a result, establish the methods of presenting such information. The researcher applied the Dale's Cone of Learning (Dale Edgar, 1969) method to analyze the content of Lanna culinary art and classify it into passive learning (verbal and visual receiving) or active learning (receiving and participating, doing)

5.3.2 Game as Digital Culinary Training

Lanna Cuisine is a game designed on the principles of simulation, applying the knowledge in Lanna culinary art to generate computer graphics of the ingredients, kitchen utensils and equipment, the environment, and precise cooking methods according to reliable and authentic recipes. All these details are then integrated into designing the game system, as well as formulating the game rule, with a programming methodology to determine what the game expects its players to do and not to do. This allows the game to guide and respond to the player's actions. That is to say, the game designers are like curriculum designers as they set the game goals and make the game challenging while guiding the players to practice their cooking skills under the conditions ruled by the game systems. When the game

responds to the player's action, they will be guided and taught to do each task as if they were being trained with an instructor.

5.3.3 Usability for Cultural Learning Through Play

- Players can learn while playing Lanna Cuisine at their own pace with no restrictions on time and place since the game is installed on a smartphone, and most Thai teenagers have their own phone.
- The game can be installed with ease as smartphone users can find it on digital distribution platforms for applications, which means no other equipment is required.
- The development team can update the game content of additional culinary art on online game stores.

5.3.4 Guidelines for Mobile Game to Promote Traditional heritage

Table 26 Guidelines for Mobile Game to Promote Traditional Heritage

	Area	Guideline	Description
Player	Knowing player	Player motivation and interest	This kind of game is designed to suite achiever, serious gamer, leisure gamer
		Previous game experience	Players are teenagers, and no experience is needed as this kind of game contain simple gameplay and graphic user interface, suitable for supplemental learning activities in classroom
		Play scenario	Games should be flexible for any circumstance and compatible with a wide range of users: family, groups of players, couples or single players.

	Area	Guideline	Description
Mobile game for promotion of tradition	Mechanics	Tutorial	A tutorial should be presented before the game starts. It should introduce all the key elements in the game starting with the user interface, game structure, game goals, and how to play it: how to select and prepare the ingredients, cooking methods, and food presentation.
		Genre	simulation
		Communicate the aim of the game	The game objectives must be clearly shown as the game begins or during initial stages of the game. That is to say, the players should know what they are expected to achieve and how to reach it.
		Continuously rewarding players	While extrinsic and intrinsic motivation retain players' attention, feedback is the most important element. Without immediate, clear, and appropriate feedback, players are likely to feel frustrated as they fail to complete the task or pass to the next level.
		Avoiding choice ambiguity	Options in the game should rely on the amount of knowledge gained through the play. Suggestion on possible results when players make a decision helps them to distinguish between desirable and undesirable outcomes.
		Well-defined game challenges	Game challenges should be precisely determined and perceived by the players effortlessly. This helps them achieve the goals easily but they will only know it once they are skillful and able to pass to the next level.

	Area	Guideline	Description
Mobile game for promotion of tradition	Mechanics	Limit cognitive overload	Simplicity is the key. Most players have limited experience in learning cultural content through games, and therefore the sequences of content should start with the simplest one, and gradually increase difficulty. Also, the graphic user interface should be brilliantly simple so that the player understands it easily.
		Simple game structures	Players should be able to learn about the game structure with ease.
	Aesthetic	Uniqueness Graphic Art	The designers should implement main concrete characteristics of traditional heritage to their design concept or inspiration to create game characters, graphics, and music to help the players blend in with the game environment effectively.
	Technology		Gaming technology should be carefully selected to suit the gameplay and this should not have any negative impacts on players' experience.
	Story	Narrative for learning	Storytelling should facilitate players' understanding in intangible content of culinary art: origins, taste, and beliefs.
		Authentic storytelling	By adding further information on local history, the story can be more realistic, contributing to a more lively imagination of the players, as the history itself is full of cultural information.

	Area	Guideline	Description
Mobile game for promotion of tradition	Story	Short story	An appropriate story length is the key to the players' sense of pleasure and liveliness as they are free to explore the game world.
		Familiar Character	The design of game characters should integrate the characteristics of the target players with fantasy features.



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APPENDIX



A: Art Theory

1. Ludwig Wittgenstein concludes in an article Games and Definitions that the meaning of game is broadly described as Olympic games and other kinds of games are seen differently. To give a precise description, common aspects of each game are required. For example, a football and basketball game does share some interrelated concepts. In fact, it is suggested to use family of meaning to clarify such unclear points like when we distinguish the color red from yellow while they both are still color.

2. Clieve Bell defines art as shapes with complicated structures, formed by composition, shapes or lines, on mass or spaces that are perceived by artists while the public may find it difficult to understand or see such work. According to an article "What is Art?", shapes can be closed lines, lines or colors as long as they represent a combination of forms. Paintings, for example, represent how an artist makes use of compositions, mass, space and color for aesthetic purposes to create art. Shapes, in fact, are complicated to comprehend, but artists are trained to see and make use of them to convey messages. Shape theory is different from imitational theory. To illustrate, the figures of humans or fruits comprise various shapes like circles or even edges. The theory of shapes is rapidly developed and often used to explain by abstract art.

3. Robert G Collingwood, a british philosopher who was trained by E.F Carrit Collingwood adopted the idea imposed by Benedetto Croce and finally defined art as expression. While Benedetto Croce had great influence on his thoughts and work, Collingwood believed that thought and goal-setting process, along with artworks that reflect feelings and imagination are the most significant. According to Collingwood, artworks are classified into 2 groups:

- Craft, which requires only skills and crafting techniques like the making of vase and pottery in the early twentieth century. (it should be noted that the definition of craft given by Collingwood is different from modern definition)

- Art proper, according to his philosophical view, is said to express feelings.

4. John Dewey concludes the definition and effects of art on humans as mentioned below.

- Art is cultivated in culture, belief, cognition and competence represented in media, whose techniques are learnt and practiced until the process of achieving a result is completed, formulating a meaningful experience while patience and industry are excluded.

- Not only a sophisticated creator, but also a competent receiver is important when presenting art as the audience can only benefit from art when they understand the essence of emotional experience.

- Media must not be misunderstood by its value. For example, vinyl records or postcards are only tools distributed to those who missed the chance to experience the original work. The roles of such media are, indeed, not the same as those of musical instruments or painting brushes used to create the media. That is to say, without monetary values, these kinds of media play an important role in broadening one's experience despite the fact that they are not in the place where the media are shown.

- Challenges to aesthetic philosophy include mentality, interaction, and shapes, all of which contribute to the way media are perceived, interacted and criticized, resulting in knowledge expansion.

- Artwork is not only the work that represents an artist's or creator's imagination, but it possesses values that allow the viewers to naturally integrate their experience and expand their imagination.

L: Lanna timeline brief history

In the 13th century, some colonies and city-states in the north of south-east Asia agreed to unite and name themselves Lanna, meaning millions acres of rice fields. A closer look at its geological features shows that the capital city of Lanna was in a rectangle shape with five city entrances and four fortresses along the city wall, showing the boundary and hierarchy of settlements. Before King Mangrai departed Wiang Kum Kam on April 12, 1296, the land possessed stronghold, located between valleys and there were two main rivers: Kok and Ping rivers, allowing the city to govern other towns and have great influences in trading with southern land (Siam), and north regions (Yunnan Chiangsaen). The establishment of Chiang Mai city wall was to make it the center of governance, economics, community and culture of Chiang Mai, which means the King intended to follow cosmology approach, surrounding the capital with smaller cities like satellite. In other word, the capital city was like the center of the universe with Wat Chedi Luang temple (referring to Kao Prasumain Mountain) sitting at the very center of the city and was honored by the locals (Ongsakul et al. 2005) Nowadays, Chiang Mai is one of Thailand major cities and the center of Lanna culture, generating a large proportion of income from tourism industry to the country. Also it is the first place most tourists visit before departing to minor cities in the north.

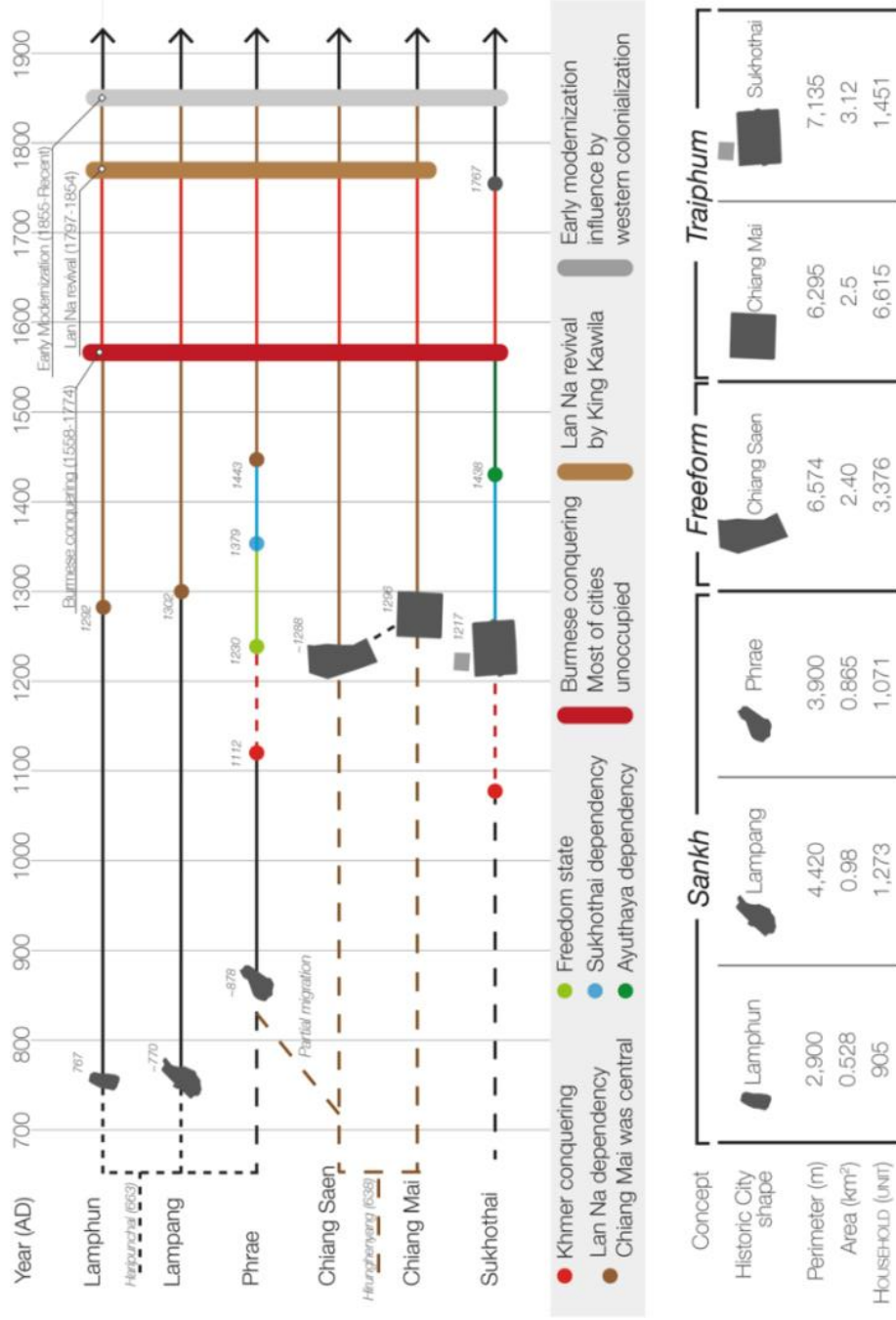


Figure 62 Cronology of the Lan Na Cities (Srinurak, N., Mishima, N., 2017)



Chiang Mai City Heritage Centre
<https://cmcity.com/lanna-timeline/>

Figure 63 Lanna timeline brief history 2 AD.-1558 AD. (Chiang Mai City Heritage Centre, 2022)

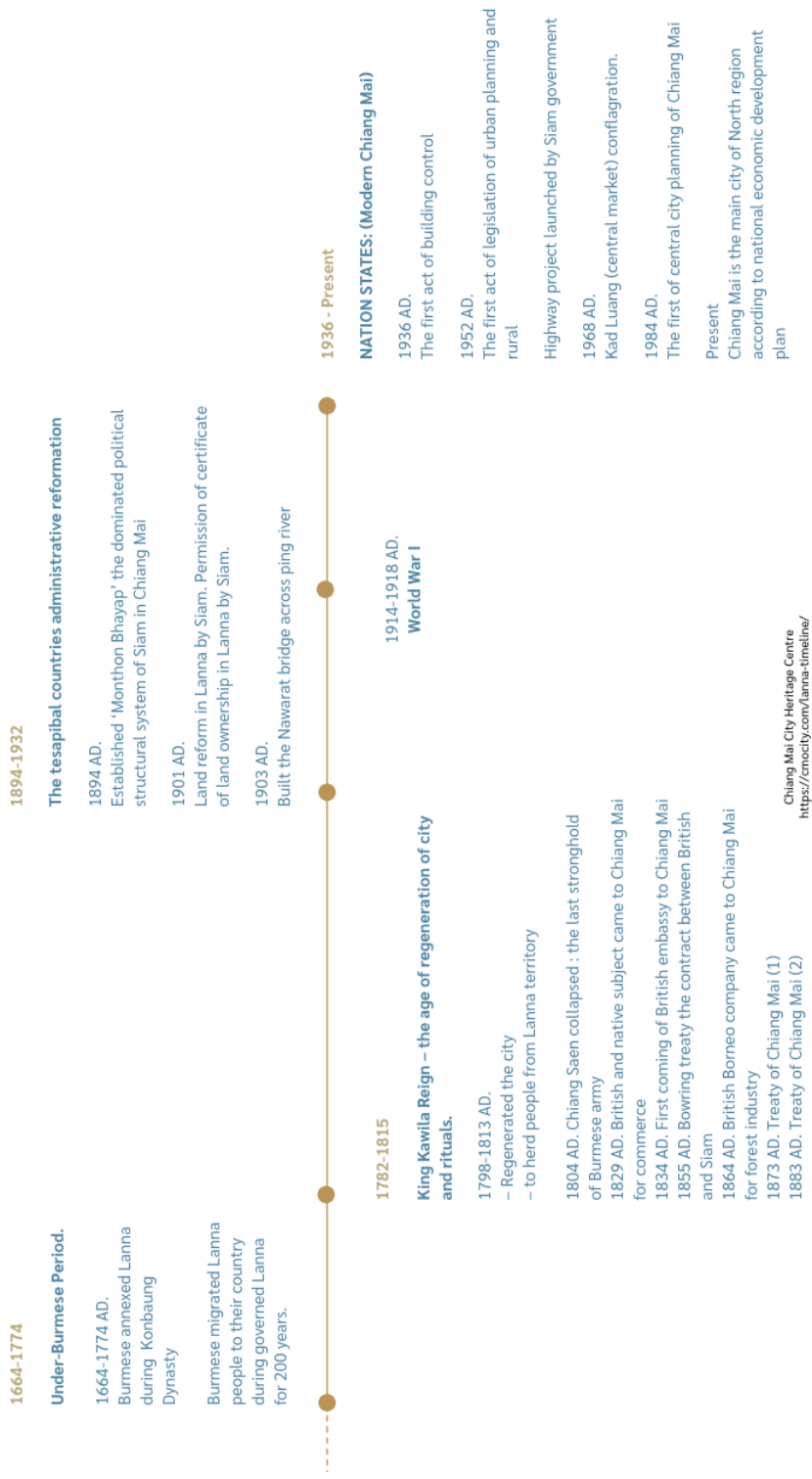


Figure 64 Lanna timeline brief history 1664 AD.-Present (Chiang Mai City Heritage Centre, 2022)

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