



Developing a Lanna Food Cooking Game

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Abstract

This research aims to develop a Lanna Food Cooking Game. The methods used in this research were studying documents about Lanna Food and interviewing the experts of Lanna Food to analyze ingredients, seasonings, cooking methods of Lanna Food. The game will be designed with the knowledge from this research and develop the game based on SDLC Model. The game presents Lanna Food and other Lanna cultures such as Lanna Tradition Dress, Lanna Traditional Houses, Lanna eating cultures. The gameplay is related to storytelling and characters. Game players have to cook the Lanna Dish from each of Lanna Traditional House. There is an instruction to help players. If the mission is completed, players will get scores and ingredients symbols. The special function of game is to save the important scenes of game to share on the social media. The certificate will be given to the players on the last scene. Then, 29 participants as a sample will test game and evaluate. It is found that a sample is satisfied contents, game design, and game features at the high level. The sample's knowledge of Lanna Food Cooking before playing game is at the middle level. After playing game, the sample's knowledge is increased to the high level.

Keywords: Cooking Game, Game development, Lanna food, Simulation Game



บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อพัฒนาเกมทำอาหารล้านนา โดยใช้วิธีการศึกษาเอกสารเกี่ยวกับอาหารล้านนา และสัมภาษณ์ผู้เชี่ยวชาญด้านการทำอาหารล้านนา เพื่อรวบรวมองค์ความรู้และวิเคราะห์วิธีการแบ่งประเภทอาหาร วัตถุดิบและเครื่องปรุง ระดับความยากง่ายในการทำอาหาร จากนั้นนำความรู้ไปออกแบบเป็นเกมทำอาหารล้านนาต่อไป โดยใช้ขั้นตอนการพัฒนาแบบ SDLC ผลการศึกษาทำให้ได้เกมทำอาหารล้านนาที่น่าสนใจ วัฒนธรรมการทำอาหารล้านนา และเรื่องอื่น ๆ ได้แก่ การแต่งกายของคนล้านนา ลักษณะของเรือนและครัวล้านนา วิธีการรับประทานอาหารของคนล้านนา โดยมีระดับการเล่นที่สัมพันธ์กับเนื้อเรื่องและตัวละคร ผู้เล่นจะต้องทำอาหารประจำเรือนต่าง ๆ ซึ่งมีคำอธิบายประกอบ โดยมีระบบสะสมคะแนนและสะสมวัตถุดิบอย่างมีเงื่อนไข ผู้เล่นสามารถสามารถบันทึกภาพได้เพื่อใช้เผยแพร่ในช่องทางต่าง ๆ ตามต้องการ เมื่อเล่นเกมจบจะได้รับประกาศนียบัตรที่มีชื่อและภาพหน้าของผู้เล่นพร้อมคะแนนรวมทั้งหมด จากนั้นได้ให้กลุ่มตัวอย่างจำนวน 29 คน ทดลองเล่นเกมและทำแบบประเมินความพึงพอใจที่มีต่อเกม ผลการทดสอบพบว่า กลุ่มตัวอย่างพึงพอใจในด้านความถูกต้องของเนื้อหา การออกแบบองค์ประกอบในเกม และความสามารถของเกมโดยภาพรวมในระดับมาก โดยกลุ่มตัวอย่างมีความรู้เรื่องอาหารล้านนาก่อนเล่นเกมในระดับปานกลาง เมื่อเล่นเกมจบแล้ว กลุ่มเป้าหมายมีความรู้เรื่องอาหารล้านนาเพิ่มขึ้นในระดับมาก



1. Introduction

Food Culture is a part of Lanna People Lifestyle for a long time. Lanna people used the seasonal ingredients and seasonings found in the local to make the Lanna recipes that descend from the ancestor. Each of the Lanna dish has a unique style and taste that represent the Lanna ancestor's wisdom. Nowadays, the new generation of Lanna change the lifestyle because of the globalization. They spend more time to work outside and eat at the Thai or Foreign street restaurants for every meal. Moreover, technology can help them to order food from everywhere, so they do not need to learn how to cook by themselves like their ancestor anymore. That is a reason why the new generation of Lanna do not have a deep connection with their local food and appreciate the importance of Lanna food culture (Thai Local Food – Lanna Recipes (In Thai), 2005; Bangsud & Arrom, 2015; Lanna Wisdom School, 2015).

Due to these situations, there are cooperation among several people or the organization to preserve Lanna food culture by collecting the knowledge from Lanna expert and publish a book, website, exhibition, and so on. For instance; Lanna Food Database was developed in 2007 by Northern Thai Information Center, Chiang Mai University Library and Information Technology Service Center. The objective of this project is to seek and collect Lanna food information from the Lanna expert and others document. The database is published on the website including content, picture, and video. Now Lanna Food Database become the popular resource for people who interested in Lanna food culture (Northern Thai Information Center, Chiang Mai University Library, 2007).

The followings of knowledge sharing are appropriated to well-experienced in cooking people or researchers who need information about Lanna Food to synthesize the new knowledge. However, other people who never known how to cook must have the motivation to learn it. So, the game which has the motivated mechanics can improve the players' behavior as creator's objectives. Players are supposed to be in some situation and practice do somethings to aim a goal with points, stars as an achievement. So, players will have an inspiration to play and learn at the same time. This kind of game is called Simulation Game (Suwan, 2012; Mitchell, 2012, p. 33).

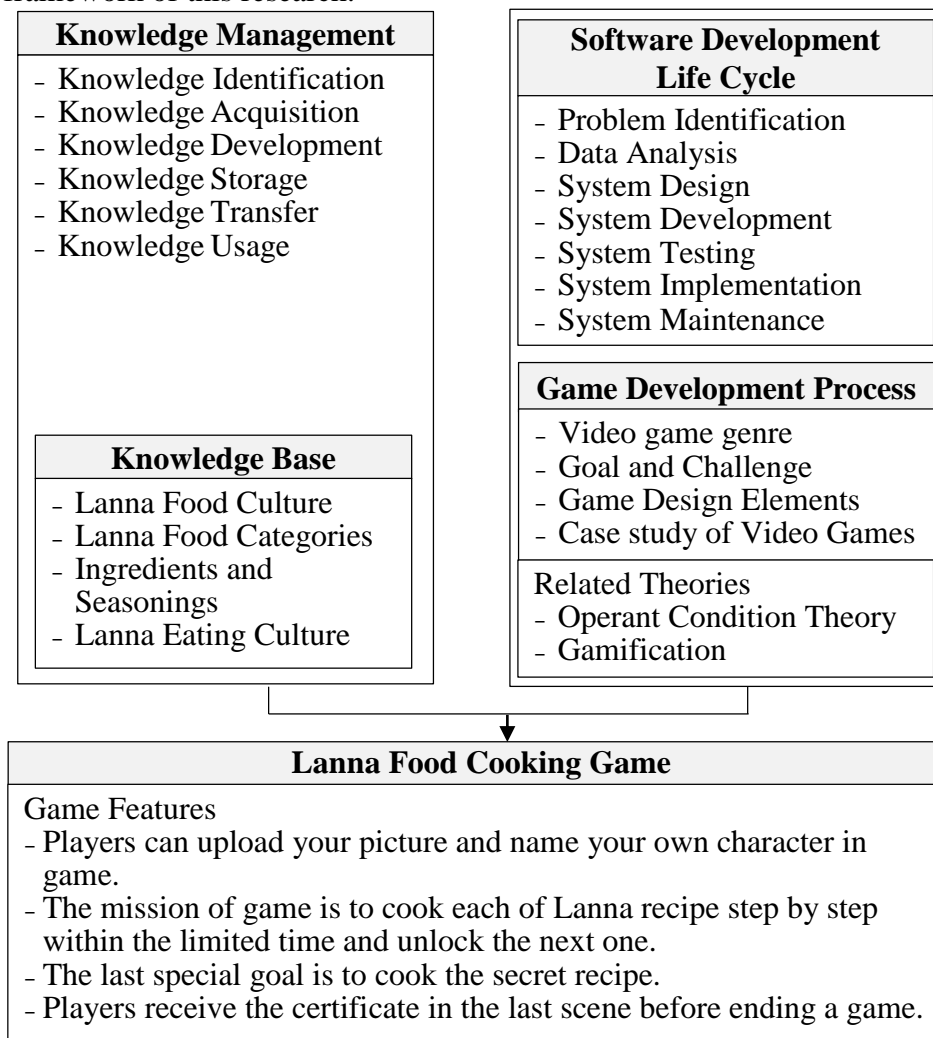
Now there are popular cooking games such as Cooking Mama playing on computers, smartphones and tablets. This game has beautiful and colorful graphic pictures. Players play the game by following the step. Beside Cooking Mama, there are others cooking game developed by Adobe Flash. For example; Sara's Cooking Class Game has several parts with different recipes like Lasagna, Japanese Rice Ball. Cooking Tom Yum Kung Game is to practice how to cook spicy soup with river prawn on game. The features of these games are to finish cooking at limited time. Players will receive points and bonus as rewards. Furthermore, some of cooking games have more conditions like What's for Dinner 2 which let players to find the right ingredients before cooking. Players not only enjoy; but also learn the difference of ingredients, food preparation, kitchen utensils and cooking methods. Players can play with cooking instruction on game even though they have never cooked before. Cooking games are suitable for all ages because of the attractive graphic pictures and easy to play.

There are several related literatures about simulation game development. For example; "Gardener Simulation" by Charoenpolnapachai (2005), "Development of Simulation for Learning in Topic of Making Chiffon Cake for Bachelor Degree Students" by Peandee (2013), "Design of Simulation Thai Folk Game upon Incentive Theory" by Pesopas (2014), "The Development of 2 Dimension Computer Games: The Trash Management" by Santhawong (2014), and "Blended-Learning Education Game to Support Learning on How to Assemble Computers" by Rujira (2016). The result of the following literatures is unidirectional that a sample is interested in computer game



and has a positive reaction. In addition, a sample can learn something through computer game. Furthermore, there is an article named “Research on Interaction Design of Chinese Cooking Game Base on Handheld Mobile Devices” by Siyuan, Dong, & Xue (2014) whose content is about designing game structure, mechanic, and gameplay based on Chinese cooking methods. This article does not tell the result of testing a game since the game has not developed. However, these literatures guarantee that game mechanic can motivate players to aim the goal and learn the content in game at the same time.

Therefore, the concept of Lanna food cooking game is developed based on the knowledge of Lanna Food and game design element to develop Lanna food cooking game with attractive graphic pictures and animation. Player can practice cooking methods on game to get points and rewards. There is an instruction to help player follow the step. Moreover, there is bit of knowledge in a game so that players who have never cooked can understand the cooking methods. Here is the conceptual framework of this research.



According to the conceptual framework, the methodology of this research is based on knowledge management theory as Probst (1998) and Marquart (2002, pp. 29-30) previously mentioned the six processes of knowledge management are as follows: 1) Knowledge Identification: main topic is Lanna cooking. 2) Knowledge Acquisition: to seek the necessary



information such as ingredients, seasonings, cooking methods and eating culture from Lanna food Database and other references. 3) Knowledge Development: to compile the content precisely for converting to the graphic pictures. 4) Knowledge Storage: to group the knowledge by type. 5) Knowledge Transfer: to publish the cooking methods on the interactive game. 6) Knowledge Usage: users can play this game to practice the cooking methods step by step.

In addition, there are some theories related to game development as follows: Gamification is a concept of applying game mechanics to non-game context. It can encourage people to do something with fun and engagement. As Zichermann & Cunningham (2011, p.15), Kapp (2012, pp.10-12), and Laisakul (2014) previously presented game mechanics including points are used to reward users who complete the goal, levels are used to make players feel like on the top, challenges/trophies/badges/achievements are used to make players be proud of their achievement, leaderboards & scoreboards are used to motivate other players to achieve the goal, virtual goods are used to let players show their personality, gifting & charity are used to persuade the new player to join a game. Another theory is Operant Condition by Skinner (1953) that explained the occurrence of human behavior “A” refers to antecedent is event that led up the “B” refers to Behavior, and “C” refers to Consequence is response from the behavior which reinforce people to modify the behavior. This theory can explain the game player behavior that players have to follow the instruction of game to aim a goal with reward. By the way, they must face both of a good help and an obstacle that cause the different results to the players. Therefore, the players will learn the things they can do or not in a game to help them finish a game more rapidly. Thus, the followed theories are used in the research to design the interesting Lanna food cooking game so that people continue to learn the Lanna food cooking methods more.

The game design is based on the following concepts: genre of games like action game, role-playing game (RPG), puzzle game, simulation game (Mitchell, 2012; Fernández-Vara, 2015; Zeman, 2017). Every game has a goal to assign the players to win a game such as to create, to destroy, to hold, to collect and so on. The challenge is to test players’ skill like time, dexterity endurance, memory, intelligence and resource management (Feil & Scattergood, 2005, p. 10; Petchwaikul, 2015, pp. 36-47). There’re five game design elements as follows: 1) Story telling: good story can make the game become outstanding. 2) Artworks: refer to game’s theme to control game design concepts like pictures, characters, scene and sound effects. 3) Graphic user interface: is to allow players interacting through graphic, for example; scores, status bars, buttons, and so on. 4) Gameplay: is to define the way players interact to win a game. (Sinthamrongruk, 2013) and 5) Gameplay progression: is divided to three parts; the first part is to introduce a gameplay, the middle part is the longest scene, so it should have more complex condition to challenge players, and the last part is to face the climax obstacle and then go to summarize scene before ending game (Feil & Scattergood, 2005, pp. 14-19).

As a result, Lanna food cooking game is expected to motivate players to learn about Lanna food culture and have an inspiration to cook in a daily life. That is a good way to preserve the Lanna food culture.



2. Method

The methodology of “Developing a Lanna Cooking Game” is research & development (R&D). The qualitative research is used for researching process and the system development life cycle (SDLC) as Iamsiriwong (2003) and Khumpunyo & Prakobpol (2013) previously mention the process of SDLC, is used for developing process as follows:

1. Problem Identification is referred to review Lanna Food Database and find more references such as Lanna cookbooks, exhibitions, Northern Thai cultures encyclopedia to capture the information of Lanna Food. Furthermore, the cooking games on website are case study of this research like Cooking Khao Soi Kai to play and note the style, content, gameplay, rewards and elements of game. And to interview 2 Lanna cooking Experts about difficulty of cooking methods, Lanna food appropriated to design a game. The interview’s questions are approved by the advisor.

2. Data Analysis is referred to analyze the collected information like ingredients, seasonings, type of Lanna recipes, difficulty of cooking methods and expectation of cooking game styles and synthesize the information as follows:

2.1 Ingredients and seasonings in Lanna food: the local vegetables are always used as ingredients or side dish of Lanna food. For example; Phak Hueat, Phak Chiangda, Phak Puya, Phak Huanmu, Phak plang (Indian spinach), Phak Wan Ban, Phak Phai (Vietnamese mint), Het Thop (earth star mushroom). Besides the vegetables, some meat (pork, chicken, fish, buffalo meat) is also used as ingredients in Lanna food (Thai Local Food – Lanna Recipes (In Thai), 2005, pp. 19-23). Lanna people like salty and spicy tastes. There are salty seasonings (e.g. crab paste, fermented soybeans, shrimp paste, salt) and spicy seasonings such as fresh chili, dried chili, Phrik Lap (spicy chili paste with java long pepper, coriander seed, Ma Khwaen, Ma laep) used in Lanna food. These seasonings are not only spicy, but they also get rid of unwanted smell. Lanna People do not like sweet tastes, so they do not add some sugar to their food. The sweet seasonings are hardly found in Lanna recipes (Thai Local Food – Lanna Recipes (In Thai), 2005, p. 9; Bangsud & Arrom, 2015, p. 11).

2.2 Lanna cooking methods: there are several cooking methods as follows: (Exhibition of Lanna Food with 700 Year Anniversary of Chiang Mai (In Thai), 1996; Thai Local Food – Lanna Recipes (In Thai), 2005, pp.10-11; Northern Thai Information Center, Chiang Mai University Library, 2007)

2.2.1 Aep is mixing meat with chili paste, wrapping in the banana leaves, and roasting or steaming until it is cooked such as aep pla (cooked fish in banana leaves), aep kung (cooked shrimp in banana leaves), aep i-huak (cooked tadpoles in banana leaves).

2.2.2 Chio is boiling water and adding shrimp paste, salt, fermented fish, shallots garlic. Then savoring the flavor with chopped spring onions, coriander leaves, and pepper. This recipe is similar to Cho but not sour. For example; Chio Phak Khom (boiling little of water with spinach), Chio Khai Mot-Daeng (boiling little of water with egg’s ant).

2.2.3 Cho is boiling water and adding fermented soybeans, shrimp paste, salt, fermented fish. Once the water is boiled, add vegetables such as mustard greens, fern tops, swamp morning glories. Then savor the sour taste with fresh tamarind or tamarind juice before turning off the stove.

2.2.4 Hum is stewing chunk of meat with curry paste on low heat until there is little of water left in the pot.

2.2.5 Kaeng (Curry) is boiling water and adding chili paste including chili, salt, shallot, garlic, fermented fish, and fermented soybeans. Sometimes the chili paste is fried before



adding to water. Once the water is boiled, add meat and vegetables into boiled water. Most of meat curry has some herb as ingredients to get rid of unwanted smells.

2.2.6 Khua is stir-frying food with fried garlic and little of water or oil until it is cooked. For instance; Khua Makhuea Thua Fakyao (stir-frying sliced eggplant and long beans), Khua Nomai (stir-frying boiled bamboo shoots).

2.2.7 Lap is mixing minced meat with Phrik Lap (spicy chili paste). The name of dishes is depended on the ingredient. For instance; Lap Kai (chicken), Lap Mu (pork), Lap Khwai (buffalo), Lap Pla (fish). The dish is also called by method. For instance; Lap Dip (raw or uncooked meat) and Lap Khua (cooked meat). Lanna people usually eat Lap with several fresh vegetables to get rid of the unwanted smell of meat and also make Lap more delicious. Some vegetables aid digestion and enhance appetite.

2.2.8 Lu is mixing ingredient similar to Lap but use some different ingredient like pork blood, lemon grass and spices to mix together. Then sprinkle Khaep Mu (crispy pork skin) and crispy entrails to the top. Lanna people usually eat Lap with several fresh vegetables like Lap.

2.2.9 Mop is pounding crabs to squeeze the liquid out and cooking on low heat. Then mixing with chili paste, vegetables, ground roasted rice and eggs.

2.2.10 Namphrik (chili paste) is pounding ingredients including chili, salt, shallots, garlic and so on into the montar. For example; Namphrik Num (young chill paste), Namphrik ong (dried chili and tomato paste), Namphrik Pla (chili and fish paste).

2.2.11 Nueng is steaming that is divided into two type. One is steaming food without wrapping such as rice steaming, fish steaming, dried banana steaming and dried beef steaming and so on. The other is steaming seasoned food wrapped in the banana leaves. It is call Ho Nueng. For example; Ho Nueng Kai (steaming cooked chicken) Ho Nueng Pla (steaming cooked fish), Ho Nueng Pli (steaming cooked banana's flower) and Ho Nueng Nomai (steaming cooked bamboo shoots)

2.2.12 Ok is putting food wrapped in the banana leaves on charcoal grill. This method is suitable for ingredients which can be cooked in short time such as eggs, fish and eggplants.

2.2.13 Pam is cooking food in the pan with banana leaves padding until the food is cooked like Khai Pam (cooked egg on banana leaves padding).

2.2.14 Ping is grilling seasoned food on charcoal until it is cooked and crispy such as Ping Pla (grilled fish), Ping Kai (grilled chicken), Ping Mu (grilled pork).

2.2.15 Sa is mixing fresh vegetables with roasted and pounded fish, chilies, shallots and garlic. Then pouring boiled fermented fish. For instance; Sa Phak Phrae (fresh vegetables from forest), Sa Yot Mamuang (fresh young shoot of mango leaves)

2.2.16 Tam is pounding vegetables or meat with seasonings such as salt, garlic, shallots, fresh or dried chilies, shrimp paste, dried soybeans, cooked fermented fish. For instance; Tam Khanun (pounded young jackfruit), Tam Makham (pounded tamarind)

2.2.17 Thot (Fry) is deep-frying food such as Khaep Mu, Khaep Kai.

2.2.18 Yam is putting cooked meat or vegetables with spices to mix together in boiled water. For instance; Yam Chinkai (boiled chicken) Yam Phak Hueat (steamed young shoot of local vegetable name Phak Hueat), Yam Chin Haeng (boiled dried beef).

2.2.19 Yang is grilling seasoned food on charcoal like Ping but takes a longer time such as Sai-Ua (spicy grilled sausage)

According to Lanna recipes information, it is found that the names of some Lanna recipes are similar to Thai recipes but have different styles and methods. For example; Chio in Lanna is some soup with litter of water, otherwise Chio in Thai is a deep-fried food. Some Lanna recipes has a unique name and method. For instance; Sa is fresh vegetables salad (mixing with roasted and pounded fish, chilies, shallots and garlic).



Figure 1: Example of Lanna Food (Northern Thai Information Center, Chiang Mai University Library, 2007)

2.3 Lanna eating culture: Lanna people usually have a meal together at home. There are about 3-4 type of Lanna dishes such as curry, chili paste, fried placed on Khan Tok (the tray made from teak wood or woven rattan). The eldest of family must have the meal first, then the others are allowed to have a meal. They put and dip some sticky rice in a food. Some vegetable is side dish for every meal. After having a meal, they do not eat some sweet or snack.

3. System Design is to design a game like game features, game elements and gameplays. Then, the storyboards are written by using Microsoft PowerPoint to set the elements of each scenes in a game from introduction to ending scene.

4. System Development is to develop a game as designed by using Animate CC step by step and test a game periodically.

5. System Testing is to test a game in person to check the game's sequence, displaying to ensure a correct interaction before launching a game. If there are some errors. A game will be revised until complete.

6. System Implementation is to launch a game on website and send short URL to a sample of 29 participants to play a game. After playing, they must complete the satisfactions survey form. Finally, the result is summarized and published on the research.



3. Results

This research is collected the knowledge of Lanna food and consider the cooking methods and ingredients to select the appropriate recipes for designing game. There are seven Lanna food recipes selected as follows: Khao Chi (grilled sticky rice), Khai Pam (cooked egg on banana leaves padding), Cho Phak Kat (sour soup with mustard greens), Sa Phak Ruam (spicy fresh vegetables salad), Lap Mu (minced pork with spices), Khao Soi Kai (curried noodle soup with chicken) and Kaeng Kradang (jelly pork curry). These recipes have the same ingredients as coriander, spring onion, salt, and so on. Some recipes are not popular such as Khai Pam, Sa Phak Ruam, Kaeng Kradang. For the reason, the seven recipes are selected to display on cooking game. According to Lanna food information, game design concepts and case studies of cooking game; the features of game can be determined as follows:

1. There are storytelling and characters: once the game starts, players act like someone who joined the cooking activity at the mystery village where the Lanna chefs has lived. Players must complete the mission by visiting each of Lanna traditional house and learning the cooking methods from the house owners (Lanna chefs) to get some points and ingredients. Once the one of missions is completed, the next one will be unlocked. After finishing all missions, the players will receive certificate. The storytelling and characters are presented Lanna tradition cultures including food, eating, dressing and houses.

2. The game levels are related to storytelling and characters: all of Lanna recipes in game is divided by difficulty of cooking methods, the number of ingredients, the popularity of recipes. The Lanna food that cooked easily and has a few ingredients is defined to easy level. The Lanna food with more ingredients is defined to intermediate level. And the last level is the most difficult because players have to cook the unknown recipe. They just follow the step until done. The game will reveal the name of recipe before ending game.

3. There is scoring system with description to show how many points the players received and the reasons. It is depended on result of game, for example; to scald the noodles in the boiled water. If the players can do it, there is a message like "Noodles was scalded, look yummy! You'll get 20 points". On the other hand, the players who cannot do it will receive the message with zero point.

4. There are ingredients received from each house. Once the cooking mission is completed, the house owner will give them some ingredients as symbols of achievement that unlock the next mission. If the players make a mistake like overcooked food, they will not receive the ingredients and fail the mission. Thus, they must go back to the last step to try again.

5. The important scenes of game can be captures to share on social media such as, the cooked Lanna food from each house, the group photo of character after special meal scene, and the certificate on the last scene.

The game elements are designed as follows: graphic pictures including food, ingredients, seasonings, scenes, characters are drawn by using multiple tools in Microsoft PowerPoint. Modern Lanna alphabet is used for headings, while Thai alphabet is used for other texts in game. Most of texts are written in Thai language except the dialogue boxes are written in Thai and Lanna languages. The game storyboard is written by using Microsoft PowerPoint to set the scenes with captions. Here is example of game design element on the picture below.



Figure 2: Example of game design element

Lanna Food Cooking game is developed by using Animate CC to use on the computers only. This game allows players to act like someone who see the advertise of Lanna cooking activity on website. They have to register before joining. After clicking register button, players will be on the game world and ride a bicycle to the mystery village where the Lanna chefs has lived. Players must visit each of Lanna traditional house to learn the cooking methods from the house owners (Lanna chefs) and get some points and ingredients. Once the cooking mission is completed, the next one will be unlocked. After visiting six houses in the village, the pavilion in the middle of houses will be unlocked and have enough ingredients to cook the secret recipe at there. When the players finish their cooking, the game will reveal the name of secret recipe. Then, all Lanna chefs come here to ask player to have a meal together. Finally, they take a group photo and present the players with the certificate. The last scene is the players go back to the real world. Here are some screenshots of Lanna Food Cooking Game on the picture below.

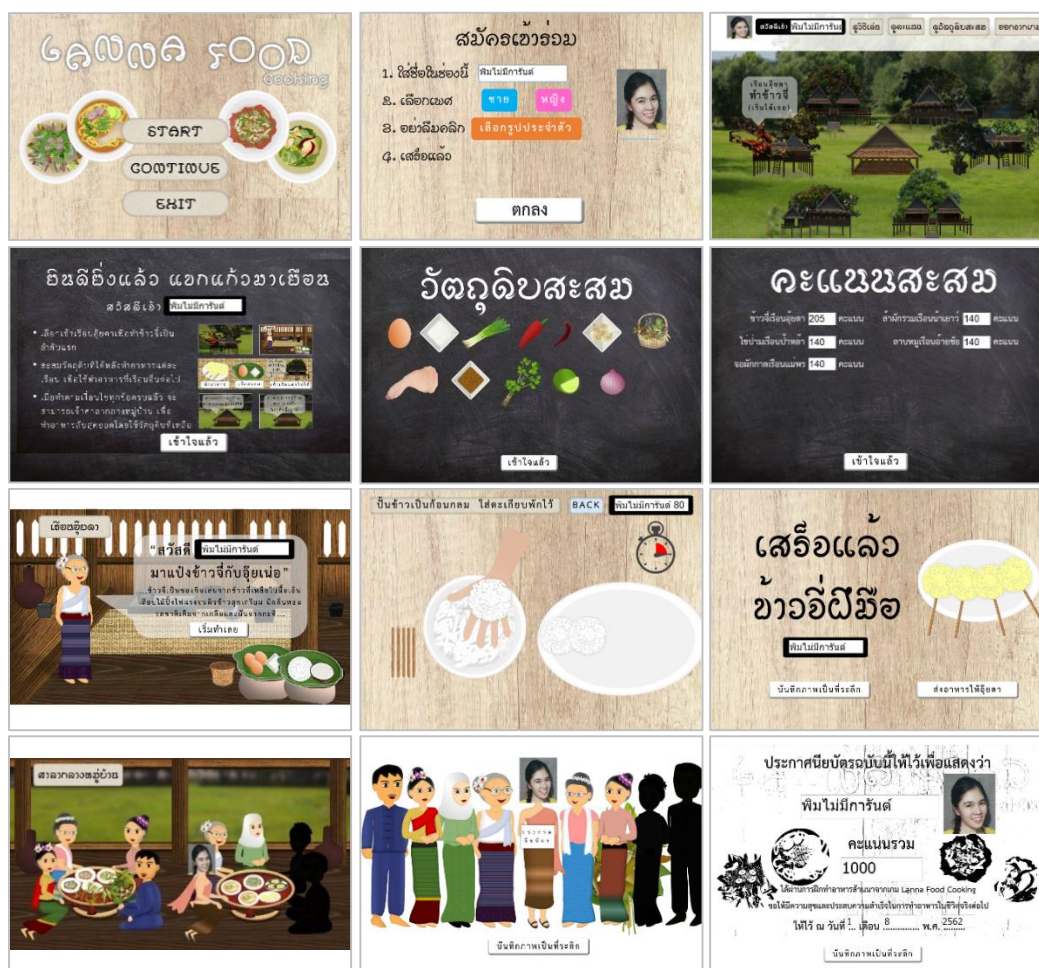


Figure 3: Screenshots of Lanna Food Cooking Game

After developing and self-testing, a game is converted to ShockWave file format launched on the website and .exe file format to upload on OneDrive. Then, the short URL of website is sent to 29 participants as a sample to test a game and complete the satisfaction survey by Google Form. The data from the survey forms is summarized as follows:

Part I: The Basic Information of a sample. There are 29 participants who tested and completed the satisfaction survey form, 4 males and 25 females. 16 participants are about 20-29 years old. 7 participants are about 30-39 years old. 4 participants are about 40-49 years old. And 2 participants are about 50-59 years old. About Lanna food experience; there are 12 participants who have a Lanna cooking experience, 10 participants who never cooked Lanna food before and 7 participants who do not give any information.

Part II: The Satisfaction of the sample to a game. The results of this part are as follows:

1. The overall satisfaction of content accuracy is at the high level ($\bar{x}=4.27$). A sample is satisfied the most with the information of Lanna recipes ($\bar{x}=4.34$). A sample is satisfied less with the ingredients, seasonal and lifestyle of Lanna people such as; Lanna eating, Lanna tradition dressing ($\bar{x}=4.31$). A sample is satisfied the least with the Lanna cooking methods ($\bar{x}=4.10$).



2. The overall satisfaction of game elements design is at the high level ($\bar{x}=4.14$). A sample is satisfied the most with the suitability of pictures and scenes design ($\bar{x}=4.34$). A sample is satisfied less with the suitability of alphabet displayed on game ($\bar{x}=4.14$). A sample is satisfied the least with the suitability of gameplay ($\bar{x}=3.86$).

3. The overall satisfaction of game features is at the high level ($\bar{x}=3.99$). A sample is satisfied the most with the game motivated learning behavior ($\bar{x}=4.38$). A sample is satisfied less with the interesting game style ($\bar{x}=4.21$). A sample is satisfied the least with the instruction of game ($\bar{x}=3.69$).

Part III: The sample's knowledge of Lanna Food Cooking before playing game is at the middle level ($\bar{x}=3.03$). After playing game, the sample's knowledge is increased to the high level ($\bar{x}=4.24$).

Part IV: 6 participants have suggestions about the problem of game interface. While 5 participants have suggestions about the unclear game instruction and tutorial.

4. Discussion and Conclusion

According to the results, there are discussion as follows:

1. Data analysis is based on Knowledge Management as Probst (1998) and Marquardt (2002, pp. 29-30) mentioned to seek the necessary information about Lanna food culture from several references and collect them as Iamsiriwong (2003) and Khumpunyo & Prakobpol (2013) presented the process of System Development Life Cycle (SDLC) is to analyze and synthesize the data thoroughly. The important process of Knowledge Management and SDLC for this research is to transfer the knowledge of cooking methods to be the game's features. Gamification as Kapp (2012, pp. 10-11) and Laisakul (2014) mentioned about the game mechanics to motivate players' behavior is also used to enhance a game be more interesting. Here are the features of a game. The avatar-based name, gender and picture customization is a virtual goods mechanic that fulfill players' self-expression. The game level is design based-on the type of Lanna recipes. The easy recipes with a few of ingredients are easy levels. The recipes that cooked more difficult with more ingredients are intermediate levels. And the climax level is the secret recipe designed from the unpopular Lanna recipes. Players do not know what this recipe is until they finish cooking. The challenge mechanics is to cook each of recipes to collect some points and ingredients from each house they visited. This feature is based-on points and badges mechanics that show the players' achievement. Players can capture the important scene to share on social media that make them be proud of themselves and invite other players to join a game also.

2. Game design is based on game elements concept as Sinthamrongruk (2013, pp 27-31) mentioned about five game elements. Firstly, story is inspired from the Lanna food cooking activity held by The Center for the Promotion of Arts and Culture, Chiang Mai University. There are about 4-5 cooking workshops at there. For instance; the pavilion, the space under Lanna tradition house. Participants can practice how to cook through the workshops. Secondly, artwork is the theme of game that express Lanna cultures like modern Lanna alphabet, Lanna conversation at the kitchen scenes before cooking and using earth tone color for everything to represent the natural lifestyle of Lanna people. Thirdly, graphic pictures are drawn from original photos with the technique of color gradient to create a realistic shadow of pictures. All pictures are the bird eye view perspective to reveal the details of pictures especially foods and represent the Lanna cultures like Lanna women usually put some flowers on the hair bun to decorate and respect the holy objects on the hair as Lanna beliefs. Fourthly, graphic user interfaces are buttons, cooking status bar, timer and so on designed based-on the artwork. Lastly, gameplay is to visit each of house and cook the Lanna recipe



step-by-step at there. If the mission is completed, players will receive the ingredients and unlock the next mission. If it is not completed, they must try again on the last step. Gameplay is also related to Operant Condition Theory by Skinner (1953) that players have to do something by the instruction to aim a goal and get a reward. However, the result of game is depended on the players' decision on game.

In addition, the game storyboard is written to show a timeline of game as Petchwaikul (2015, pp. 57-61) and Feil & Scattergood (2005, p. 14-19) presented the 3 parts of the game progression design. The first part is starting from the registration scene. Players can show self-expression by customizing the name, picture and gender. The players' character with their uploaded face's picture wearing Lanna dress depend on gender is riding a bicycle on screen. This scene is surprised for players. The next scene is the mystery Lanna village. Players must visit Grandma Da's house to cook Khao Chi (grilled sticky rice) first with a tutorial and get points and ingredients as reward. After leaving Grandma Da's house, the second part is begun. Players have to visit others houses in the village to practice cooking and collect some ingredients. The type of Lanna recipes in a game is different level depended on cooking methods and ingredients. The last part is a climax scene of cooking a secret recipe designed from the unpopular Lanna recipes. Players do not know what this recipe is until they finish cooking. Finally, the last scene is having a meal together at the pavilion and take a group photo and getting the certificate with picture and total scores. This is a happy ending of game to reward the players.

3. Lanna food cooking game has seven scenes of cooking and other special scenes such as registration scene, having a meal scene before ending (motion graphic), and so on. The game is going as planned like story, consequences of events, elements and feature like; avatar-based name, gender and picture customization, screen capture button for special scenes, collecting points and ingredients according to the game's conditions. The game record them so that players can see in the score scene and the ingredients scene. It is related to Cooking Academy 2 : World Cuisine that let the players practice the international recipes from several restaurant showing on the map to pass the level and go on.

Nevertheless, some features of game are not going as planned. Firstly, the game platform does not support mobile devices because it is ShockWave Flash file that display on computer only. Secondly, the condition of passing the game level has changed. If the cooking is not succeeded, players must start over instead. Besides, this condition is available on the first three levels only. Afterward there is no condition of passing the level anymore. So, a game is difficult at first and then it seems easier. Lastly, some graphic user interfaces are missing. For example; none of cooking status bar like chopping, boiling to show a progress, description of objects in a game and navigation to let players follow the right step. As a result, this game is not related to Cooking Mama Let's Cook because of the missing of user interfaces.

4. Lanna food cooking game has been played by 29 participants as a sample. After playing, a sample will complete the satisfaction survey of game. The results of satisfaction are discussed by part as follows:

The score of overall content accuracy is the highest on average of 4.27 because the content of game has been found by using Knowledge Management Process to access the credible resources and capture the important knowledge as Lanna recipes information, ingredients and seasonings, Lanna eating, Lanna traditional dressing correctly.



The score of overall game elements design is on average of 4.14. A sample is satisfied the most with the suitability of pictures and scenes design on average 4.34 because pictures and scenes are designed based-on the synthetic knowledges to create the realistic objects such as ingredients, seasonings, foods, kitchen and houses. A sample is satisfied the least with the suitability of gameplay on average 3.86 because A sample does not understand how to cook at first and click randomly until it is correct.

The score of overall game features is the lowest on average of 3.99. A sample is satisfied the most with the game motivated learning behavior on average of 4.38 and the interesting game style on average of 4.21 because the story of game is interesting with interactive motion graphic. However, a sample is satisfied the least as follows: the suitability of game level on average of 3.90, the interactive of game on average of 3.79 and the instruction of game on average of 3.69.

Here are the reasons why game features' scores are the lowest of all. A game is difficult at first and become easy later because the instruction is unclear. A sample try to play and remember a result at the first time. After playing for a while, A sample will learn the thing can do or not in a game as Skinner (1953) previously mentioned in Operant Conditions Theory that player have learned the things from a result. Moreover, there is a problem with Drag & Drop. Sometimes players cannot drag an object to the required position on time. These problems make a game more difficult so that a sample is satisfied the least. As Feil & Scattergood (2005, pp. 14-19) presented the relationship between game progress and timeline. After introduction, a game should not be too difficult because players just play a game, otherwise they will give up. However, a sample is very satisfied about game's style on average of 4.21 and game-based learning the cooking methods on average of 4.38 which is related to the results of Santhawong (2014) reveal that a sample has the increased learning behavior while playing a game.

A sample's knowledge before playing is at the middle level on average of 3.03. After finishing a game, a sample's knowledge is increased to the high level on average of 4.24 which is relate to the results of Peandee (2013) reveal that a sample got a higher score after playing a game than before.

In conclusion, Lanna cooking food game is the result from the research and development method. To collect the knowledge of Lanna food culture from several resources and revise to a cooking simulation game with storytelling and mechanic to challenge players to play. Thus, a game is represented the Lanna cultures so that players can memorize them. A developed game features are mostly based-on theories. However, there are some errors need to be fixed. Most of participants as a sample have a positive feedback about a game and their knowledge is increased after playing a game. A sample's suggestion is about improving the instructions more clearly and decreasing the amount of game condition. This game is the interactive media with mechanics to motivate players achieve a goal and get sentimental value reward. Players will have inspiration to learn how to cook in the daily life from now on.



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