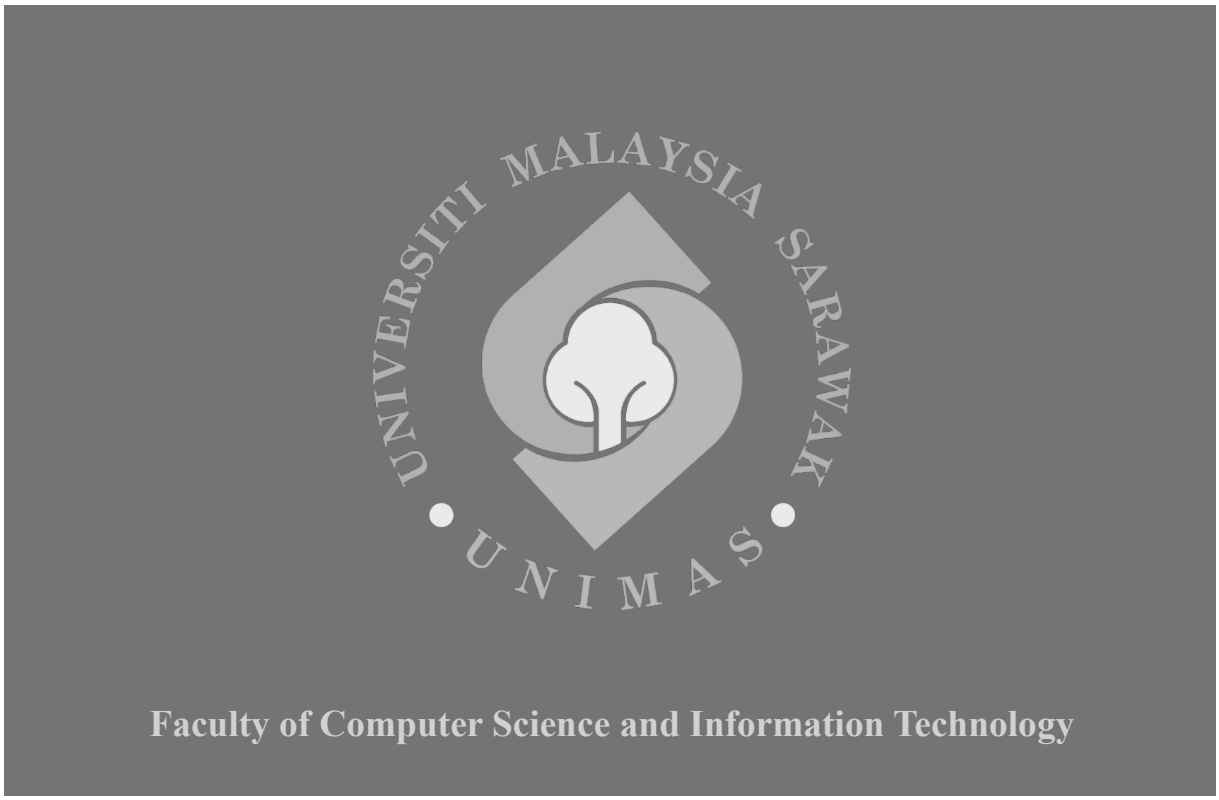


# *Herbal Madness: Discover The Healing Power Of Chinese Herbs Through Interactive Gameplay.*

Lim Ai Vi

Bachelor of Computer Science (Multimedia Computing) with Honours

2025

# HERBAL MADNESS: DISCOVER THE HEALING POWER OF CHINESE HERBS THROUGH INTERACTIVE GAMEPLAY

LIM AI VI

This project is submitted in partial fulfilment of the

requirement for degree of

Bachelor of Computer Science (Multimedia Computing) with Honour

Faculty of Computer Science and Information Technology

UNIVERSITI MALAYSIA SARAWAK

2025

**UNIVERSITI MALAYSIA SARAWAK**

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21th July 2025

LIM AI VI

Faculty of Computer Science and Information Technology

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## ACKNOWLEDGEMENT

First and foremost, I would like to express my deep and sincere gratitude to my supervisor, Dr Suriati Khartini binti Jali for giving me the opportunity to do this research and providing me invaluable guidance throughout this Final Year Project. I am extremely grateful to be study under her guidance and for everything she has offered me. I would like to thank to my examiner, Dr Syahrul Nizam bin Junaini for his feedback and support.

Furthermore, I would like to express my sincere gratitude to my friend, Aiman Zahrah Binti Mohd Nizam, for generously dedicating her time to draw the assets for my project despite her academic commitments. I am also deeply thankful to my friends for assisting me in times of need and giving me moral support throughout this journey especially during this chaotic semester. Their contributions are truly appreciated and will not be forgotten. Additionally, I extend my heartfelt gratitude to CtrlD Studio for their valuable guidance and unwavering support.

Last but not least, my deepest appreciation to my parents for their endless love and sacrifices for educating and preparing me for my future. I wish to thank my supportive sister for providing me never ending inspiration. Any omission in this brief acknowledgement does not mean my lack of gratitude.

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## LIST OF ABBREVIATIONS

| Abbreviation | Definition |
|---|---|
| CAM | Complementary and Alternative Medicine |
| CHM | Chinese Herbal Medicine |
| GDD | Game Design Document |
| NPC | Non-playable character |
| PC | Personal Computer |
| SD | Standard Deviation |
| SDG | Sustainable Development Goals |
| SUS | System Usability Scale |
| T&CM | Traditional & Complementary Medicine |
| TCM | Traditional Chinese Medicine |
| UI | User Interface |
| UML | Unified Modelling Language |
| UX | User Experience |
| VR | Virtual Reality |
| WHO | World Health Organization |

## ABSTRACT

Herbal Madness is an educational simulation game designed to raise public awareness about Traditional Chinese Medicine among young adults. Limited exposure to Traditional Chinese Medicine contributes to underutilisation, misconceptions, and a generation disconnect. By offering an interactive and engaging approach to Traditional Chinese Medicine education, Herbal Madness aims to bridge this knowledge gap. Players will interact with non-playable characters, interpret their health concerns, and craft herbal tea using the right combinations of herbs. Throughout gameplay, players can learn about the properties of each herb. Developed using the Unity Engine, the game will be available on the Windows platform and will support the English language. Usability testing yielded positive results, with an average System Usability Scale (SUS) score of 69.08, indicating that Herbal Madness is an effective tool for enhancing learning about Chinese herbs and their remedies. This project aims to empower players with knowledge about herbs and their application while ensuring the continued relevance and cultural preservation of Traditional Chinese Medicine within modern healthcare.

## *ABSTRAK*

*Herbal Madness adalah permainan simulasi pendidikan yang direka untuk meningkatkan kesedaran tentang Perubatan Tradisional Cina dalam golongan dewasa muda. Pendedahan yang terhad terhadap Perubatan Tradisional Cina menyumbang kepada penggunaan yang kurang, salah faham, dan jurang generasi. Dengan menawarkan pendekatan interaktif dan menarik dalam pendidikan Perubatan Tradisional Cina, Herbal Madness bertujuan untuk merapatkan jurang pengetahuan ini. Pemain akan berinteraksi dengan NPC, mentafsirkan masalah kesihatan mereka, serta menyediakan teh herba dengan menggunakan kombinasi herba yang betul. Sepanjang dalam permainan, pemain juga boleh mempelajari tentang setiap herba dan sifatnya. Dibangunkan dengan menggunakan Unity Engine, permainan ini akan dilancarkan di platform Windows dan menggunakan Bahasa Inggeris sebagai bahasa pengantara. Ujian kebolehgunaan menghasilkan keputusan positif, dengan purata skor Skala Kebolehgunaan Sistem (SUS) sebanyak 69.08, menunjukkan bahawa Herbal Madness adalah alat yang berkesan untuk meningkatkan pembelajaran tentang herba Cina dan ubat-ubatannya. Projek ini bertujuan untuk pemain meningkatkan pengetahuan tentang herba dan penggunaannya serta memastikan kesinambungan dan kelestarian budaya Perubatan Tradisional Cina dalam penjagaan kesihatan moden.*

# Chapter 1 Introduction

## 1.1 Introduction

Complementary and alternative medicine (CAM), which is an alternative to mainstream health care, is widely used worldwide as an integral part of the medical system. It includes treatments from a variety of histories and cultures. According to the World Health Organization (WHO) (2022), CAM has a long history of use in health maintenance and disease prevention and treatment. It represents the sum of the knowledge, skill, and practices of health maintenance as well as of the prevention, diagnosis, improvement, and treatment of physical and mental illness (World Health Organization, n.d.).

A high prevalence of CAM usage has been reported among Malaysians. Jasamai et al. (2017) found that 71.2% of their respondents used CAM, while Aziz & Tey (2009) reported a prevalence of 33.9%. Reasons for using CAM often include low cost, easy access, family recommendations, belief in effectiveness, perceived health benefits, and perceived safety compared to conventional medicine.

As one form of CAM, Traditional Chinese Medicine (TCM) is one of the popularly used medical or health practices throughout the world. TCM is based on unique views on life, on fitness, on diseases, and on the prevention and treatment of diseases that have been formed during its long history of absorption and innovation (World Health Organization, 2022). Chinese Herbal Medicine (CHM) is one of the major components in TCM, where CHM take a natural and holistic approach to healthcare and considered as trustworthy for various cultural and social backgrounds. CHM has been increasing in popularity among chronic patients.

According to Tzeng et al. (2013), patients with diabetic complications can be treated using CHM by addressing abnormalities related to blood viscosity, microcirculation, and

oxidative stress. A study by Matthews et al. (2015) reported that herbal medicines were used in many countries to treat pregnancy-related illnesses and to promote healthy pregnancies and overall well-being. A similar trend was observed in Malaysia, where Lexshimi et al. (2013) study found that 30.8% of breast cancer patients used CHM to improve treatment outcomes.

Although CHM has a historical significance and the wealth of knowledge it encompasses, there exists a notable gap in understanding and acceptance of CHM among young adults in Malaysia. Despite the public's preference for CHM, limited knowledge and understanding of its efficacy, safety, and practical applications often lead to underutilisation or misuse, as many people misjudge its benefits and risks (Silvanathan & Low, 2015). With the increasing integration of CAM into mainstream healthcare, understanding CHM becomes crucial not only for preserving cultural heritage but also for enhancing health outcomes in a modern context.

Studies have shown varying levels of knowledge and attitudes among students regarding traditional and complementary medicine (T&CM). Rao et al. (2015) found that students were unsure about the effectiveness and safety of T&CM products. In contrast, Awad et al. (2012) observed that Kuwaiti medical and pharmacy students had limited knowledge of herbal medicine but displayed positive attitudes and beliefs in its benefits. Ashraf et al. (2019) also reported positive attitudes and perceptions towards traditional medicine among university students. Research indicates that respondents are often more inclined to seek alternative treatments but may lack the necessary education to make informed decisions regarding their health (Wong & Wong, 2020). According to the study by Sahanudin & Abdullah (2023), respondents have adequate knowledge, positive attitudes, and good practices regarding T&CM, but lack knowledge and understanding of T&CM itself and its side effects. Furthermore, the

WHO recognises the significance of traditional medicine in global healthcare systems, advocating for its integration with modern medical practices (World Health Organization, 2023).

This presents an opportunity to develop educational tools that can bridge the knowledge gap and promote safe practices related to CHM. Research indicates that knowledge of traditional medicine is positively correlated with attitudes toward its use, highlighting the importance of effective educational interventions (Zhang et al., 2020). By educating young adults about CHM through engaging platforms such as interactive games, we can foster a greater appreciation for these traditional practices while ensuring that they are used safely and effectively. Studies have shown that game-based learning can enhance learning outcomes and engagement among young adults, making it a valuable approach for teaching complex subjects like CHM (Hainey et al., 2016).

### 1.2 Problem Statement

The significant lack of knowledge and awareness among young adults regarding the proper use and potential health advantages of CHM not only leads to its underutilisation or misuse of herbal remedies but also results in its gradual neglect and eventual forgotten status. This missed opportunity also hinders the integration of Traditional Chinese Medicine as a complementary health practice and limits public understanding of its cultural value and relevance. Moreover, misconceptions about CHM compared to modern medicine contribute to scepticism regarding its effectiveness.

While TCM has gained popularity among various ethnic groups, a cultural divide remains regarding its acceptance. Many individuals still view TCM as folklore lacking scientific backing. This cultural misunderstanding poses challenges to the widespread acceptance and integration of TCM into the healthcare system, further exacerbating the

generational disconnect in recognising its value and hindering efforts to preserve this vital aspect of cultural heritage.

Addressing this issue is critical, as young adults represent a key demographic in shaping future healthcare trends and wellness practices. Enhancing their understanding of CHM could not only promote more informed health choices but also contribute to the broader acceptance and appropriate use of herbal remedies in modern healthcare.

This research seeks to address these issues by evaluating the current understanding of CHM among young adults. Furthermore, the study aims to develop an engaging educational tool to increase awareness, improve understanding, and encourage the proper use of Chinese herbal medicine among young adults. By doing so, the research hopes to bridge the knowledge gap and foster greater integration of CHM into young adults' health and wellness routines.

### 1.3 Scope

The research will focus on individuals aged 18-50 in urban Sarawak areas in Malaysia, where access to both modern healthcare and traditional practices is prevalent. While the study will encompass a broader age group, it will particularly focus on young adults within 18-30 years old as they are more likely to engage with a game-based approach to learning about CHM.

The study will explore various aspects of CHM, including common herbs, their applications for specific symptoms and preparation methods. The game will be developed using Unity and will be accessible on PC platforms to facilitate the spread of awareness about CHM among young adults in Malaysia.

## 1.4 Aims and Objectives

This research aims to assess the current knowledge and awareness of CHM among young adults in Malaysia and develop an educational game to promote its proper use and understanding. The project will be guided by the following objectives:

1. To analyse existing traditional medicine games for their relevance to the design of Herbal Madness.
2. To develop a game to improve learning about the traditional Chinese herbs and its remedies.
3. To evaluate the game effectiveness and functionality through usability testing and feedback from target audiences.

## 1.5 Brief Methodology

Scrum, which is one of the agile methodologies, will be used in this project. Scrum is a project management framework that divides work into manageable units called sprints to ensure efficient task completion. By organising tasks into smaller, prioritised units, setting time-bound goals, and regularly reviewing progress, individuals can maintain focus, adapt to changing priorities, and enhance productivity. It contains 3 phases consisting of pre-game phase, development phase and post-game phase as shown in Figure 1.1.

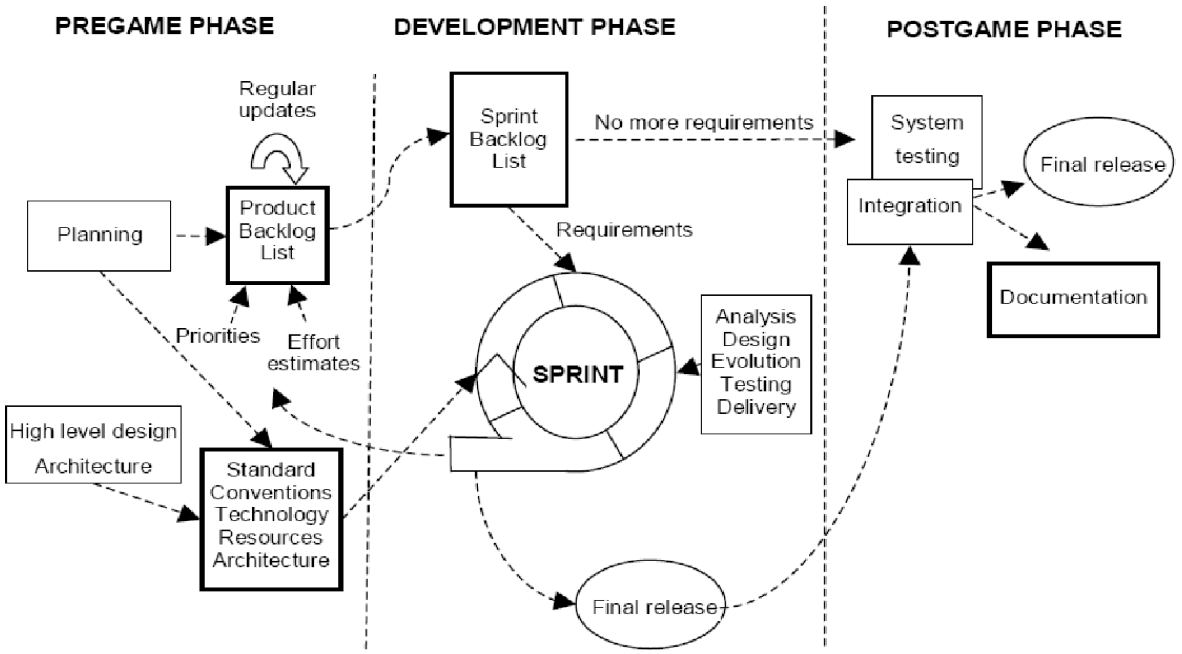


*Figure 1.1 Details of the scrum process. (Kristiadi et al., 2019)*

### 1.5.1 Phase 1: Pre-game

This phase focuses on defining the user requirement, conceptualising game design, objectives, selecting programming language and determining target platform to create the product backlog. This phase also includes brainstorming ideas to establish core gameplay mechanics, identify fun and engaging game elements and the overall game vision. A Game Design Document (GDD) is created to outline the game's features and technical specifications.

### 1.5.2 Phase 2: Development

The development phase involves iterative development cycles, known as sprints, to execute the game project. Each sprint targets the creation of specific features or components, such as character design, level creation, or user interface elements. Relevant game assets are designed and gathered during this phase. A storyboard is created to visually represent the game before coding begins. After designing, a prototype of the game is then developed. Once the prototype is validated, the full game development process begins. Continuous testing and feedback are

essential during development to identify and rectify bugs and to ensure that gameplay remains engaging and functional.

### 1.5.3 Phase 3: Post-game

The post-game phase involves evaluating the completed game through playtesting sessions with the target audience. Game manual documentation is created during this phase. After the game is launched, the target audience plays the game, and feedback is gathered through questionnaires to identify strengths, weaknesses, problems, and potential improvements.

## 1.6 Significance of Project

This research is significant as it aims to bridge the knowledge gap surrounding CHM among young adults in Malaysia.

This project is aligned with the third and fourth goal of the Sustainable Development Goals (SDG) of the United Nations Development Programme (n.d.), which are good health and well-being and quality education. The relevant targets in SDG 3 and 4 focus on ensuring healthy lives, promoting well-being, and providing equitable quality education, with aims to prevent non-communicable diseases, support reproductive health, promote research on herbal medicine, and ensure lifelong learning opportunities that equip individuals with the knowledge and skills for sustainable development. By developing an engaging educational game, the project seeks to increase awareness and improve understanding of CHM while respecting cultural heritage.

## 1.7 Project Schedule

The project is scheduled during the final year, with a duration of one year which has two academic semesters. The first semester is dedicated to FYP 1, starting from 7$^{th}$ of October 2024 until 17$^{th}$ of January 2025, whereas the second semester is dedicated to FYP 2 beginning from 16$^{th}$ of March 2025 to 23$^{th}$ of June 2025. The project schedule and tasks are depicted in a Gantt Chart in Appendix A.

## 1.8 Expected Outcome

The project aims to significantly enhance the understanding and application of CHM among young adults in Malaysia. It is anticipated that there will be an increased awareness and understanding of CHM, empowering players with knowledge about herbs and their application. This initiative is expected to lead to improved attitudes towards herbal remedies as complementary treatments. Additionally, the project will result in the development of a user-friendly educational game that makes learning about CHM engaging.

## 1.9 Project Outline

Chapter 1 covers the introduction of the proposed game, Herbal Madness. This chapter provides an overview of the project which includes the introduction of TCM, problems identified that initiate the development of this proposed game, aims and objectives to be achieved, methodology to assist the development, scope of the proposed game, significance of the project and project schedule.

Chapter 2 presents a literature review of existing applications by reviewing related application available in the market. Moreover, four existing games and application are chosen to review and analyse. This review analyses the limitations and functionalities of these applications, identifying features that can be adapted for implementation in Herbal Madness.

Chapter 3 provides a comprehensive overview of the requirements analysis and design process for the proposed application. This includes detailed documentation such as questionnaires, activity diagrams, use case diagrams, sequence diagrams, class diagrams, and storyboards.

Chapter 4 explains the implementation phase of the proposed game. The storyboard of the game is applied from the design created during the requirement analysis and design phase, with additional gameplay scenes and snippets of code.

Chapter 5 focused on the discussion of functional and non-functional testing aspect from the user’s perspective. This phase involves testing of the proposed game's features through comprehensive test cases and usability assessments, aimed at refining the application based on valuable user feedback and enhancing overall user experience.

Chapter 6 summarizes the overall achievements and explores future enhancements for the proposed game. The chapter also addresses limitations, and constraints encountered throughout the project.

# Chapter 2 Literature Review

## 2.1 Introduction

This literature review examines existing games related to traditional medicine and their relevance to the proposed educational game aimed at enhancing knowledge and understanding of traditional medicine among young adults. By analysing current games, this chapter will establish a foundation for understanding the limitations of existing resources and how the proposed system can effectively address these shortcomings.

TCM is a holistic healthcare system that has evolved over thousands of years, integrating concepts such as yin-yang balance, the Five Phases theory, and the regulation of qi (vital energy) throughout the body (Marshall, 2020). TCM diagnostic and treatment methods focus on maintaining internal harmony, utilizing herbal medicine, acupuncture, and therapeutic exercises like Qigong and Tai Chi (Matos et al., 2021). The Five Phases—Wood, Fire, Earth, Metal, and Water—are fundamental in TCM, influencing organ function, emotions, and therapeutic strategies (Marshall, 2020). Unlike Western medicine, which prioritizes disease pathology, TCM emphasizes syndrome differentiation, aiming to treat underlying imbalances rather than isolated symptoms (Matos et al., 2021).

CHM refers to the use of plants and plant extracts to promote health and treat various ailments, rooted in ancient Chinese philosophy and practices. It classifies herbs based on their thermal nature (hot, warm, neutral, cool, or cold), flavour, and their effects on specific organ systems (Panyod et al., 2020). Common examples of herbal medicines used include Ginger (*Zingiber officinale*), frequently used to alleviate nausea and digestive issues; and Dong Quai (*Angelica sinensis*), traditionally utilised for gynaecological health, particularly in managing menstrual symptoms (Better Health Channel, n.d.; Johns Hopkins Medicine, n.d.). Ginseng (*Panax ginseng*) is widely used to replenish energy and enhance immune function,

while Huang Qin (*Scutellaria*) is known for its anti-inflammatory and antimicrobial properties (Panyod et al., 2020). Ma Huang (*Ephedra*), a historically significant herb, contains ephedrine, a bronchodilator used in asthma treatment (Matos et al., 2021). Other commonly used herbs include *Astragalus* for immune support, Qinghao (*Artemisia annua*) for malaria treatment (Matos et al., 2021). These herbs are often combined into decoctions, where their synergistic properties enhance therapeutic efficacy (Marshall, 2020).

Recent scientific research has explored the integration of Chinese herbal medicine into modern healthcare systems. Studies have demonstrated the effectiveness of *Artemisia annua* in developing anti-malarial treatments, with Tu Youyou's discovery of *artemisinin* (Matos et al., 2021). The increasing prevalence of CAM, particularly in Western countries, has driven research into herbal pharmacology, drug interactions, and quality standardization (Marshall, 2020). Additionally, CHM has been investigated for its potential antiviral effects, with certain herbs showing promise in immune modulation and respiratory disease treatment, including applications for COVID-19 prevention (Panyod et al., 2020). Despite its potential, concerns regarding clinical validation, standardization, and toxicity assessment remain challenges for full integration into Western medicine (Matos et al., 2021).

Game-based learning has emerged as a powerful educational tool that utilises game elements to create engaging and motivating learning experiences for various age group. Game-based learning integrates cognitive, affective, motivational, and sociocultural elements through design features that foster an enjoyable experience (Plass et al., 2015). GBL has been shown to improve student engagement, motivation, and knowledge retention compared to traditional teaching methods (Tavares, 2022). Study in Squire (2013) shown that games can significantly enhance learning, especially when specific subjects are integrated into the gameplay. Players often feel that they're acquiring information unintentionally while having fun. Unlike

conventional lectures, GBL provides interactive experiences that integrate self-determination theory, where students feel autonomy, competence, and relatedness in their learning process (Xu et al., 2023). It includes elements such as quizzes, escape rooms, and active learning approaches, making the learning experience more dynamic and effective. While traditional methods rely on passive knowledge absorption, GBL encourages problem-solving and hands-on participation, leading to better long-term retention (Tavares, 2022).

Simulation-based games in healthcare education provide learners with a safe environment to develop both technical and non-technical skills (Xu et al., 2023). These games often incorporate decision-making, procedural learning, and cause-effect relationships to reinforce educational content (Satria et al., 2023). Digital platforms, virtual reality (VR), and real-world simulations are commonly used to train medical students in diagnostics, decision-making, and emergency response (Al-Rayes et al., 2022). Studies have shown that simulation games, such as those designed for neonatal resuscitation and patient management, significantly improve knowledge retention and clinical decision-making skills (Xu et al., 2023). Additionally, location-based learning games like *Herbarian* have proven effective in enhancing knowledge retention of herbal medicine and plant identification (Vimolmangkang et al., 2022). By integrating these mechanics, players not only engage with the game but also internalize the learning process, making education more interactive and effective (Vimolmangkang et al., 2022).

Engagement in educational games is driven by well-designed mechanics such as feedback loops, challenge-based tasks, and social interaction (Krishnamurthy et al., 2022). Features like real-time feedback, achievement tracking, and adaptive learning help maintain player motivation throughout the experience (Vimolmangkang et al., 2022). Additionally, meaningful storytelling and immersive environments enhance player engagement while

reinforcing knowledge acquisition (Xu et al., 2023). Key motivational elements in educational games include points, leaderboards, unlockable content, levels, and challenges, which create a structured learning path, encourage competition, and foster a sense of achievement (Al-Rayes et al., 2022). Research suggests that game-based applications in healthcare effectively utilize these mechanics to improve adherence to medical treatments and encourage positive behavioural changes (Krishnamurthy et al., 2022).

Effective educational games for health and wellness integrate structured learning objectives with engaging gameplay (Al-Rayes et al., 2022). These games often include scenarios that mimic real-world situations, such as patient care, nutrition management, and disease prevention (Al-Rayes et al., 2022). Research highlights the importance of including game mechanics like challenges, progression systems, and goal-oriented tasks to ensure that players learn effectively while staying engaged (Krishnamurthy et al., 2022). Designing an educational simulation game for herbal medicine should focus on balancing fun with structured learning objectives.

The findings suggest that a casual simulation game focused on TCM remedies could serve as an engaging educational tool that enhances knowledge retention and decision-making skills. By integrating GBL mechanics, such as interactive customer diagnosis, herbal remedy crafting, and real-time feedback, players can experience an immersive, hands-on approach to learning. The game could feature progressive difficulty, clear and accessible storytelling, and problem-solving tasks to strengthen learning outcomes while sustaining player engagement. Such a game would provide both entertainment and educational value, making TCM more accessible and appealing to a wide audience, including students, herbal enthusiasts, and general public.

This chapter offers a comparative analysis of four existing games and application, examining their strengths and weaknesses in relation to the proposed game. By identifying gaps and opportunities, this analysis informs the strategic planning and development of the envisioned game.

## 2.2 Review of Existing Games

The following section will review and compare four existing games and applications to the proposed game. These are Traditional Healer, 中医模拟器 (Traditional Chinese Medicine Simulator), Hell's Pharma, and Herbapp.

### 2.2.1 Traditional Healer

Traditional Healer, developed by RitchieT using Unity, available on itch.io, is a top-down 3D casual simulation prototype that immerse players in the practice of traditional Indonesian medicine as shown in Figure 2.1. Players take on the role of a healer tasked with diagnosing patients and preparing herbal remedies to treat various ailments.


*Figure 2.1 A screenshot of Traditional Healer (RitchieT, 2023)*

As illustrated in Figure 2.2 and Figure 2.3, the gameplay is divided into two core phases: the diagnostic phase, where players analyse patient symptoms to determine their possible illnesses, and the medicine dispensing phase, where players answer quiz-based questions to choose the appropriate remedies and simulate their preparation before administering them to the patient.

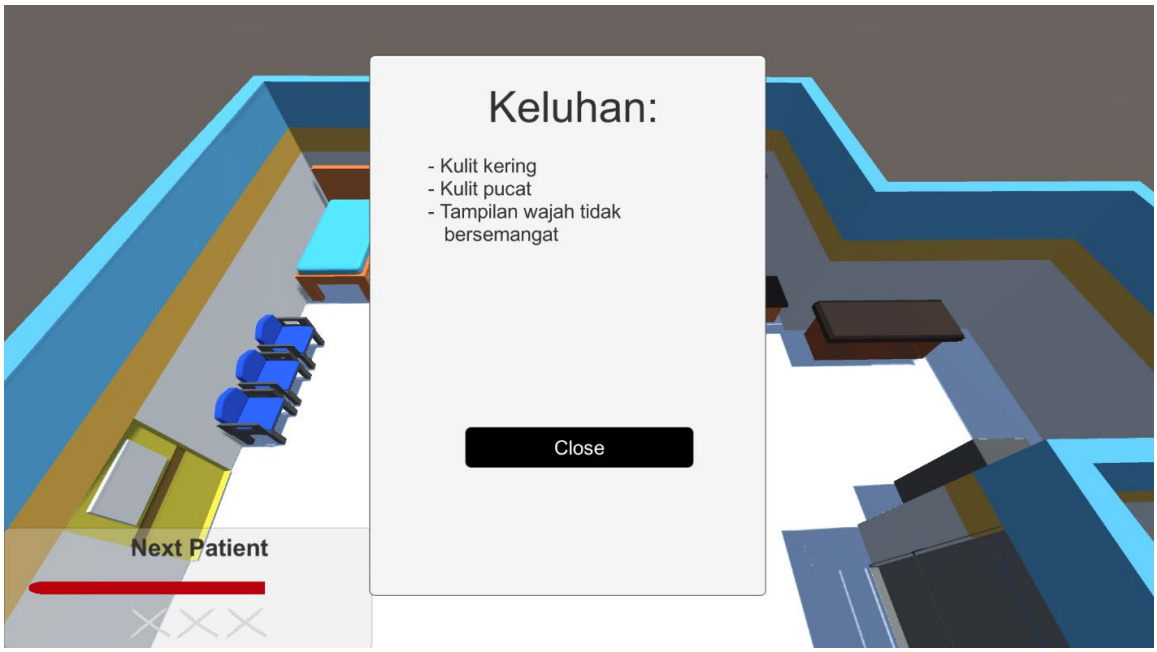


*Figure 2.2 A screenshot of Traditional Healer (RitchieT, 2023)*

*Figure 2.3 A screenshot of Traditional Healer (RitchieT, 2023)*

Traditional Healer incorporates traditional Indonesian remedies, providing Indonesian remedy recipes, allowing the target audience to learn that many of these treatments can be prepared using common herbs found in their kitchen.

While the gameplay successfully incorporates the concept of Indonesian herbal remedies, it lacks explanations of what each remedy does. Relying solely on visual feedback for correct or incorrect choices may hinder learning for players unfamiliar with traditional medicine. The gameplay is primarily in Indonesian, which may pose a challenge for non-Indonesian speakers.

### 2.2.2 中医模拟器 (Traditional Chinese Medicine Simulator)

中医模拟器 (Zhōng Yī Mó Nǐ Qì), Traditional Chinese Medicine Simulator, developed by 曲波 (Qū Bō) using Unity, is an educational click-and-drag game. In the game, players take on the role of a TCM practitioner. They diagnose patients through chat-based dialogues by interpreting symptoms, as illustrated in Figure 2.4. Each symptom is then further broken down

and analysed into specific categories of illness—such as different types of fever—as shown in Figure 2.5. Based on this analysis, players then make a deduction before selecting the appropriate herbal remedy.


*Figure 2.4 A screenshot of Traditional Chinese Medicine Simulator (曲波, 2021)*


*Figure 2.5 A screenshot of Traditional Chinese Medicine Simulation, (曲波, 2021)*

The gameplay emphasises a combination of observation, deduction, and knowledge of herbal properties, mirroring the real-life practices of TCM. It has a unique focus of the game on educating users about TCM, particularly its thorough approach to diagnosing ailments and utilising herbal remedies. Figure 2.6 shows the Traditional Chinese Medicine Simulator also features a learning tool that tests players' knowledge of herbs and their properties through quiz-style challenges.


*Figure 2.6 A screenshot of Traditional Chinese Medicine Simulator, (Xiaorenwu, 2023)*

Many reviews highlight the game's educational value, saying it's a good introduction to the basic principles of Traditional Chinese Medicine, which is often seen as a niche topic. However, some players feel that the learning aspect can take over the fun, making the game feel more like a lesson than entertainment. Overall, the game is often seen as more serious and education-focused than a typical casual game.

The game currently supports Simplified Chinese for its interface and audio, with no English language support. This limits accessibility, especially for non-Chinese speakers who

may be interested in learning about Traditional Chinese Medicine. The game is available on Steam and iOS, with prices varying by platform.

### 2.2.3 Hell's Pharma

Hell's Pharma is a click and drag simulation game developed by Rainman Studios using Game Maker. In this game, players assume the role of an intern pharmacist in Hell, tasked with preparing potions to cure a variety of demon patients. The gameplay involves analysing prescriptions provided by the demon, as shown in Figure 2.7, followed by creating and mixing the appropriate ingredients, as illustrated in Figures 2.8 and 2.9.


*Figure 2.7 A screenshot of Hell's Pharma (Rainman Studio, 2019)*

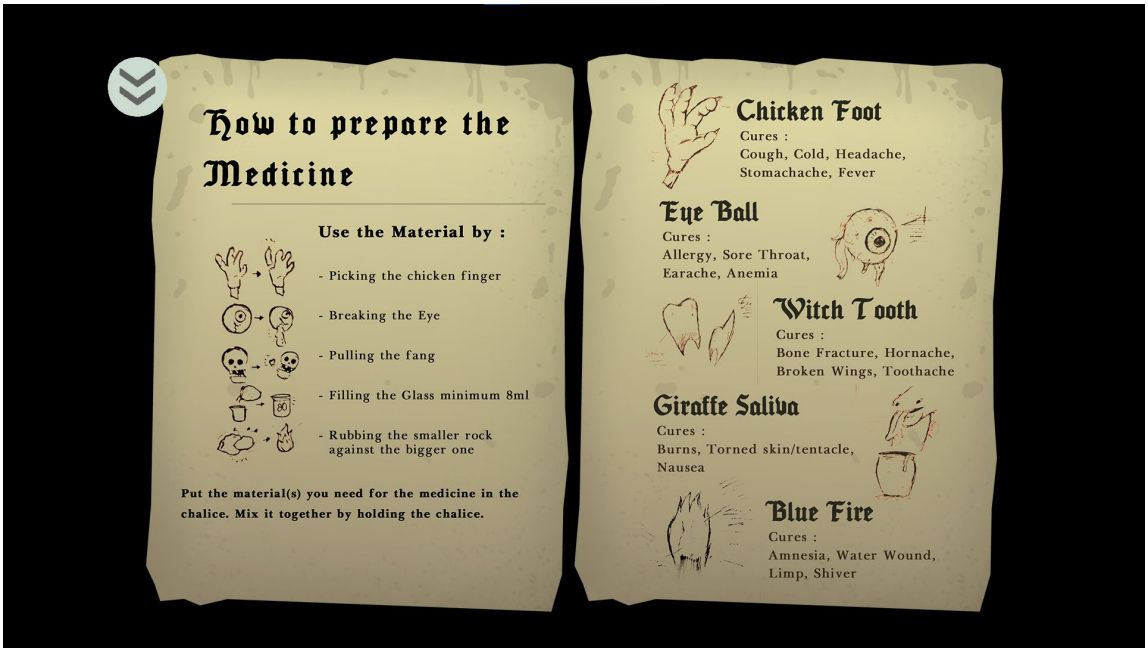


*Figure 2.8 A screenshot of Hell's Pharma (Rainman Studio, 2019)*

*Figure 2.9 A screenshot of Hell's Pharma (Rainman Studio, 2019)*

Players must cross-check demon prescriptions with the doctor's schedule to prevent manipulation by demons attempting to obtain drugs illegally, while also ensuring compliance with the law to avoid dispensing prohibited substances, as shown in Figure 2.10. As the game progresses, new symptoms and medicines are introduced, gradually increasing the difficulty.

Players also face moral dilemmas, confronting the consequences of their decisions. These elements allow players to actively influence the course of events in the game.


*Figure 2.10 A screenshot of Hell's Pharma (Indie Direct, 2020)*

The game offers a unique blend of dark humor and strategic decision-making, creating an engaging experience for players who enjoy simulation games with a supernatural twist. It features fantasy elements and supernatural potions, setting it apart from real medical or herbal practices. While the gameplay structure may resemble certain real-life processes, the treatments and their context are entirely fictional and do not represent actual health practices or remedies. The game is available for purchase on Steam.

### 2.2.4 Herbapp

HerbApp is a free mobile reference application with in-app purchases developed by Ievgen Kryvun for iOS and Android. It is designed to support learning and practice in TCM. Depicted in Figure 2.11, this application is designed to provide users with comprehensive information on herbs and formulas used in Traditional Chinese Medicine.

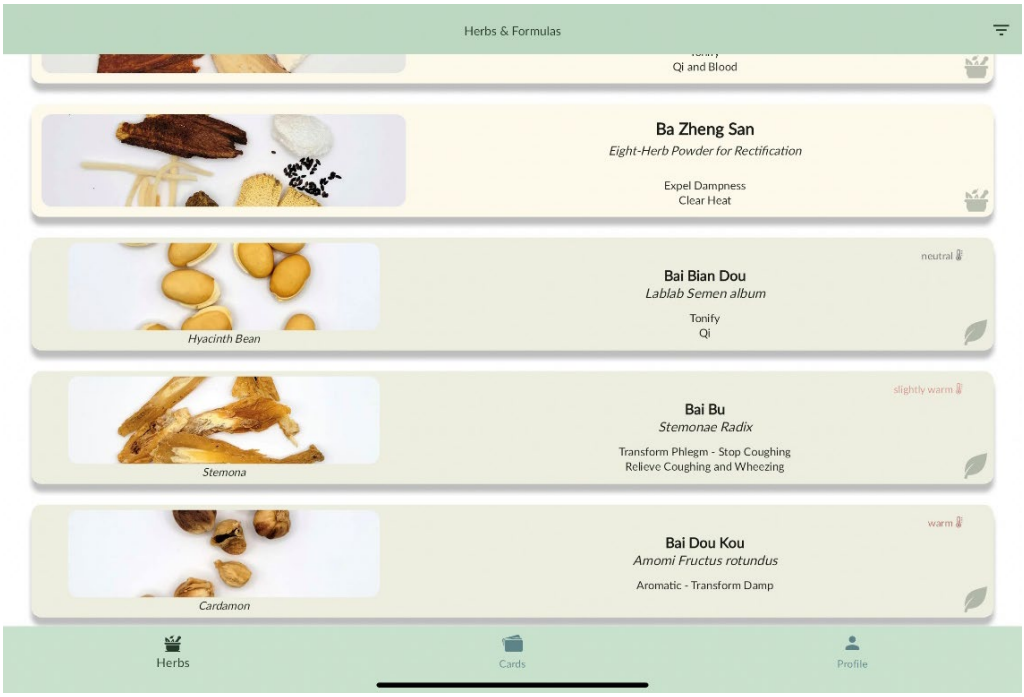


*Figure 2.11 A screenshot of Herbapp (Ievgen Kryvun, n.d.)*

As depicted in Figure 2.12 and Figure 2.13, it features a detailed entries on TCM herbs, including their names, properties, functions, and associated formulas, making it a valuable resource for students, practitioners, and herbal medicine enthusiasts.

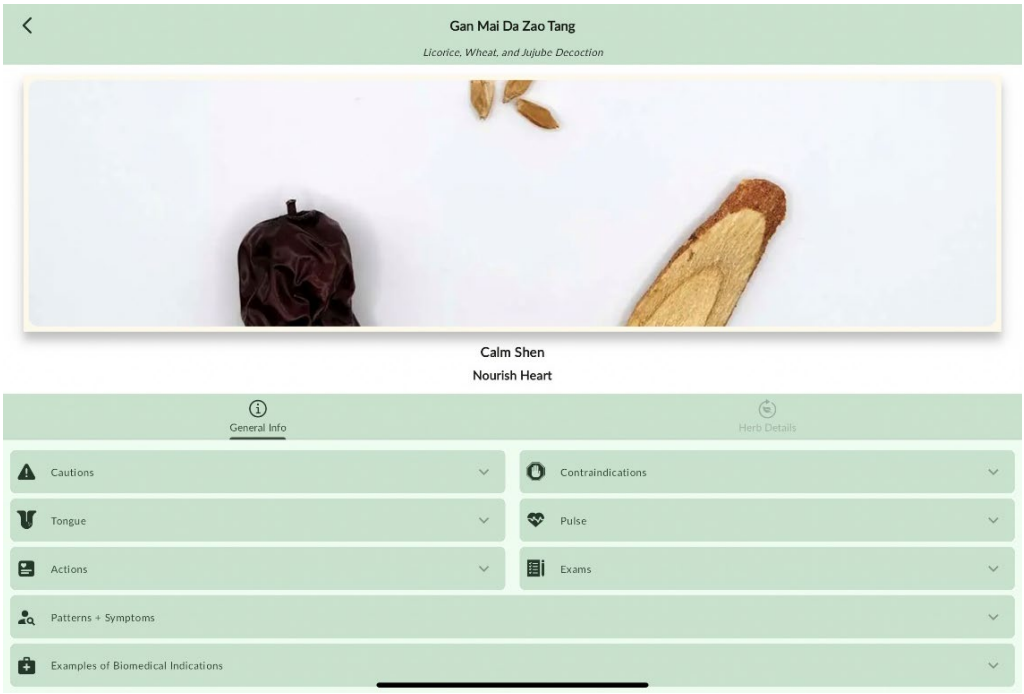


*Figure 2.12 A screenshot of Herbapp (Ievgen Kryvun, n.d.)*

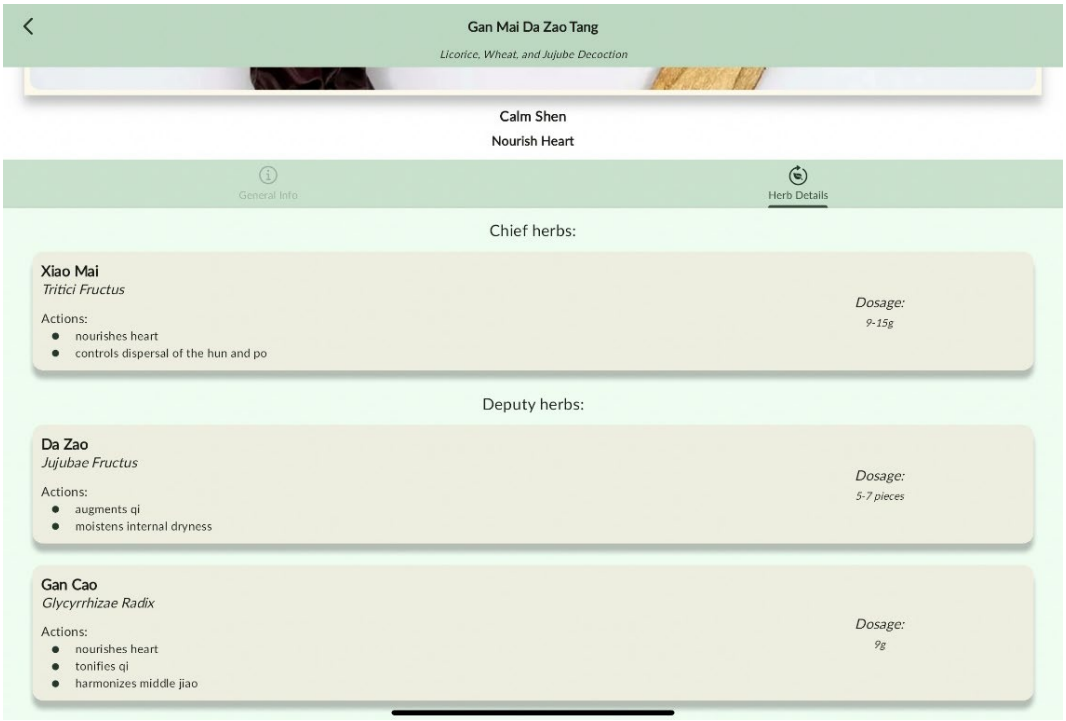


*Figure 2.13 A screenshot of Herbapp (Ievgen Kryvun, n.d.)*

Not only that, Herbapp also offers a flashcard-style quiz tool to enhance learning. In this mode, the name of a herb is shown as depicted in Figure 2.14, and users must decide whether the revealed properties on the back of the card match the herb by answering correct or incorrect as illustrated in Figure 2.15.

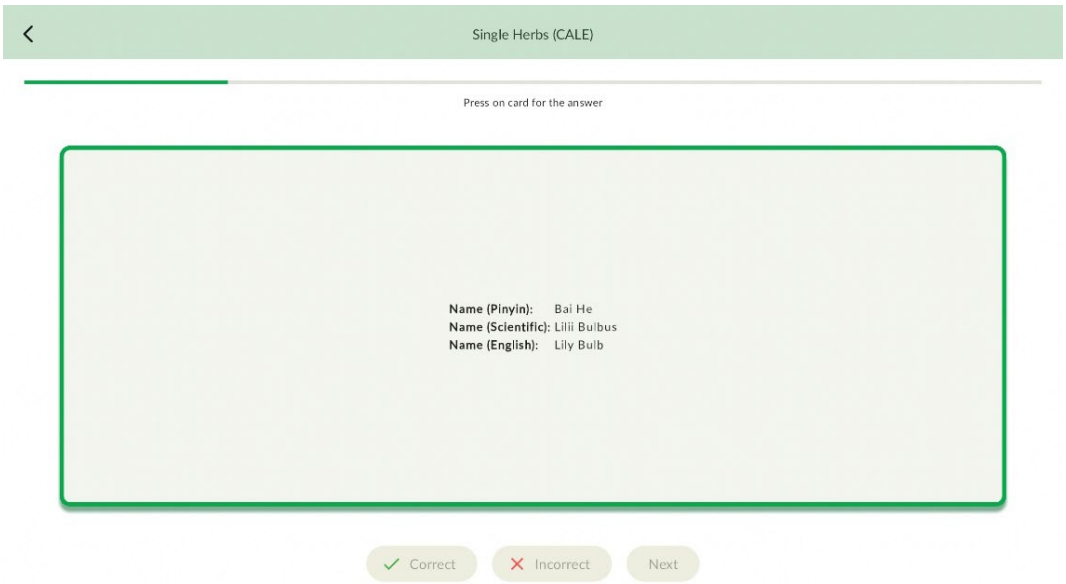


*Figure 2.14 A screenshot of Herbapp (Ievgen Kryvun, n.d.)*

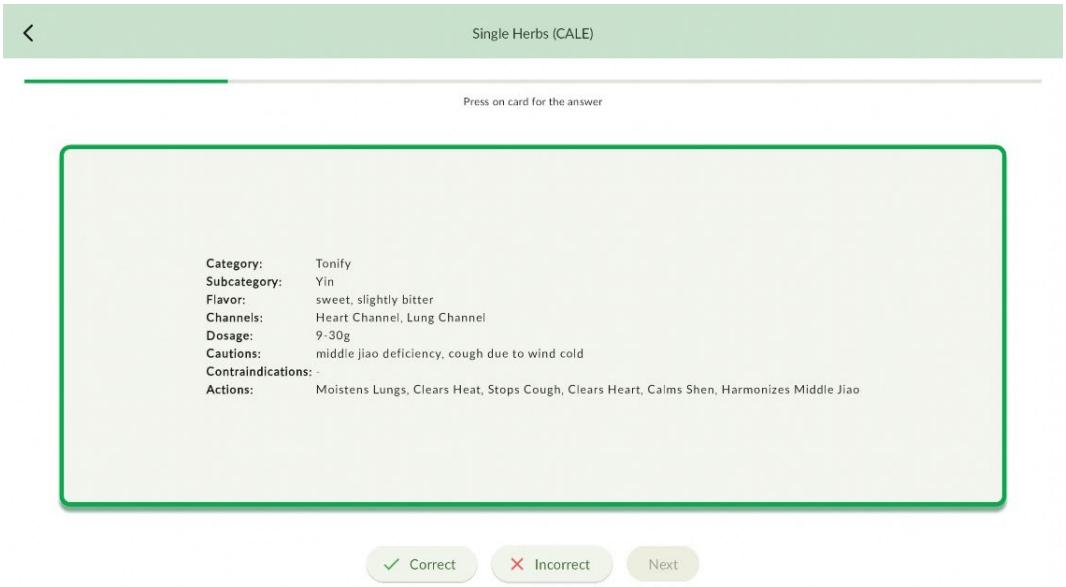


*Figure 2.15 A screenshot of Herbapp (Ievgen Kryvun, n.d.)*

While HerbApp is a rich reference tool, it is primarily static and not an interactive or gamified experience. The flashcard feature supports memorization but lacks story-based scenarios, visual engagement, or simulated decision-making, such as diagnosing patients or applying herbs in context.

## 2.3 Comparison of Existing Games and Proposed Game

*Table 2.1 Comparison of Existing Game and Application with Proposed Game*

| Features | Existing Game and Application | | | | Proposed Game |
|---|---|---|---|---|---|
| | Traditional Healer | Traditional Chinese Medicine Simulator | Hell's Pharma | Herbapp | Herbal Madness |
| TCHM Coverage | ✗ | ✓ | ✗ | ✓ | ✓ |
| Story-based Coverage | ✗ | ✗ | ✓ | ✗ | ✓ |
| Level Difficulties | ✗ | ✓ | ✓ | ✗ | ✓ |
| Learning Tool | ✗ | ✓ | ✗ | ✓ | ✓ |
| Graphics | 3D | 2D | 2D | 2D | 2D |
| Game Engine | Unity | Unity | Game Maker | Not mentioned | Unity |
| Language | Indonesian | Simplified Chinese | English | English | English |
| Platform | Windows PC (itch.io) | Windows PC (Steam), iOS | Windows PC (Steam) | iOS, Android | Windows PC |
| Price | Free | Varies depending on the platform | RM 12.50 (Steam) | Free (In-app purchases available) | Free |

### 2.3.1 Traditional Chinese Herbal Medicine Coverage

Traditional Chinese Herbal Medicine refers to how the game or application represents and teaches TCM concepts such as the herbal remedies, herbs and their properties.

Traditional Chinese Medicine Simulator and Herbapp effectively cover wide range of Traditional Chinese Herbal Medicine, providing players with valuable insights of Chinese herbs and their applications. Traditional Chinese Medicine Simulator focuses on the principles and practices of TCM, allowing users to analyse symptoms and deduce the most suitable remedies in detail. Herbapp serves as an extensive database of commonly used herbs and formulas, providing detailed information on each herb's properties, indications, contraindications, and traditional uses.

### 2.3.2 Story-based Coverage

Story-based coverage involves using narrative elements such as character dialogue, patient backstories, or in-game events to present learning content.

Unlike most existing apps and games that present symptoms in a straightforward list or quiz format, Hell's Pharma uniquely incorporates narrative elements where the narrative evolves through different weeks, with each bringing new challenges and ethical dilemmas. Players navigate through a demon world, facing increasingly complex situations, such as a war between humans and demons, a drug addiction crisis, and the strange occurrence of humans in Hell.

### 2.3.3 Level Difficulties

Level difficulties refer to how the challenge in the game increases over time. It can be represented through progressive levels, for example, Level 1 to Level 2 with increasingly complex cases or task complexity, for instance, additional symptoms and herbs. This gradual increase in difficulty helps learners build knowledge step by step without feeling overwhelmed.

Both Traditional Chinese Medicine Simulator and Hell's Pharma incorporate different difficulties of level in their gameplays. In Traditional Chinese Medicine Simulator, as players progress through chapters, more complex mechanics are introduced, requiring them to not only diagnose patients based on symptoms but also to select the correct herbal formula and match herbs to alleviate the symptoms. In Hell's Pharma, as the game advances, new symptoms and medicines are introduced, ramping up the difficulty by combining increasingly complex potions

### 2.3.4 Learning Tool

Learning tool is the features or mechanics that help players understand and retain knowledge. Examples including quizzes or multiple choice, interactive simulations and problem-solving.

Traditional Chinese Medicine Simulator follows a quiz-based format, where players match pictures of herbs to their names. In Herbapp, the flashcard feature displays the name of a herb on one side and then presented with a set of properties on the reverse side. User must determine whether they correctly match the herb by selecting correct or incorrect.

### 2.3.5 Graphics

Among the compared applications, only Traditional Healer utilizes 3D graphics, whereas Traditional Chinese Medicine Simulator, Hell's Pharma, and Herbapp all feature 2D graphics.

### 2.3.6 Game Engine

The game engine used to develop Traditional Chinese Medicine Simulator and Traditional Healer is Unity. Meanwhile, Hell's Pharma is developed using GameMaker. However, for Herbapp, it was not mentioned what engine is used to create it.

### 2.3.7 Language

All existing games support the English language, except Traditional Chinese Medicine Simulator, which supports Simplified Chinese only, and Traditional Healer, which uses a combination of Indonesian and English.

### 2.3.8 Platform

Each game offers different platform availability: Traditional Chinese Medicine Simulator is available on Windows PC (via Steam) and iOS; Hell's Pharma is available on Windows PC (via Steam); HerbApp is accessible on both iOS and Android devices, whereas Traditional Healer is exclusively available on Windows PC via itch.io.

### 2.3.9 Price

Herbapp is free but includes in-app purchases while Traditional Healer is completely free, making it accessible for users who want to explore herbal medicine without upfront costs. Meanwhile, prices for Traditional Chinese Medicine Simulator vary based on the platform it is offered on; however, Hell's Pharma, priced at RM 12.50 on Steam.

## 2.4 Brief Overview on the Proposed Game

The proposed game, Herbal Madness, will incorporate all the features outlined in the comparison table. Herbal Madness is a click and drag simulation game where players take on the role of herbal tea crafter, managing a herbal tea shop. The core gameplay revolves around interpreting NPCs' health concern and crafting herbal tea using the right combinations of herbs to address their needs.

The game will be produced using Unity and C# programming language. Unity is more widely recognised in the industry, offering a robust ecosystem and professional tools that provide students with hands-on experience using industry-standard software. The game will be launched and available to play on itch.io and PC.

## 2.5 Summary

In summary, this chapter reviews and compares several games similar to the proposed game. Table 2.1 provides an overview, offering a snapshot of the analysed games and their comparison with the proposed game. These existing games serve as key reference points for the

development of the proposed solution. Each reviewed game has its own strengths and weaknesses, which will be carefully considered during the development of the proposed game, Herbal Madness.

# Chapter 3 Requirement Analysis and Design

## 3.1 Introduction

Requirements analysis and design are fundamental components in the software development lifecycle, particularly in the context of game development. This phase is essential for understanding and documenting the needs and constraints of end-users, stakeholders, and the system itself. The primary objective of requirements analysis is to establish a clear and comprehensive set of specifications that guide the development process. As highlighted by Sommerville (2011), this systematic approach ensures that all parties involved have a shared understanding of what the software must achieve.

In contrast, the design phase focuses on translating these requirements into a detailed plan or blueprint for the software system. This includes making architectural decisions, selecting appropriate data structures, defining algorithms, and outlining the overall system structure. The goal is to create a design that not only fulfils the specified requirements but also ensures scalability, maintainability, and efficient performance.

The adaptation of the Scrum methodology is used in this study, which serves as a framework for project management. Scrum emphasises systematically breaking down tasks into manageable segments to facilitate smooth execution. The Scrum process is divided into three phases: pre-game, development, and post-game. This structured approach aligns well with the dynamic nature of game development, allowing teams to remain agile and responsive to changes throughout the project lifecycle.

## 3.2 Methodology

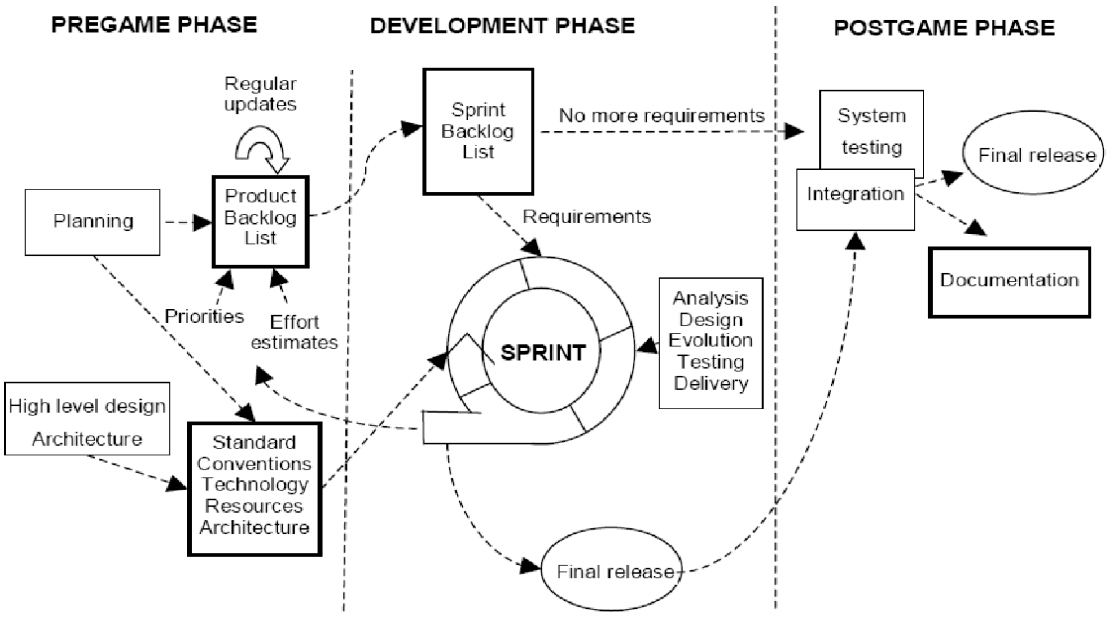


*Figure 3.1 Details of the scrum process. (Kristiadi et al., 2019)*

### 3.2.1 Phase 1: Pre Game

The pre-game phase entails thorough planning for both project management and system architecture. This architectural component includes identifying the systems and tools that will be utilised in the project. Details regarding these systems and tools are outlined in the software and hardware requirements specification sections. This phase focuses on defining the user requirement, conceptualising game design, objectives, selecting programming language and determining target platform to create the product backlog. This phase also includes brainstorming ideas to establish core gameplay mechanics, identify fun and engaging game elements and the overall game vision. A GDD is created to outline the game's features and technical specifications.

#### 3.2.1.1 Survey

A questionnaire was created on Google Forms (refer to Appendix C) to collect user requirements and opinions. The questionnaire was divided into 5 sections (Demographic

Information, Overall Experience with Traditional Chinese Medicine, Chinese Herbs' Knowledge, Gaming Preference, Herbal Awareness through Gaming) consisting of close-ended and open-ended questions. 50 respondents were recruited through in-person and social media. Only 18 years of age and above were eligible respondents.

**Section 1: Demographic Information**

The survey results indicate a notable gender distribution, with 68% of respondents are female and the remaining respondents are male as shown in Figure 3.2 below.

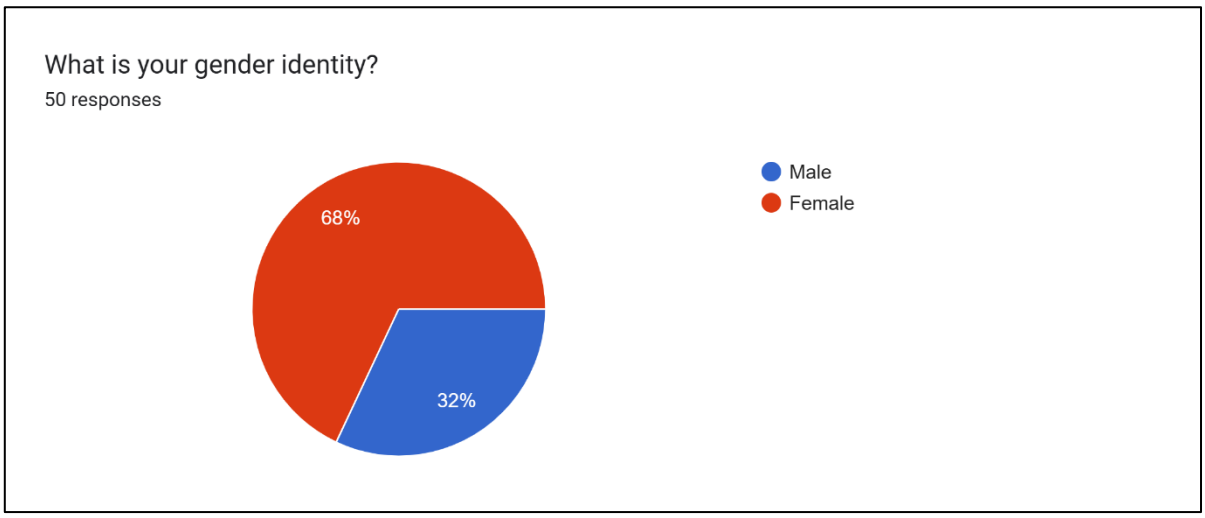


*Figure 3.2 Respondents' gender*

Figure 3.3 reveals that most (60%) of respondents fall within the 23-29 age group, followed by 18-22 age group at 34% and then the remaining 6% are 40-49 age group. This age distribution likely reflects the survey's primary distribution among university students, resulting in a high concentration of respondents in their 20s.

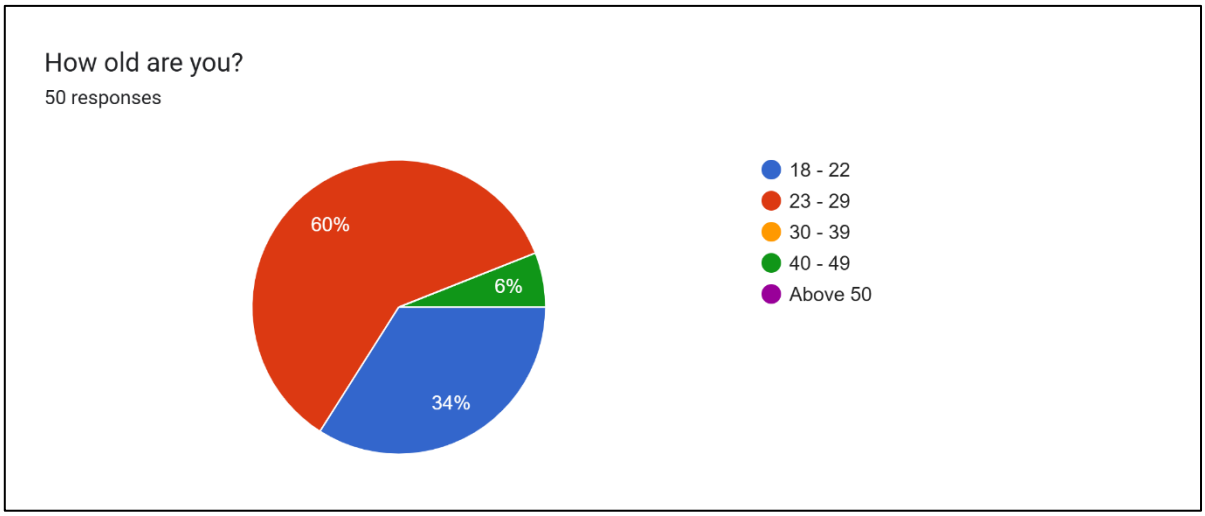


*Figure 3.3 Respondents' age group*

Figure 3.4 below demonstrates the diverse racial and ethnic backgrounds of the respondents. This finding suggests that initiatives to raise awareness about herbal medicine through gaming have the potential to reach and resonate with a wide range of individuals, regardless of their backgrounds.

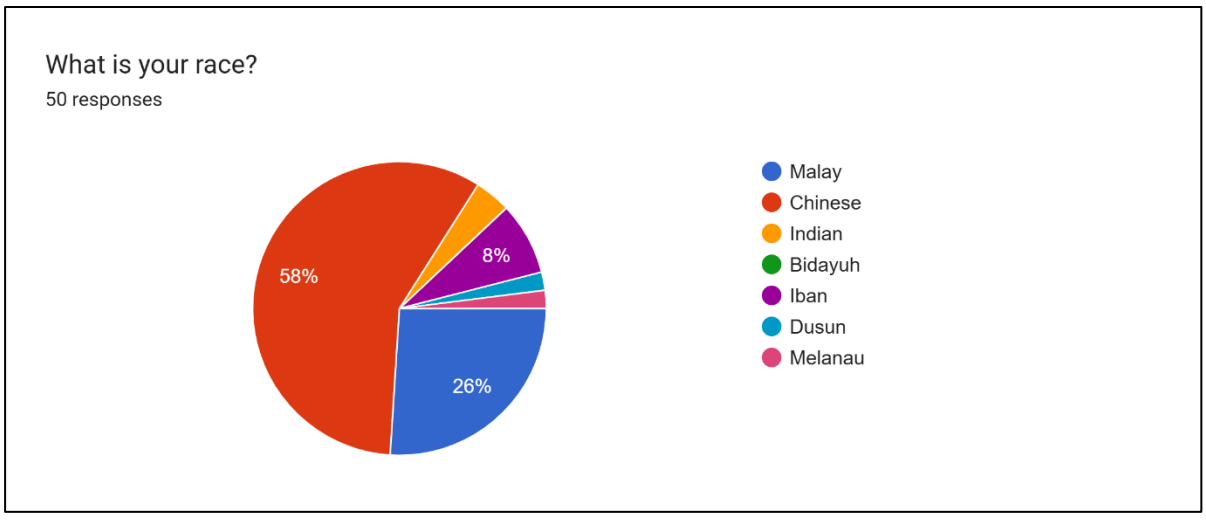


*Figure 3.4 Respondents' race*

Figure 3.5 below indicates Chinese (42%) is the predominant home language among respondents, followed by Malay (24%) in second and English (22%) in third. While the game is developed in English for accessibility and inclusivity, some information will be presented

using Romanised Chinese, especially for those without common English names or only having complex scientific names. This approach ensures accuracy and cultural sensitivity while providing a valuable learning experience for players interested in the original terminology.

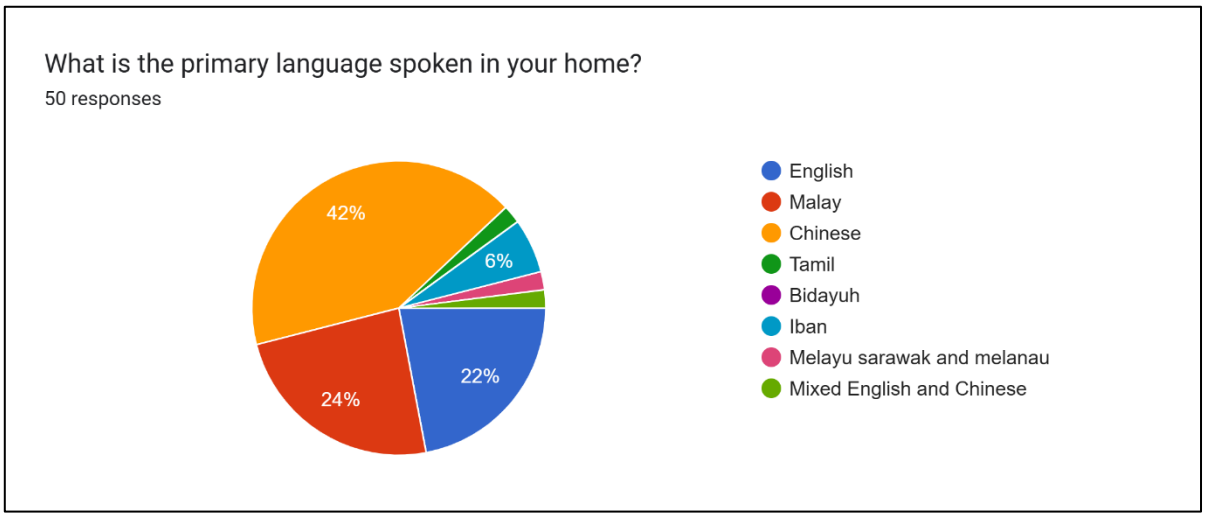


*Figure 3.5 Respondents' primary language spoken at home*

The pie chart shown in Figure 3.6 below shows the respondents' education level, with 82% of them are bachelor's degree holder, 12% have graduated from college/pre-university/diploma and the remaining are postgraduate. Given that most of the respondents are aged in 20s, it is unsurprising that a high percentage have obtained bachelor's degrees.

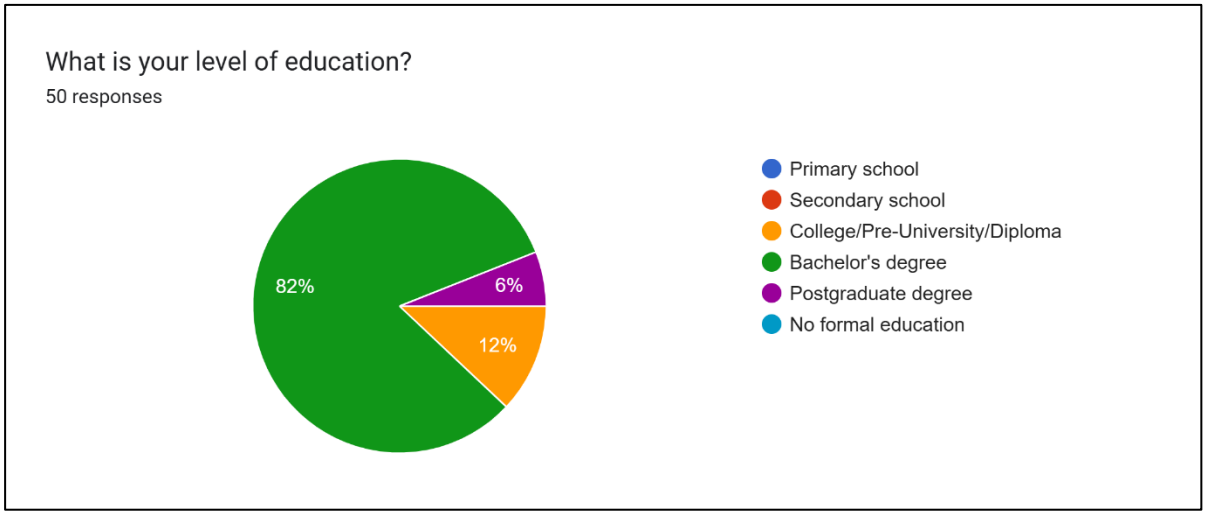


*Figure 3.6 Respondents' level of education*

As illustrated in Figure 3.7, the distribution of employment status among the respondents indicates that 66% are students, 26% are employed, 6% are self-employed and the remaining are unemployed. Since the majority respondents are age from 23-29, this age group likely to be university students.

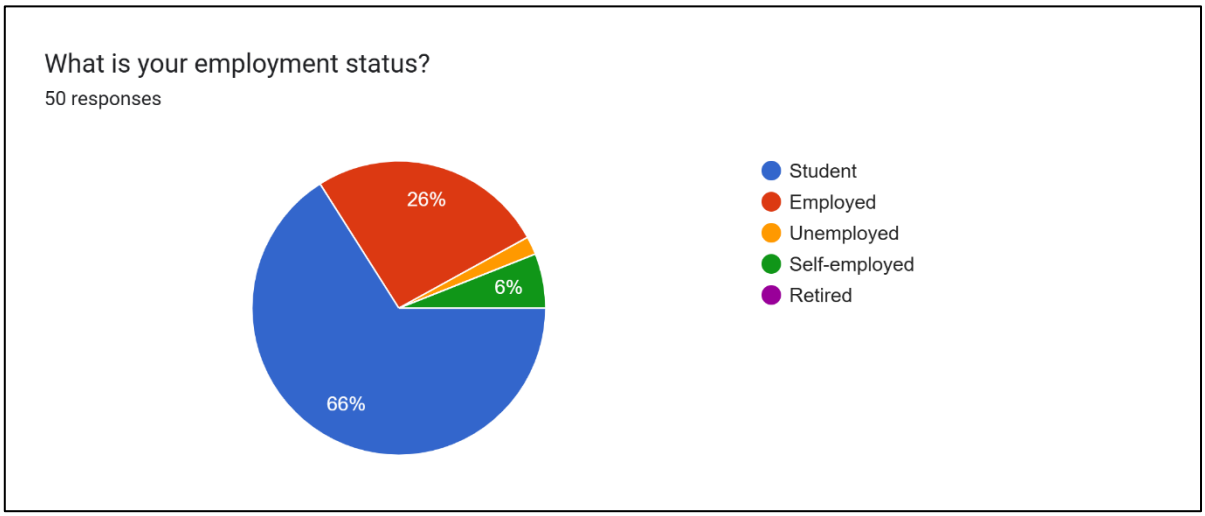


*Figure 3.7 Respondents' employment status*

Figure 3.8 shows that most (62%) of the respondents live in urban areas, followed by the sub-urban areas are at 34% while the remaining are from the rural areas. The survey was distributed in Sarawak which has its own subdistricts of urban areas, sub-urban areas and the rural areas.

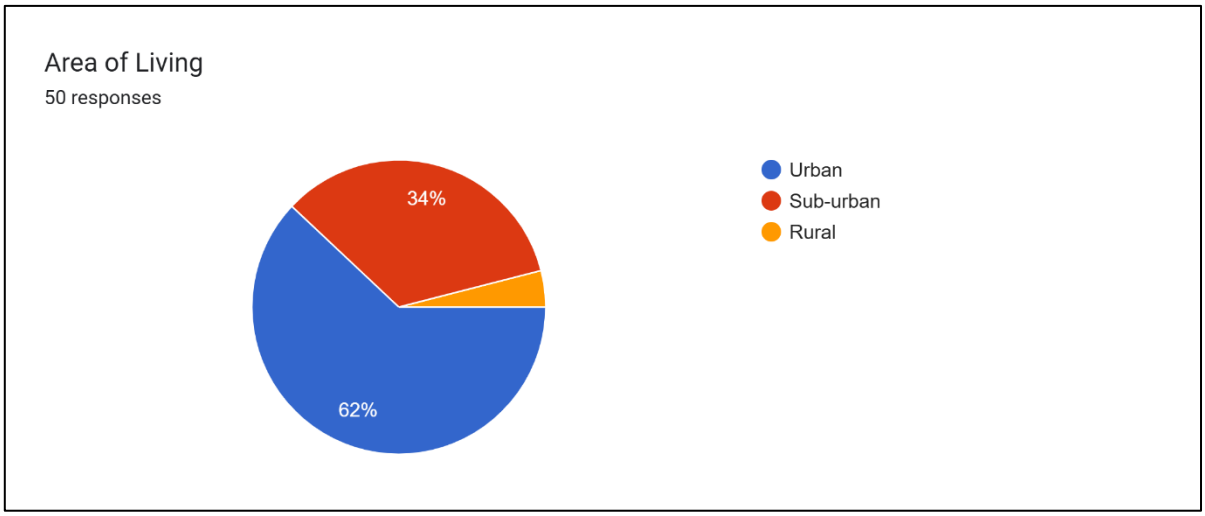


*Figure 3.8 Respondents' area of living*

**Section 2: Overall Experience with Traditional Chinese Medicine**

Figure 3.9 illustrates that majority of respondents (70%) have previously used TCM or herbal remedies. This may suggest a positive perception and potential acceptance of TCM and herbal remedies within this population.

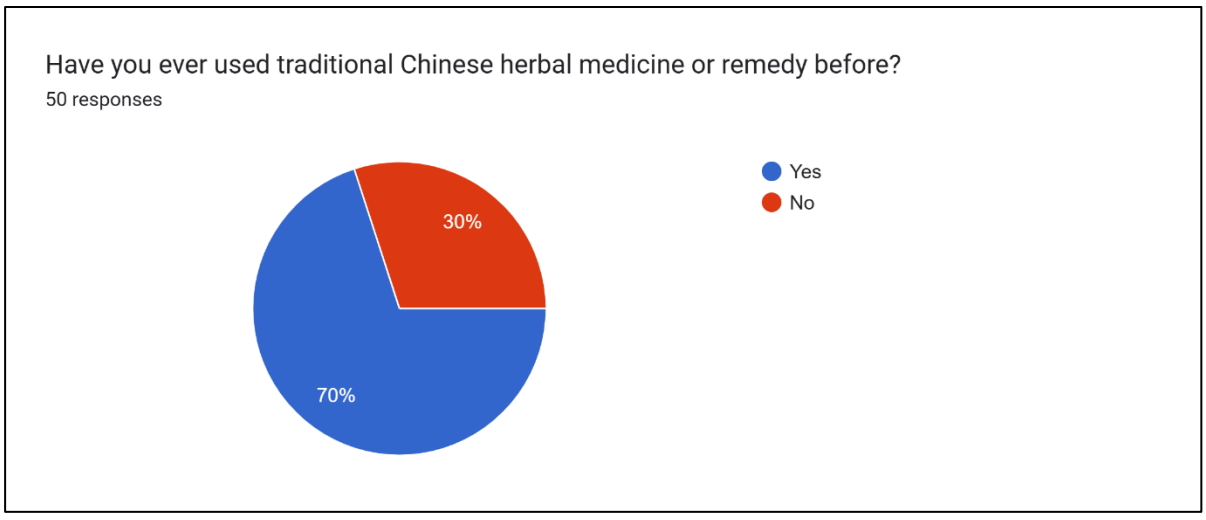


*Figure 3.9 Respondents' use of traditional Chinese herbal medicine or remedy*

**For Traditional Chinese Medicine User**

In this section, the analysis provides a preliminary understanding of the reasons for utilising TCM among respondents who have previously used TCM.

Figure 3.10 reveals that respondents most commonly utilise TCM or remedies for respiratory problems (60%) and menstrual issues (51.4%). This suggests that these conditions are perceived to be effectively addressed through TCM within this population. Digestive issues (40%), General wellness and prevention of illness (28.6%), pain relief (22.9%), and detoxification and cleansing (22.9%) also represent significant areas of TCM usage.

Conversely, conditions such as rehabilitation and cure rashes have lower reported usage rates, with some conditions, like rehabilitation, not being used at all by the respondents.

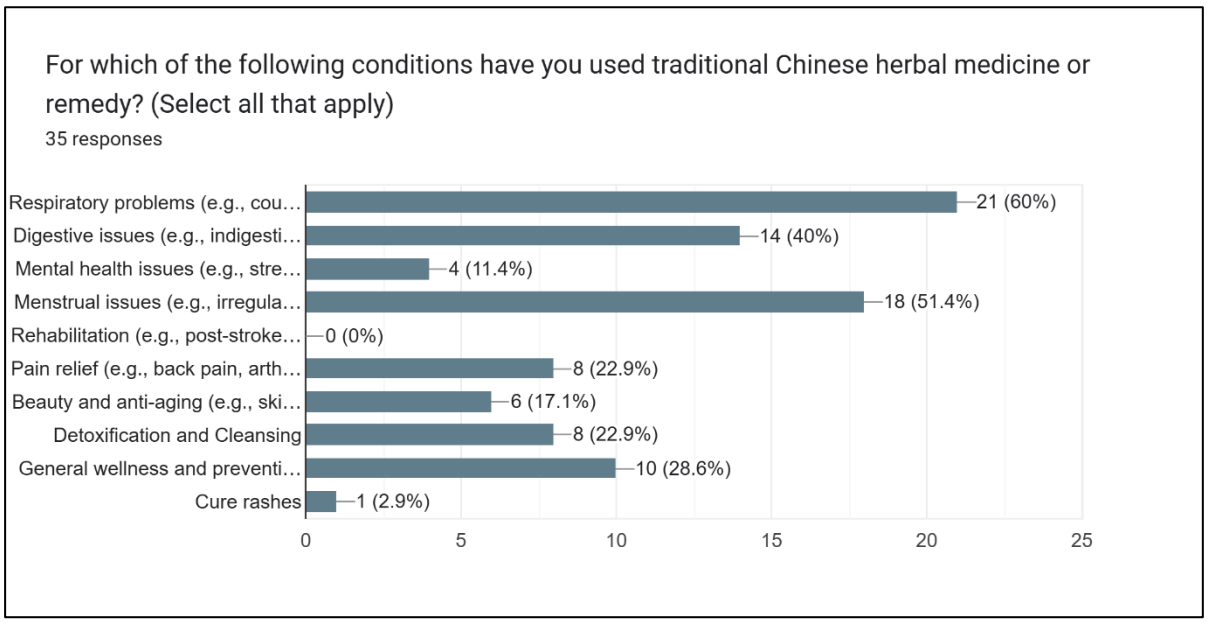


*Figure 3.10 Specific conditions for which have used traditional Chinese herbal medicine or remedies*

Figure 3.11 illustrates the frequency of TCM or herbal remedies usage among respondents. It reveals that 'As needed' is the most common usage pattern, accounting for 45.7% of responses. This suggests that herbal medicine or remedies are primarily used by respondents on an ad-hoc basis, likely in response to specific health concerns or as needed for symptom relief. 'Occasionally' (25.7%) and 'Rarely' (17.1%) follow as the next most frequent usage

patterns. ‘Monthly’ (5.7%), ‘Weekly’ (2.9%) and ‘Daily’ (2.9%) usage patterns are less common, indicating that for a smaller proportion of respondents, TCM usage is not as frequent.

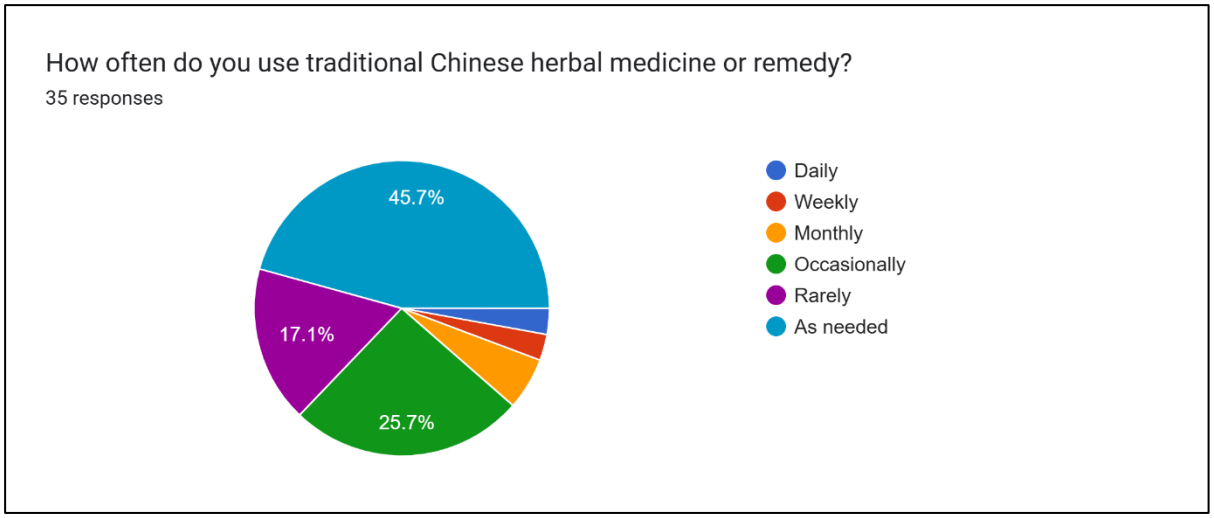


*Figure 3.11 Respondents' frequency usage of traditional Chinese herbal medicine or remedies*

Figure 3.12 shows that ‘Recommendation from a friend, family member, or healthcare professional.’ emerged as the most significant factor influencing respondents' decisions to use TCM or herbal remedies, with 77.1% of respondents citing it. This suggests that personal recommendations play a crucial role in introducing individuals to TCM and fostering its adoption.

‘Positive personal experience’ (45.7%), ‘Accessibility and affordability’ (28.6%) and ‘Perceived effectiveness for specific conditions’ (25.7%) also significantly influenced respondents' decisions. This indicates that positive personal experiences and perceived efficacy are key drivers in the continued use and recommendation of TCM.

‘Cultural beliefs and traditions’ (22.9%), and ‘Holistic approach to health and wellness’ (11.4%) were also identified as influential factors, albeit to a lesser extent. ‘Dissatisfaction with conventional medicine’ (8.6%) was cited by a relatively small proportion of respondents.

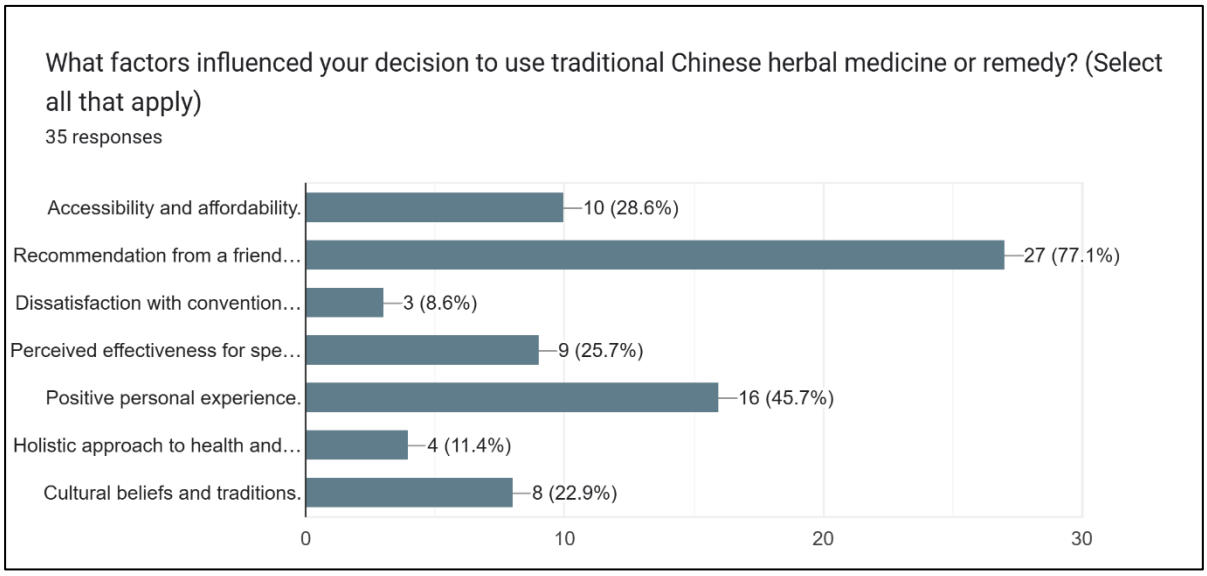


*Figure 3.12 Factors influencing respondents' decisions to utilise traditional Chinese herbal medicine or remedies*

Figure 3.13 highlights the significant role of 'Family and friends' as a primary source of TCM information (88.6%), emphasising the influence of social networks. This finding aligns with the observation that personal recommendations strongly influence the decision to utilise TCM, demonstrating the impact of social networks on TCM awareness and adoption.

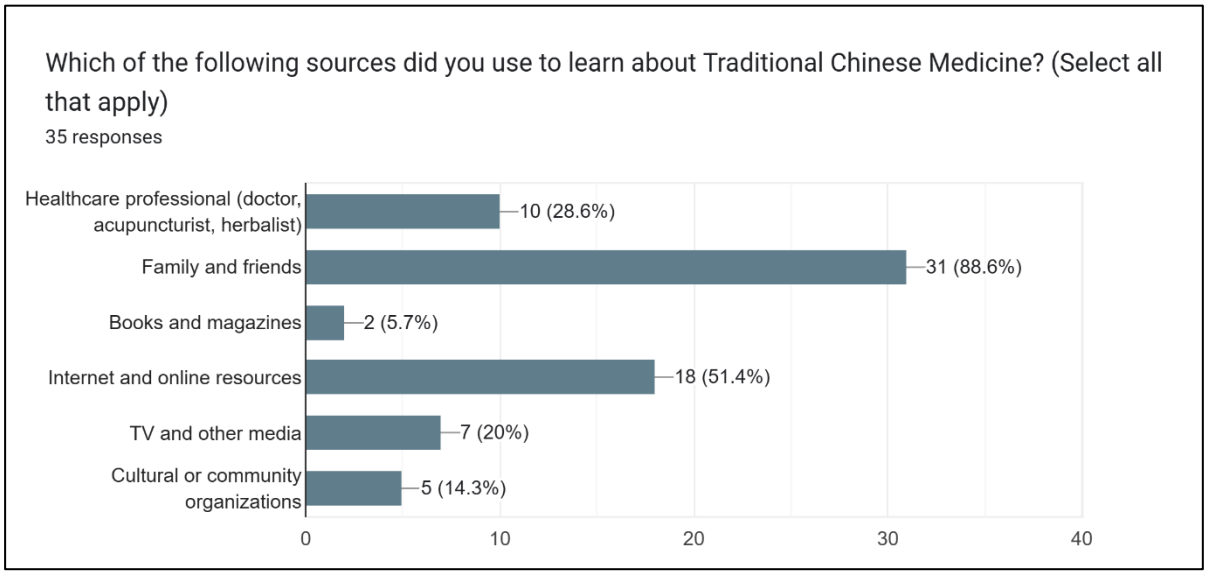


*Figure 3.13 Respondents' reported sources of information regarding Traditional Chinese Medicine*

Figure 3.14 shows the following distribution of respondent satisfaction with the effectiveness of TCM or herbal remedies on a scale of 1 to 5:

- 5 respondents chose 5 (Very satisfied)
- 19 respondents chose 4
- 10 respondents chose 3
- 1 respondent chose 2
- 0 respondents chose 1 (Very dissatisfied)

This demonstrates that a significant majority of respondents (combined 24 out of 35) expressed high satisfaction, choosing either 4 or 5 on the scale, indicating a positive perception of TCM effectiveness based on their experiences.

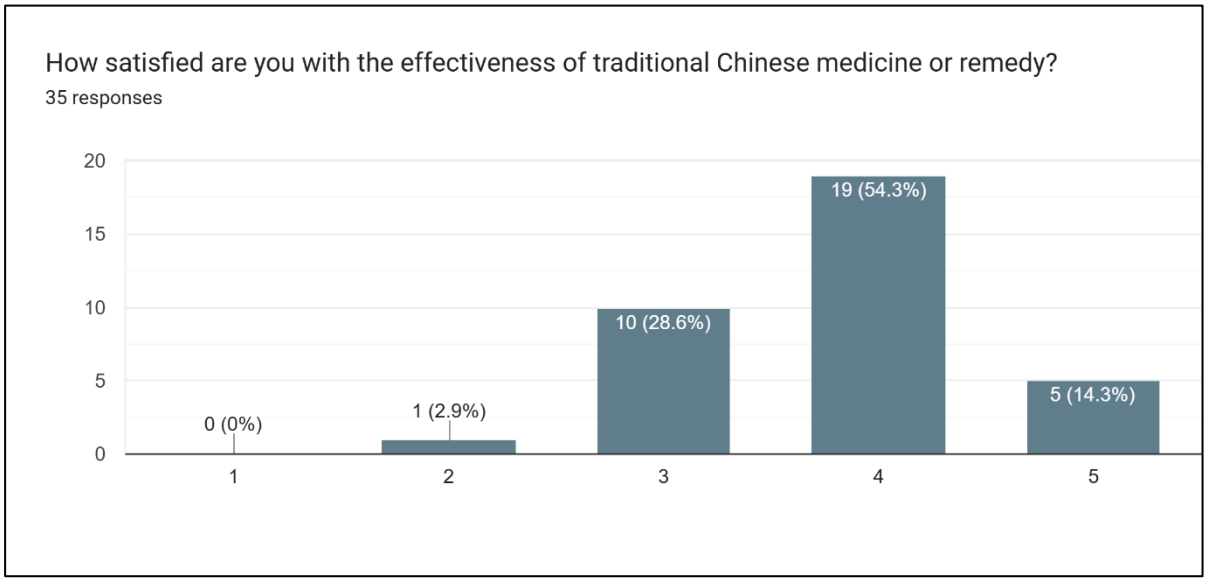


*Figure 3.14 Respondents' reported level of satisfaction with the effectiveness of traditional Chinese herbal medicine or remedies*

**For Traditional Chinese Medicine Non-User**

These analysis under this section provides a preliminary understanding of the primary reasons for non-utilisation of TCM among respondents who have not used TCM before.

Figure 3.15 highlights that a lack of awareness and accessibility is the primary barrier to TCM use, with 60% of respondents indicated that they 'haven't heard much about it and don't know how or where to access it'. This suggests that improving information dissemination is crucial. However, the strong reliance on 'Family and friends' as a knowledge source based on Figure 3.13 suggests that information about TCM may primarily circulate within existing social networks, potentially limiting exposure and contributing to a lack of awareness among individuals outside these networks.

'Hesitancy about trying something outside of conventional medicine' is the second most cited reason (26.7%), highlighting the need to address concerns and build trust in TCM. 'I don't believe in its effectiveness' (6.7%) and 'I prefer modern medicine' (6.7%) were cited by a smaller proportion of respondents, indicating that while some scepticism exists, it is not the primary barrier to TCM usage within this sample.

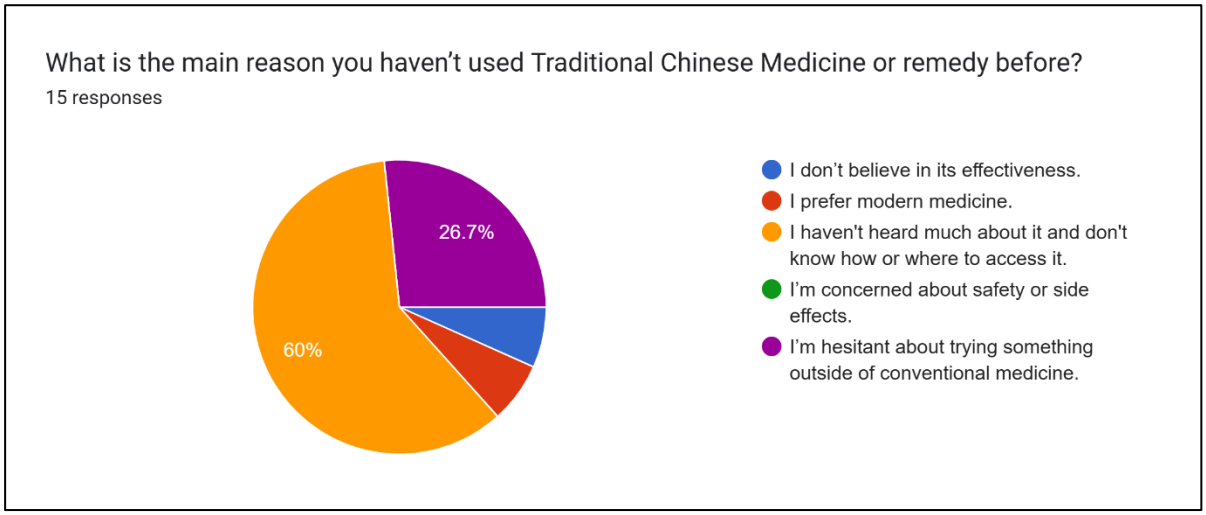


*Figure 3.15 Respondents' primary reasons for not using traditional Chinese herbal medicine or remedies before*

Figure 3.16 illustrates the following distribution of respondent interest in learning about Chinese herbal remedies on a scale of 1 to 5:

- 5 respondents chose 5 (Very interested)
- 6 respondents chose 4
- 3 respondents chose 3
- 1 respondent chose 2
- 0 respondents chose 1 (Not interested at all)

This shows that a significant majority of respondents (combined 11 out of 15) expressed high interest in learning about Chinese herbal remedies, choosing either 4 or 5 on the scale.

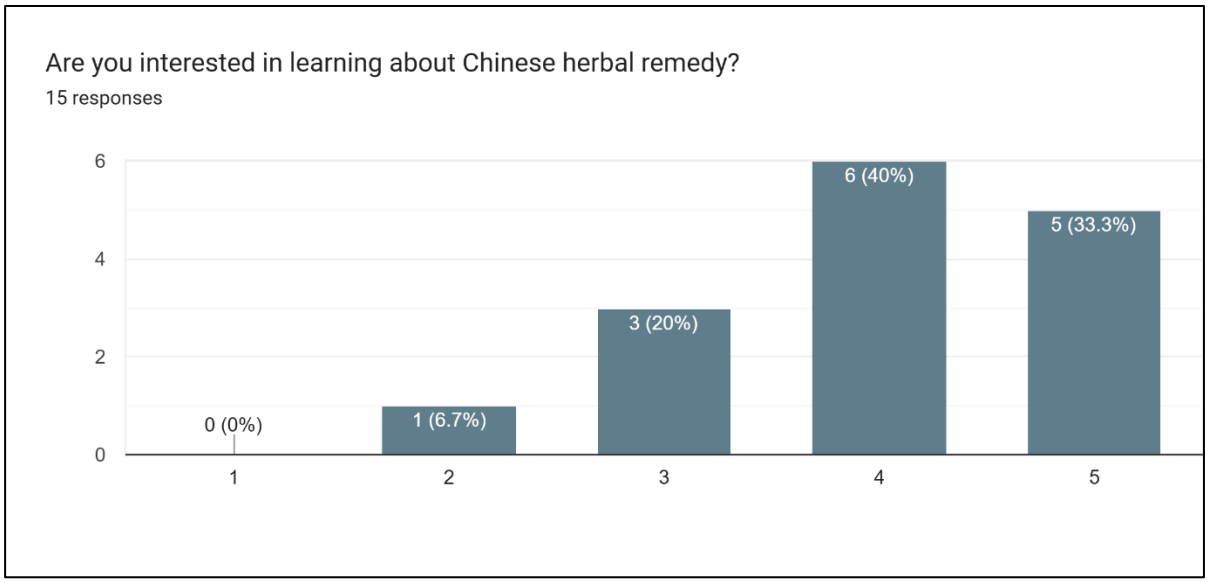


*Figure 3.16 Respondents' expressed interest in learning about Chinese herbal remedies*

Figure 3.17 reveals that all respondents expressed interest in learning about 'Their benefits for specific health conditions,' indicating a strong desire to understand the potential therapeutic applications of TCM. A significant proportion of respondents (73.3%) also expressed interest in learning about 'How Chinese herbal remedies are prepared and consumed,' and 53.3% were interested in 'How to incorporate them into daily life,' further emphasising the practical application of TCM knowledge.

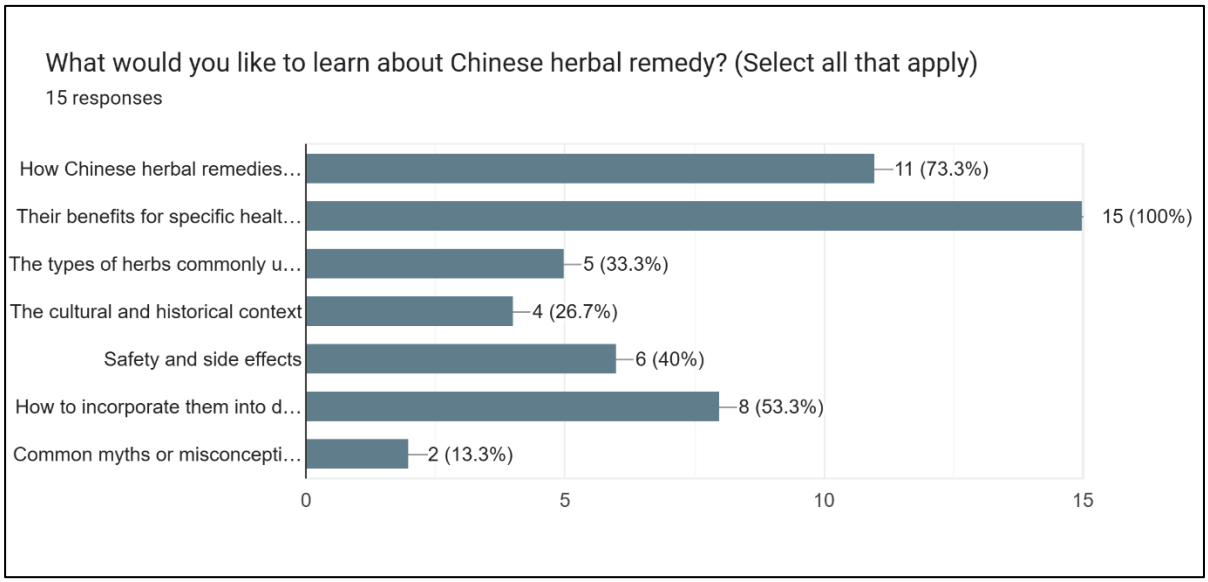


*Figure 3.17 Respondents' expressed areas of interest for learning about Chinese herbal remedies*

**Challenges of utilisation in Traditional Chinese Herbal Medicine among younger generation**

Figure 3.18 shows that 80% respondents cited 'Lack of knowledge or awareness about Traditional Chinese Medicine or herbal remedies' as the biggest barrier to use TCM among younger generation. This would suggest that educational efforts aimed at increasing awareness and understanding of TCM are crucial to promote wider adoption among younger demographics.

Furthermore, a significant proportion of respondents also expressed 'Preference for modern or pharmaceutical medicine' (66%) and 'Difficulty finding reliable sources, practitioners, or products' (60%) as major barriers. This highlights the need for readily accessible and reliable information on TCM in the gameplay.

Other notable barriers include 'Distrust or scepticism towards TCM' (44%), 'Concerns about how it works or its side effects' (42%), 'Cultural perceptions or stigma associated with TCM' (26%), 'Fear of using something outside of conventional medicine' (20%), and 'Higher cost compared to modern treatments' (18%).

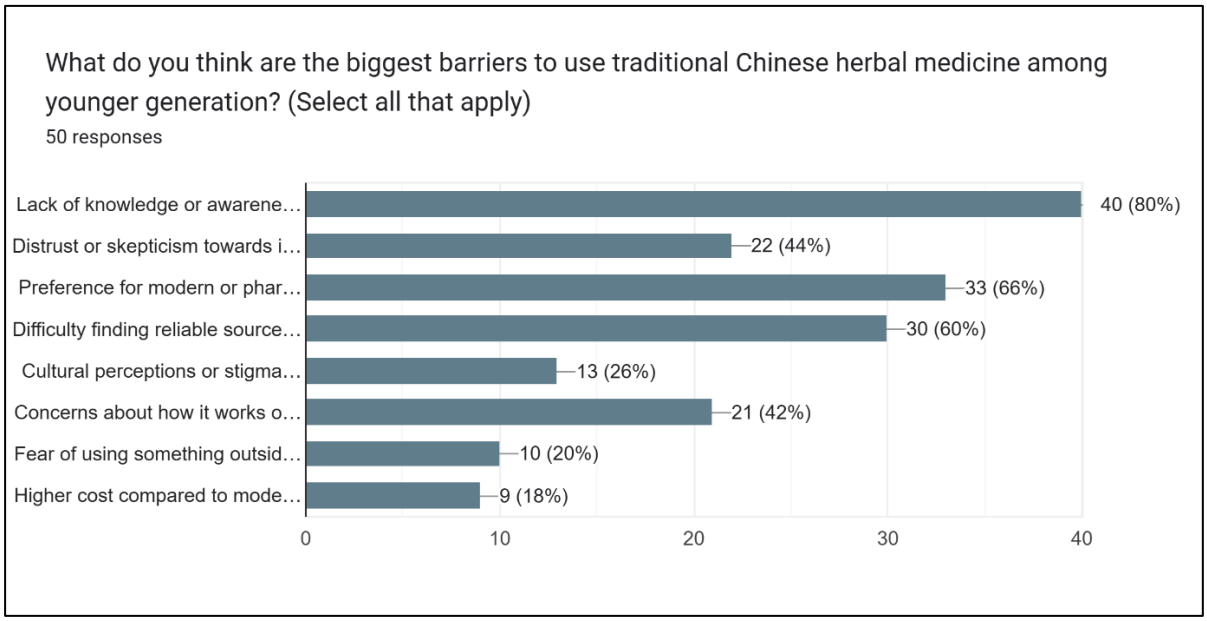


*Figure 3.18 Respondents' perceived barriers to the use of traditional Chinese herbal medicine among younger generation*

**Section 3: Chinese Herbs' Knowledge**

Figure 3.19 indicates that a significant majority (86%) of respondents possess some awareness of common Chinese herbs, while the remaining 14% are not.

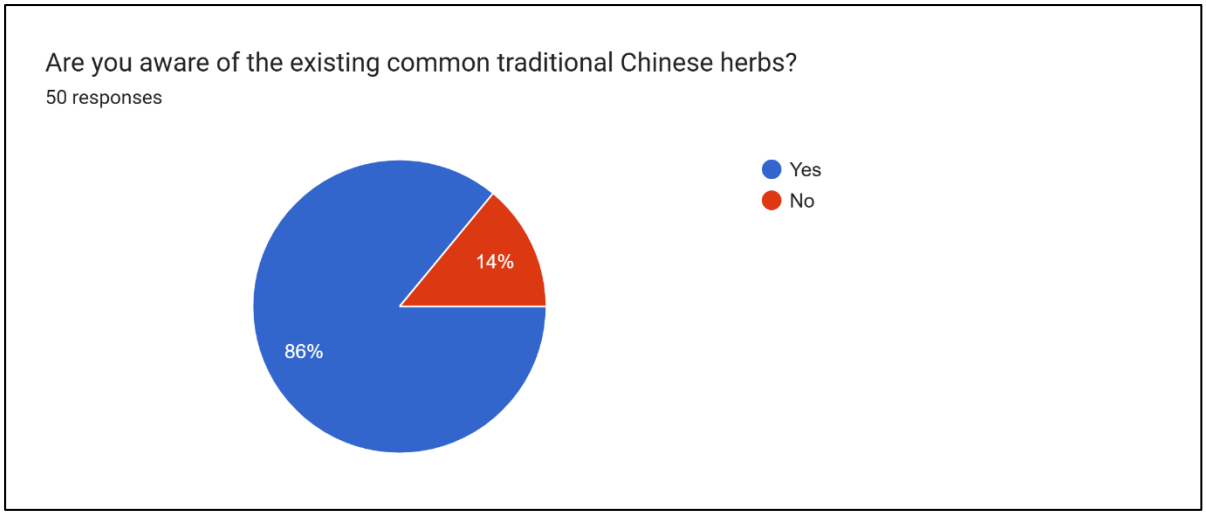


*Figure 3.19 Respondents' awareness of existing common Chinese herbs*

Figure 3.20 shows portion of the survey responses reveals a varied level of awareness among respondents regarding common Chinese herbs. Ginseng, Goji Berries, and Jujube

emerged as the most frequently mentioned herbs, demonstrating their widespread recognition. Additionally, the inclusion of fruits and vegetables within the responses reflects a broader understanding of natural remedies within the context of TCM.

Respondents often use a combination of English and Pinyin (Romanised Chinese) to describe the herbs. The frequent use of Pinyin alongside English names for Chinese herbs in real-world contexts suggests that the game should similarly incorporate both languages together. This dual-language approach will not only accurately reflect real-world usage but also provide players with a valuable opportunity to learn and practice the pronunciation and association of Chinese herb names, enhancing the game's educational value and cultural authenticity.

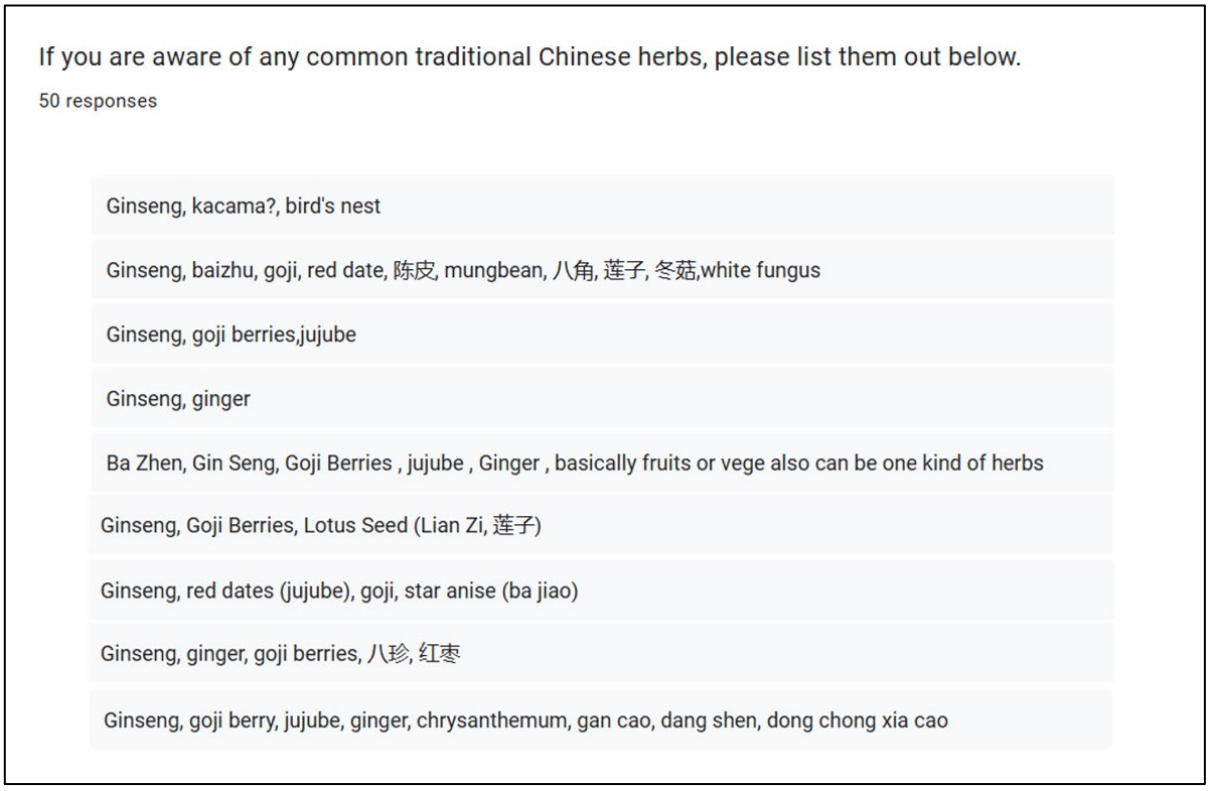


*Figure 3.20 Common Chinese herbs recognised by respondents*

**Quiz analysis of Chinese herb knowledge**

A set of 10 questions were provided in the survey for the respondents to test their level of knowledge in Chinese herb.

Figure 3.21 shows the analysis of the quiz results reveals a moderate level of Chinese herb knowledge among the respondents. A detailed analysis of the quiz results, as presented below in Table 3.1, provides insights into respondents' knowledge of Chinese herbs.

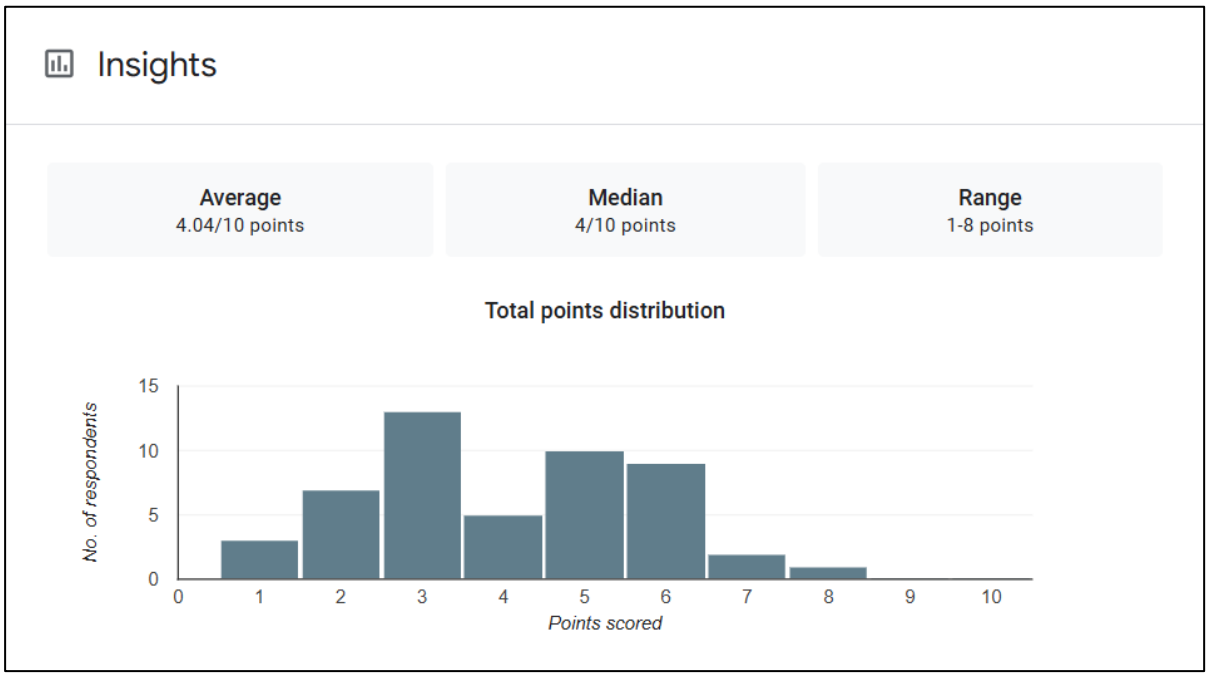


*Figure 3.21 Analysis of quiz results revealed respondents' level of knowledge regarding Chinese herbs*

*Table 3.1 Detailed insights of the quiz results regarding respondents' knowledge of Chinese herbs*

| **Score** | 0/10 | 1/10 | 2/10 | 3/10 | 4/10 | 5/10 | 6/10 | 7/10 | 8/10 | 9/10 | 10/10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Number of Respondents** | 0 | 3 | 7 | 13 | 5 | 10 | 9 | 2 | 1 | 0 | 0 |

The average and median scores of 4.04/10 and 4/10 points, respectively, indicate that while some individuals demonstrated strong understanding, there's a significant variation in knowledge levels, with scores ranging from 1 to 8 points. The distribution of scores, with a higher concentration in the mid-range, suggests that while some respondents performed well,

there's room for improvement in overall knowledge across the group. These findings highlight the need for targeted educational efforts to enhance knowledge of Chinese herbal medicine.

**Section 4: Gaming Preference**

Figure 3.22 shows that 86% of the respondents play video games while 14% does not play video games. This is promising as it shows a potential interest for the proposed game.

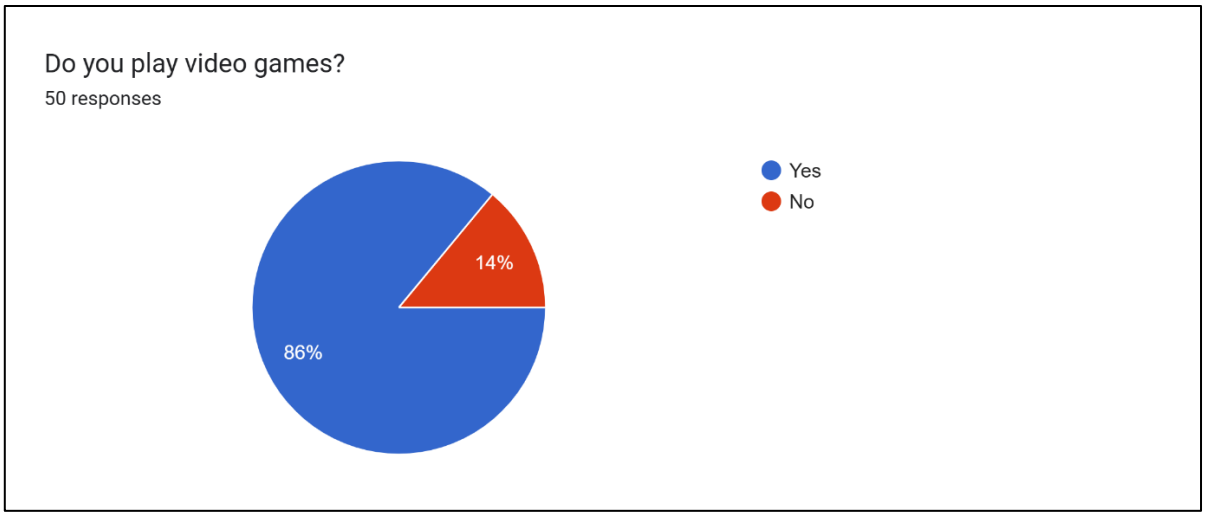


*Figure 3.22 Respondents' engagement in video games*

Figure 3.23 shows that Mobile/Tablet platforms (68%) and PC/Desktop/Laptop (60%) are the most preferred gaming platforms among respondents, suggesting a strong market potential for games developed for these devices. While consoles (24%) represent a smaller market share, they still hold significant appeal. The proposed system will be exclusively available on PC/Desktop/Laptop platforms, capitalising on the high preference for this platform among the target audience and aligning with the system's intended functionality.

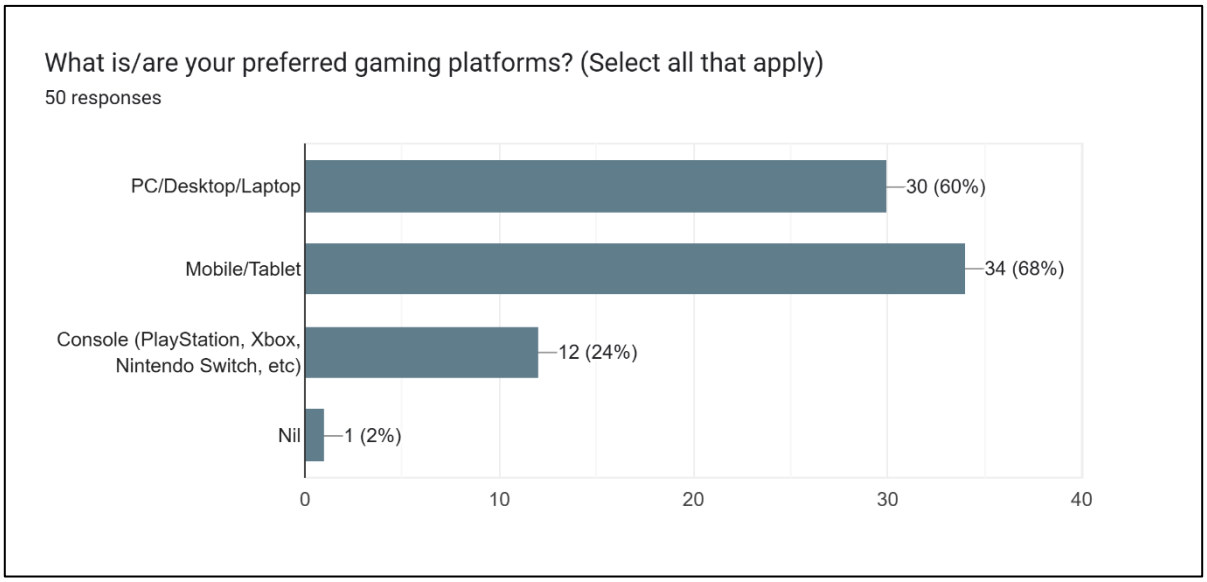


*Figure 3.23 Respondents' gaming platforms preference*

Figure 3.24 shows that a significant majority of respondents (66%) identify as 'Casual gamers,' indicating a strong preference for games that are easy to pick up and play, with a focus on relaxation and entertainment rather than intense competition. While a notable portion (32%) identify as 'Hybrid' gamers, suggesting a preference for games that offer a balance between relaxed gameplay and some level of competition. A smaller portion of respondents (2%) identify as 'Competitive gamers,' indicating a preference for games with a strong emphasis on challenge and skill-based gameplay.

The data indicates a strong preference for casual gameplay experiences among the target audience. Game development should prioritise and balance both entertainment and learning. While catering primarily to casual gamers, incorporating elements that appeal to those seeking a more competitive edge could broaden the game's appeal.

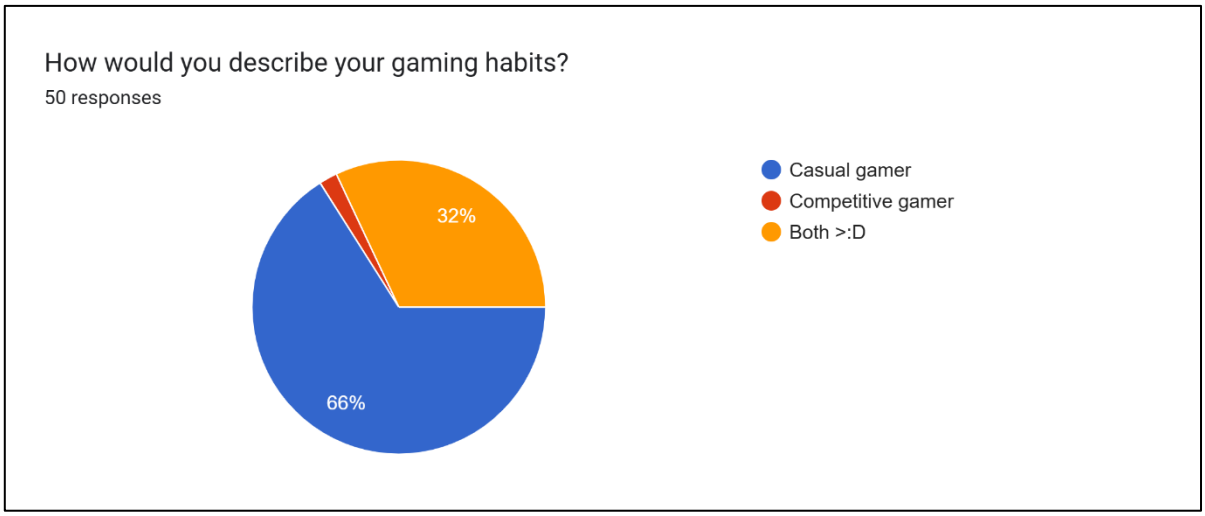


*Figure 3.24 Respondents' gaming habits*

Figure 3.25 shows respondents' favourite game genres. Action (56%), Adventure (60%), and Role-Playing Games (RPGs) (56%) are the most popular genres, indicating a strong preference for games with dynamic gameplay, immersive narratives, and character development. Simulation (46%) and Strategy (38%) genres also hold significant appeal, suggesting an interest in games that require strategic thinking, planning, and resource management. A considerable portion of respondents (28%) enjoy Visual Novels and Narrative-focused games, indicating an appreciation for strong storytelling and character-driven experiences. Puzzle and casual games (48%) and Sandbox and creative games (20%) also have a significant following, suggesting a preference for more relaxed and creative gameplay experiences. Genres like Sports and Racing (20%), Rhythm (16%), First-Person Shooter (4%), and Tower Defence (2%) have a smaller but dedicated following.

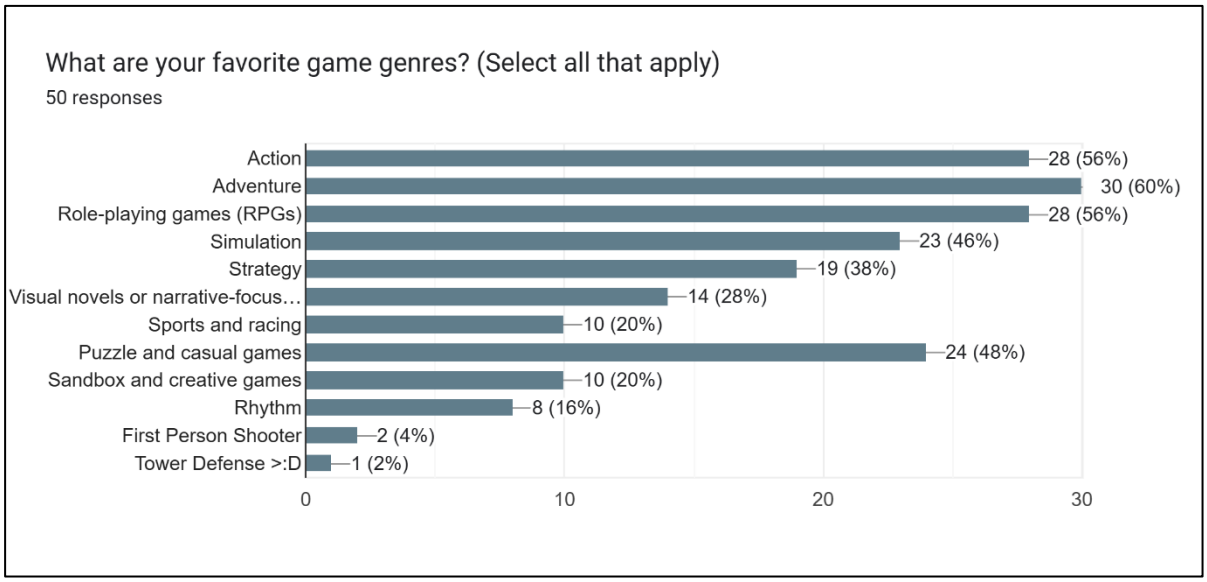


*Figure 3.25 Respondents' favourite game genres*

Figure 3.26 shows respondents' game feature preferences they enjoy the most. Most of them prefer 'Engaging gameplay and attractive design' (52%), followed by 'Storyline' at 26%, 'Graphics' at 18% and then 'Game difficulty' at 4%. This highlights the importance of creating a fun and immersive gameplay experience with visually appealing elements.

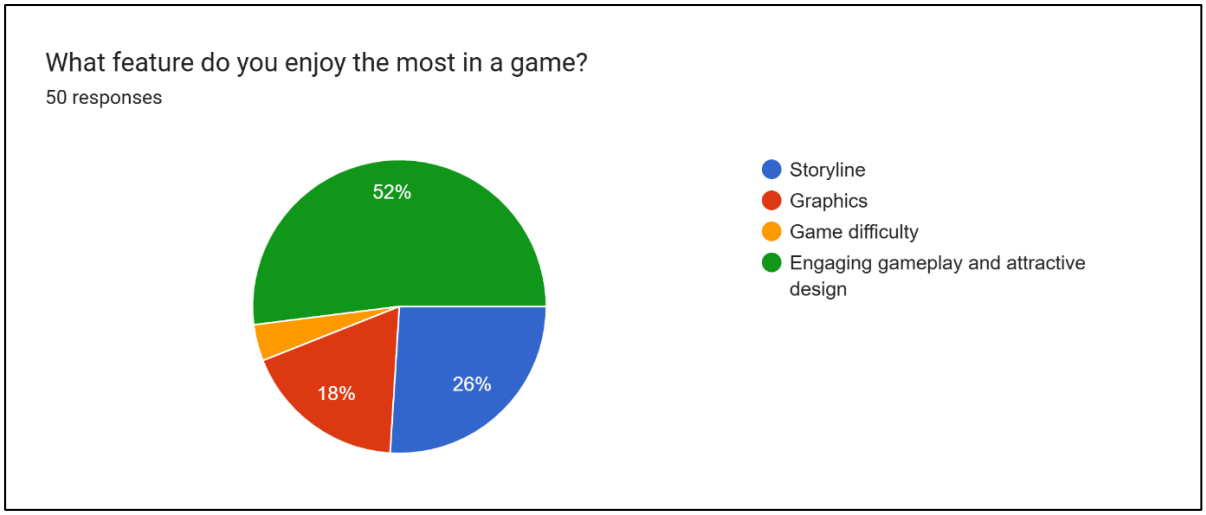


*Figure 3.26 Respondents' preferences for specific features within video games*

Figure 3.27 shows respondents' game aspects that keeps them engaged. Most of them prefer 'Progression and achievement' (38%), followed by 'Engaging puzzles and riddles' at 24%, 'Challenging gameplay' at 22% and then 'Multi-level and replayability' at 16%. This

suggests that player have a strong preference for games that provide a sense of progression and accomplishment while motivated by intellectual challenges with a desire for games that offer variety and long-term engagement.

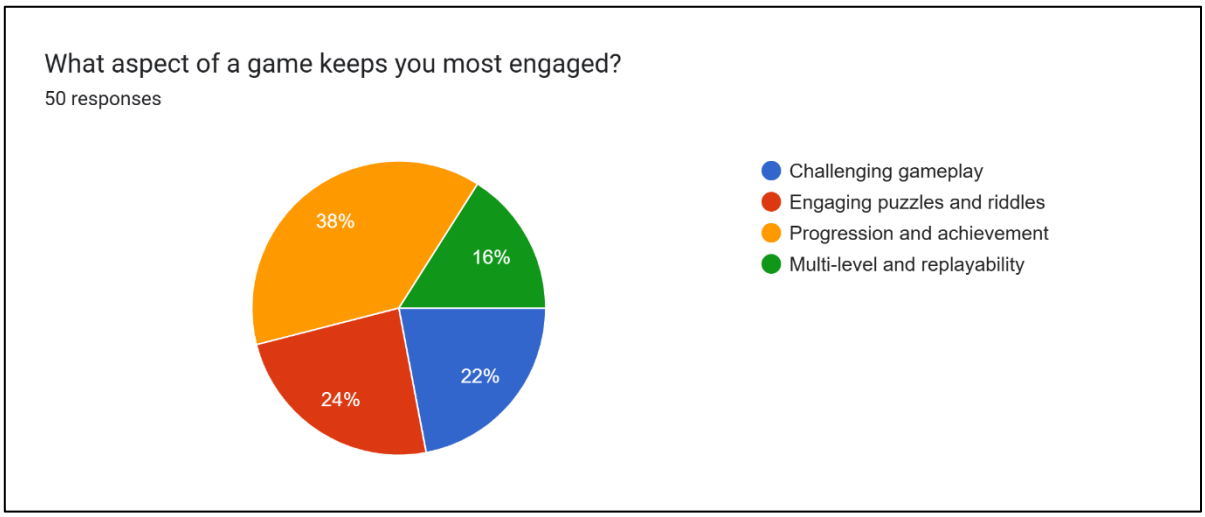


*Figure 3.27 Aspect identified by respondents as contributing to their engagement in video games*

**Section 5: Herbal Awareness through Gaming**

Figure 3.28 illustrates a significant majority (90%) of respondents are not aware of any existing games that promote herbal awareness. This suggests that there is a limited presence of such games in the current market. The low awareness of existing games that promote herbal awareness presents a significant opportunity for the development of innovative and engaging games that can educate and entertain players while raising awareness about the benefits and uses of traditional herbal medicine.

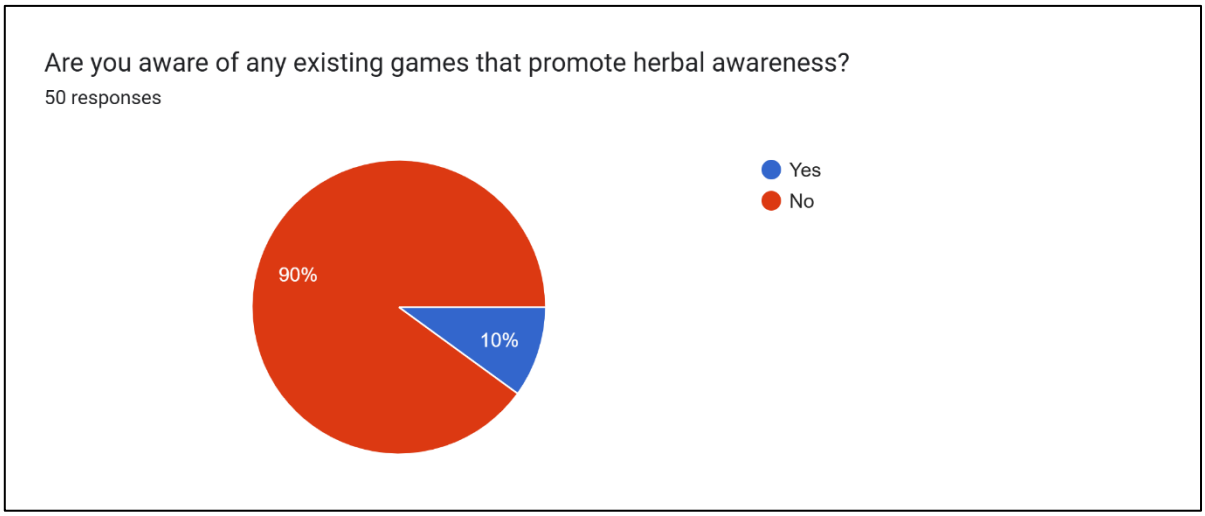


*Figure 3.28 Respondents' awareness of existing games that promote herbal awareness*

Figure 3.29 illustrates a significant majority (86%) of respondents expressed interest in playing a casual simulation game whereas only 14% of respondents indicated they would not be interested in playing a casual simulation game. While figure 3.25 indicates that action, adventure and RPGs are highly favoured genres, this data also reveals a strong interest in casual simulation games. This presents a strong opportunity for developers to create engaging casual simulation games that cater to the interests of this audience.

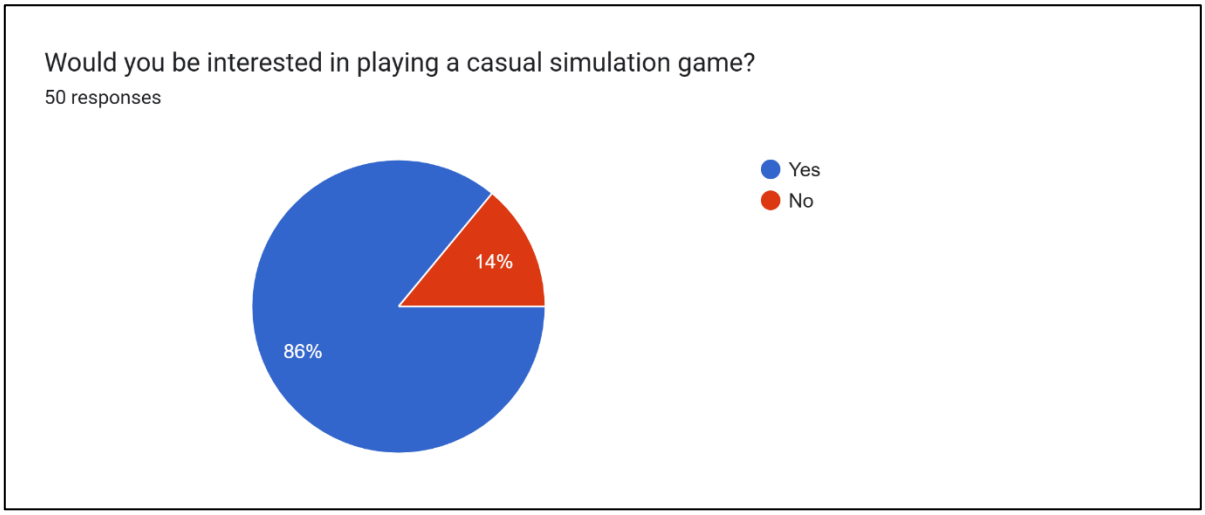


*Figure 3.29 Respondents' interest in playing casual simulation game*

Figure 3.30 shows ‘A variety of symptoms and conditions that require different teas and herbal combinations’ (66%) is the most desired feature, followed by ‘Real-life tea recipes inspired by Traditional Chinese Herbal Medicine’ at 60%, ‘Visuals of tea preparation’ at 56%, ‘A progression system where you unlock new herbs and recipes as you advance’ at 52%, ‘Time-based challenges’ at 44%, ‘Mini-games or challenges within the main gameplay’ at 34% and ‘A system to measure effectiveness of the teas based on customer satisfaction’ at 24%.

‘A variety of symptoms and conditions’ is the most desired feature, indicating a preference for realistic and challenging scenarios. Features like real-life tea recipes contributes authentic experience. Visual appeal, particularly animations of tea preparation, is also highly valued. A progression system can enhance engagement. By incorporating these elements, developers can create engaging and educational games that resonate with players' preferences.

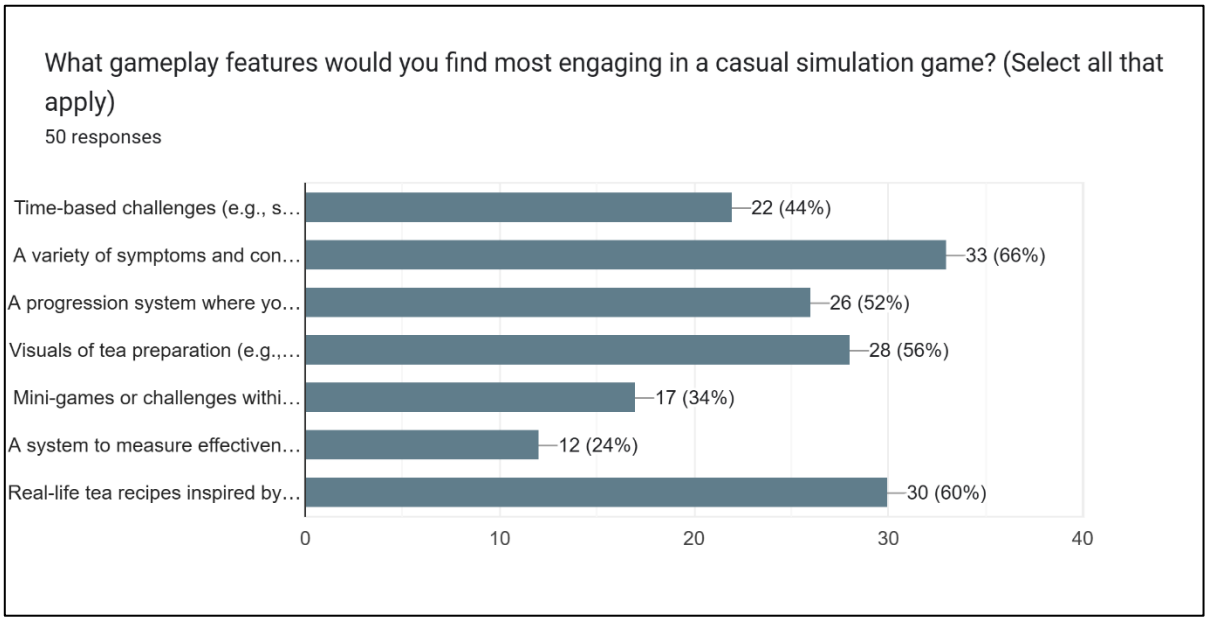


*Figure 3.30 Respondents' preferred gameplay features for casual simulation games*

Figure 3.31 shows that ‘Pop-up facts and tips about history, herbal remedies, and symptoms management of TCM’ (70%) is highly desired educational features, followed by ‘Tutorials that teach you how to mix herbs for different health conditions’ (62%), ‘Instant results

or customer feedback within the game that helps me understand if I've used the correct herbs and remedies' (52%), 'A journal or in-game encyclopaedia with information about herbs and their properties.' (48%), 'Engaging challenges or quizzes that assess my knowledge about teas and herbs' function' (40%) and 'Real-life TCM information, such as the history and cultural significance of certain herbs' (36%).

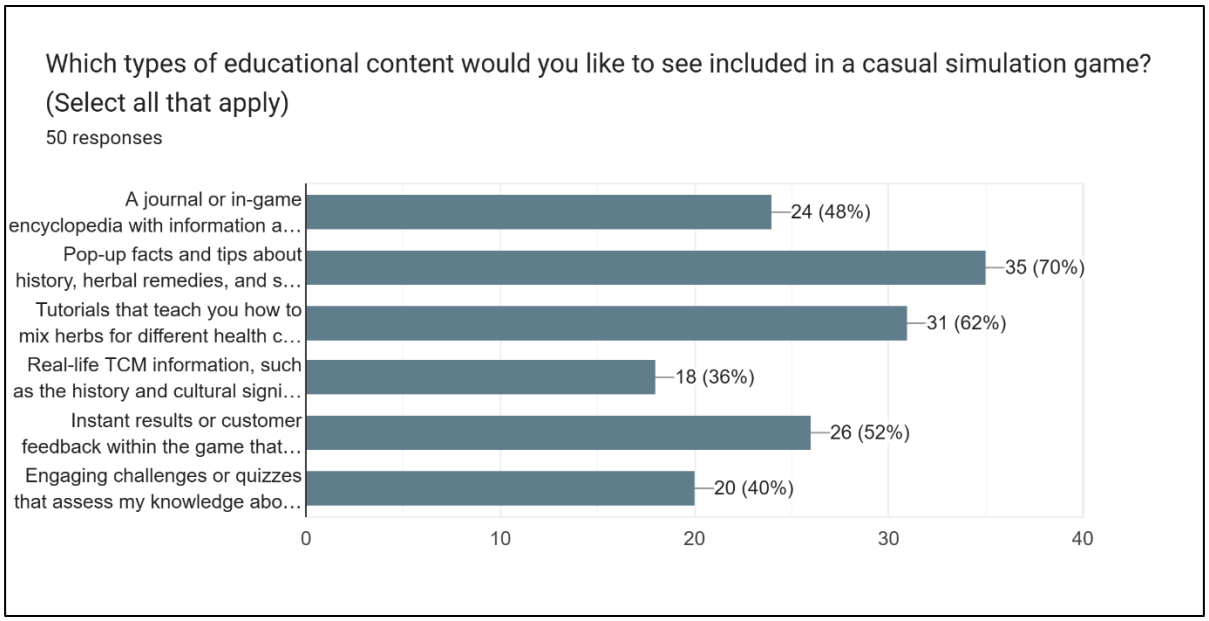


*Figure 3.31 Types of educational content preferred by respondents for inclusion in casual simulation games*

Figure 3.32 illustrates that all respondents believe that game could help raise public awareness about Traditional Chinese Herbal Medicine. By creating engaging and educational games, developers can leverage the power of gaming to promote a better understanding and appreciation about TCM.

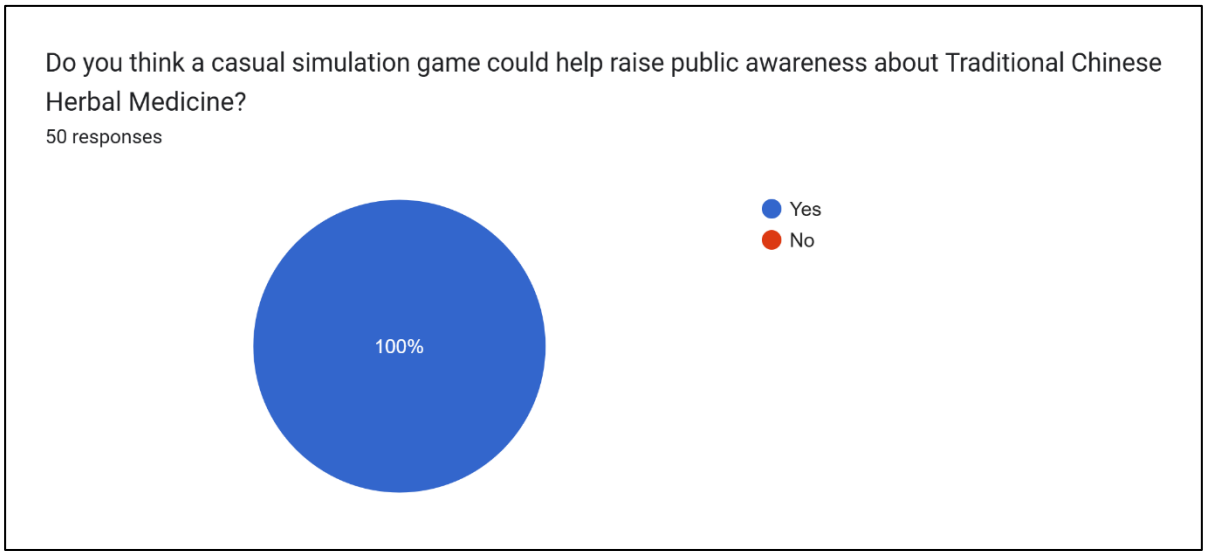


*Figure 3.32 Respondents' perceptions regarding the potential of casual simulation games to raise public awareness about Traditional Chinese Herbal Medicine.*

A game about Traditional Chinese Herbal Medicine can effectively raise public awareness by providing an engaging, interactive, and fun learning experience. Games captivate audiences, especially the younger generation, by making education entertaining and memorable. As shown in Figure 3.33, respondents believe games can effectively raise public awareness about Traditional Chinese Herbal Medicine due to their interactive nature, accessibility, and ability to engage players. Through gameplay, players can explore herbs, learn about their medicinal properties, benefits, and uses, and understand their cultural significance. By incorporating educational elements and presenting information in an engaging way, games can spark curiosity, encourage deeper exploration, and ensure the preservation and appreciation of Traditional Chinese Herbal Medicine among modern audiences, making learning both fun and memorable.

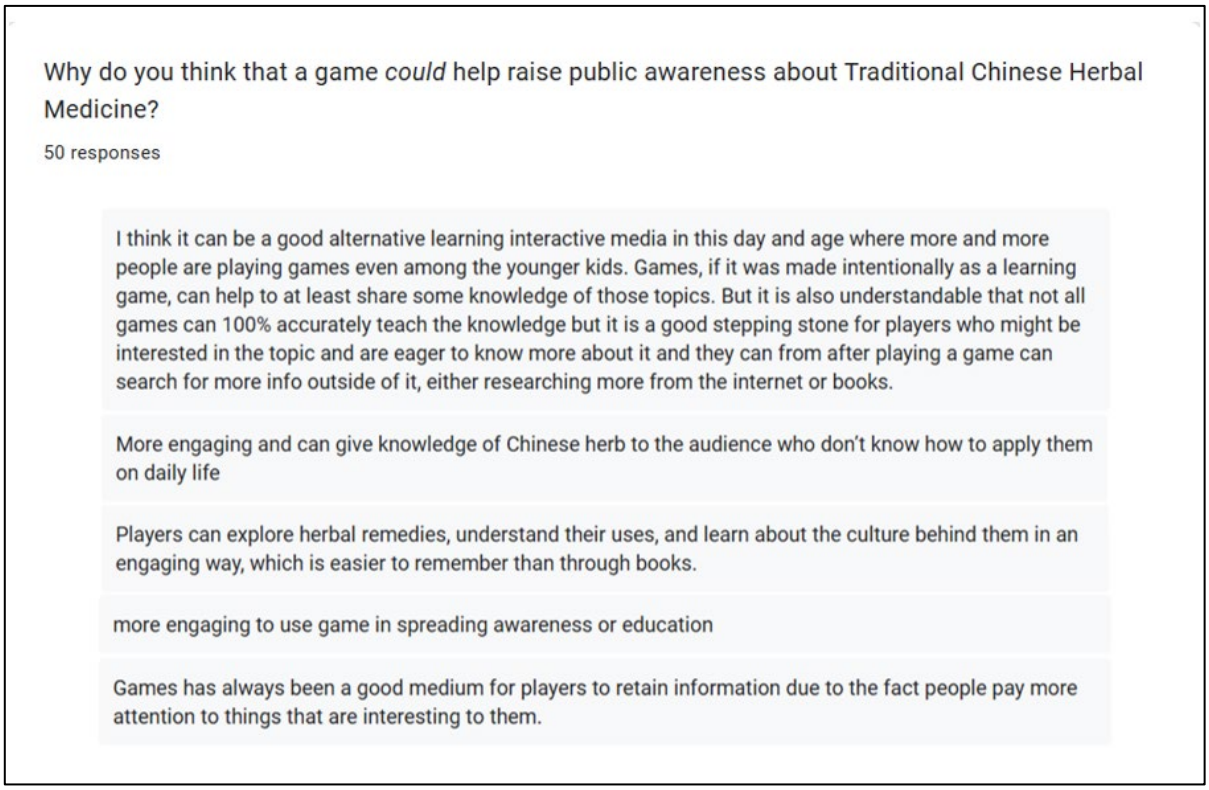


*Figure 3.33 Respondents' opinion on game could help to raise public awareness about Traditional Chinese Herbal Medicine*

While games can be engaging, respondents expressed concerns that they might not effectively raise public awareness about Traditional Chinese Herbal Medicine due to several limitations. As shown in Figure 3.34, the opinions of the respondents highlight various factors that could limit the effectiveness of such games. These include accessibility issues, as not everyone has the required platform to play, and the risk of oversimplifying complex information, which could lead to inaccuracies or misunderstandings. Players might prioritise entertainment over education, overlook important details, or distrust the authenticity of the information provided. Ensuring the game engages the right audience, maintains accuracy in its representation of TCM, and is accessible to a wide range of players are crucial for maximising its educational impact. Additionally, the game design should encourage players to absorb and retain information beyond what is strictly necessary for gameplay. Furthermore, targeting the

wrong audience or creating a game that is too simple, overly complex, or not visually or thematically appealing could diminish its effectiveness in raising awareness.

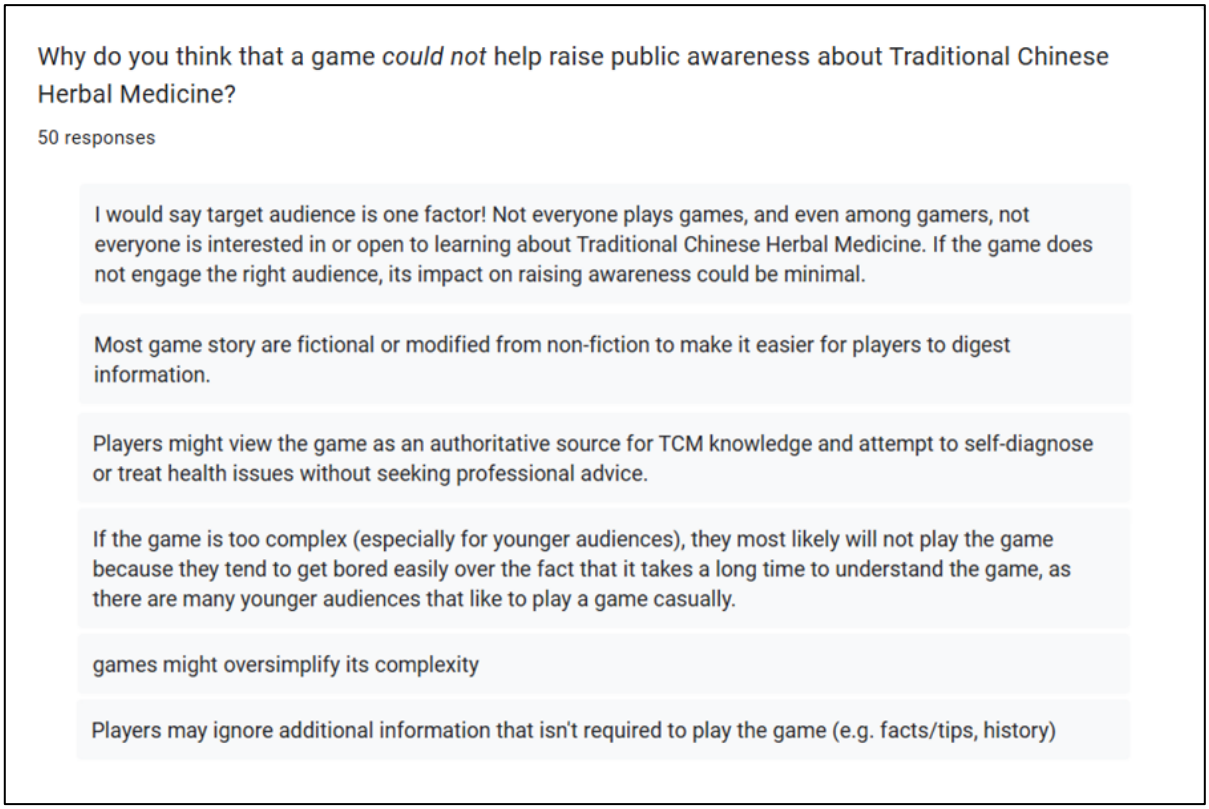


*Figure 3.34 Respondents' opinion on game could not help to raise public awareness about Traditional Chinese Herbal Medicine*

### 3.2.1.2 Functional Requirements

Functional requirements define the essential features and components necessary for the prototype to achieve its intended purpose and project objectives (AltexSoft, 2022). These requirements will be further refined by incorporating insights from user surveys, reflecting the preferences and opinions of the respondents. The following are the functional requirements of the prototype:

1. The game must have a title screen where the player can choose to begin the gameplay, adjust settings, view credits and exit the game.
2. The game must allow player to point, click and drag to interact with the ingredients.

3. The game must present visual elements and information of the tea or herbs.

#### 3.2.1.3 Non-functional Requirements

Non-functional requirements are equivalent to the quality attributes of a system (AltexSoft, 2022). These quality attributes outline the criteria by which the system will be assessed. Additionally, non-functional requirements can enhance the overall gameplay experience. The requirements are as follows:

1. User interface must be compatible with screen resolution.
2. The game controls must be easy to play on PC.
3. The game should respond to user input and actions within a specified time frame to ensure a smooth and immersive experience.
4. The user interface should be intuitive, responsive, and easy to navigate.

#### 3.2.1.4 Software Requirements Specification

Table 3.2 outlines the software requirements for the developer's laptop, used for developing and deploying PC game prototype.

*Table 3.2 Software Requirements Specification*

| **Software** | **Requirement** | **Description** |
|---|---|---|
| Operating system | Windows 10 Home Single Language | Window 10 for personal computers with specific language preference. |
| Game engine | Unity | Software for game development. |
| Scripting language | C# | Programming language the prototype will be developed in. |
| Audio software | Audacity | Free, open-source audio editing software for recording, editing, and enhancing audio tracks. |

#### 3.2.1.5 Hardware Requirements Specification

Table 3.3 outlines the hardware specifications for the developer's laptop, an Acer Nitro 5, used for developing and deploying PC game prototype.

*Table 3.3 Hardware Requirements Specification*

| **Hardware** | **Requirement** | **Description** |
|---|---|---|
| Processor | Intel(R) Core(TM) i5-11400H @ 2.70GHz | A 6 core CPU designed for laptops, suitable for gaming and productivity tasks. |
| Storage | 500GB | The storage capacity of the device for storing data and applications. |
| Graphics card | NVIDIA GeForce RTX 3060 | A dedicated graphics card for gaming and graphic-intensive applications, providing enhanced visual performance. |
| Random Access Memory (RAM) | 8GB | The system's random-access memory, contributing to overall performance and multitasking capabilities. |

### 3.2.2 Phase 2: Development

The development phase represents the actual sprint in which development work is executed and completed. During this phase, all assets are designed and gathered. The assets include 2D art, sprites, objects, soundtracks, and any other game-related assets. A storyboard is also created for a graphical representation of the game prior to coding the game.

After designing, a prototype of the game is then developed. Once the prototype is finished, the full game development process begins. The prototype and the game are created using Unity Engine. Unity is a real-time 3D development platform and game engine that allows users to create interactive experiences for multiple platforms (*Real-Time 3D Development*

*Platform & Editor| Unity*, n.d.). The game engine supports the use of multiple scripting languages aside from its primary coding language, C#, such as C/C++, Rust, IronPython, Lua, Javascript and Java (Evans, 2023). This allows developers to build games for multiple platforms.

After the game is completed, it is tested internally to identify any bugs or problems. The developer will be responsible for all in-house testing. The purpose of in-house testing is to verify and evaluate the game's logical flow using the Unified Modelling Language (UML) diagrams. Furthermore, in-house testing determines the game's visual and performance on each hardware specification that the developer uses. The game will be the finished product at the end of the development phase.

#### 3.2.2.1 Activity Diagram

An activity diagram is a type of UML diagram that depicts the sequence of activities or actions within a system or process. It focusses on the sequence of activities and their relationships, giving a dynamic picture of the system's behaviour.

As illustrated in Figure 3.35 below, the activity diagram shows the step and flow of the proposed game, Herbal Madness. The player begins by entering the title screen. At the title screen, the player can select ‘Start Game’ to start the gameplay, ‘Settings’ to adjust settings, ‘Credits’ to view credits and ‘Quit Game’ to close the game. During the gameplay, the player can adjust the sound volume from the ‘Settings’.

Selecting ‘Start Game’ begins the gameplay. The player will then interact with an NPC to understand their symptoms through dialogue prompts. Based on the information gathered, the player will select Chinese herbs to create an herbal drink. The chosen herbs will determine the NPC’s satisfaction. Once the drink is prepared and served, the NPC’s reaction will vary depending on how well the herbs address their symptoms—expressing happiness if the selection is correct or showing dissatisfaction and providing feedback if the drink is ineffective.

The interaction with the NPC and the drink creation loop will continue until it is completed. Once the player finishes the game, the total score will be displayed, marking the game's completion.

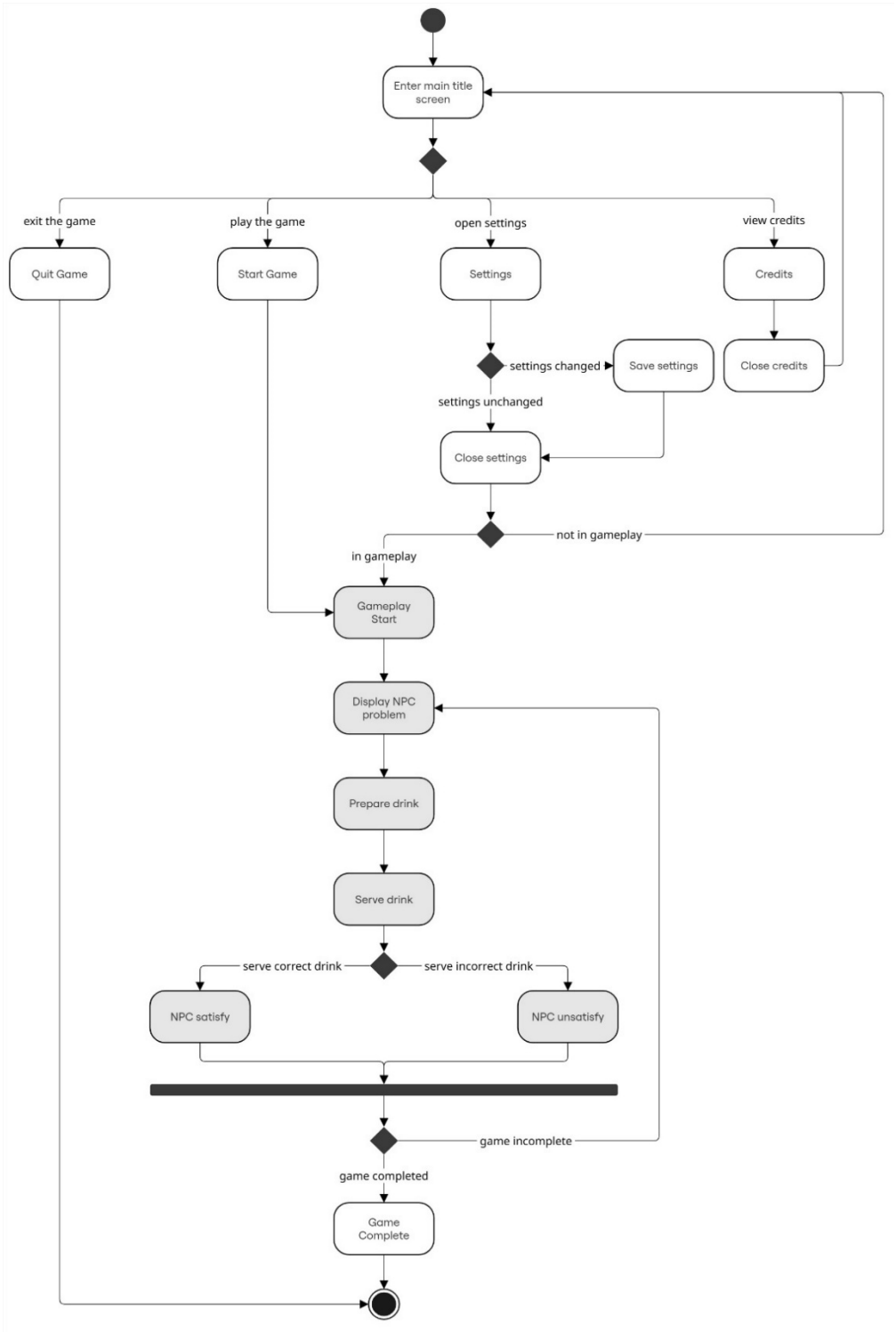


*Figure 3.35 Activity diagram*

### 3.2.2.2 Use case diagram

A use case diagram is a behavioural diagram in the UML that shows how player (called actor) interacts with a system to achieve specific goals. Figure 3.36 shows the use case diagram for Herbal Madness.

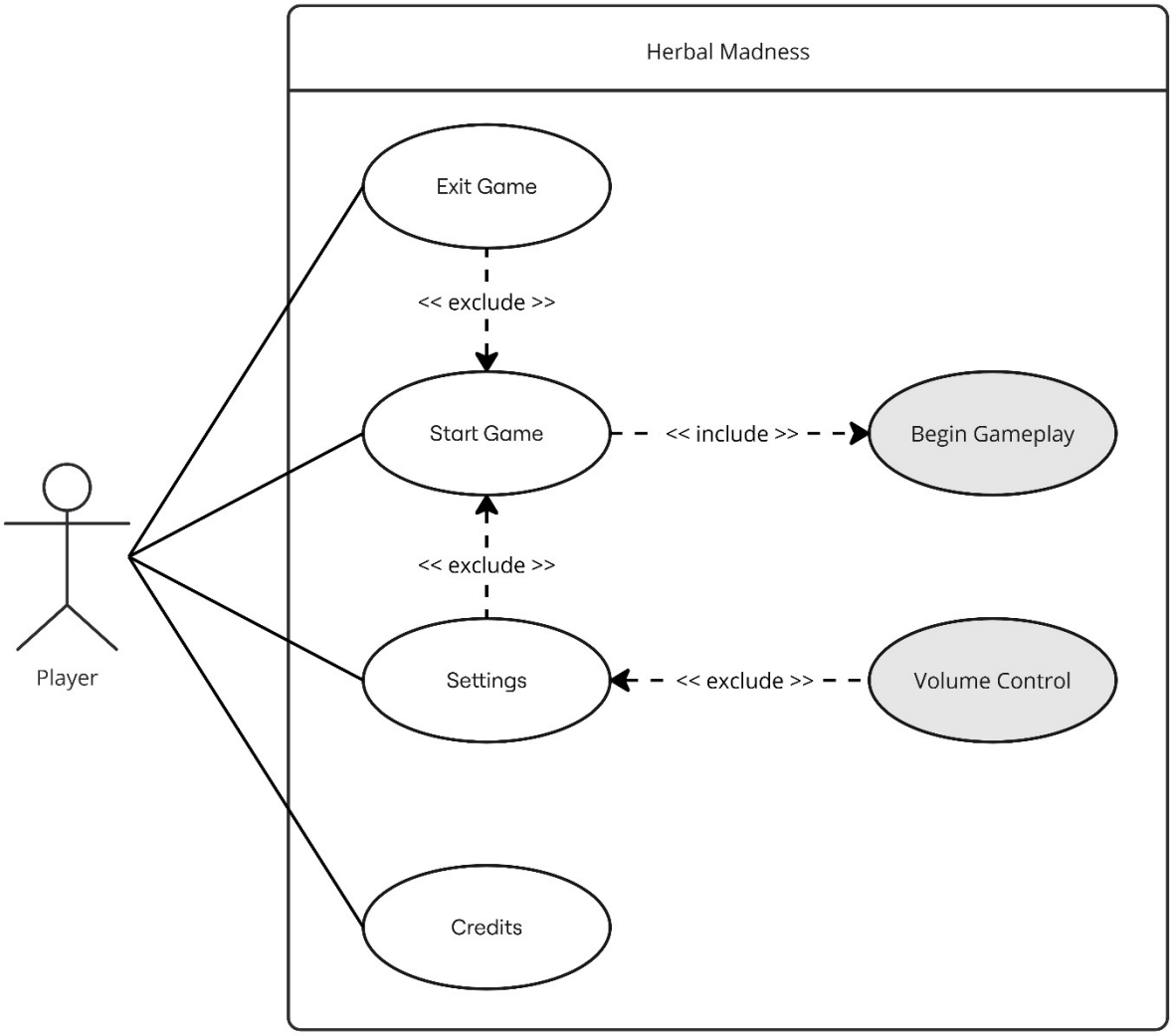


*Figure 3.36 Use case diagram*

When the game is executed, the main title screen will load. The player has four options to choose from: 'Start Game' will begin the gameplay, 'Credits' will display information regarding on the developer and necessary credits to be made in accordance with copyright or software licences, 'Settings' contains volume control of music and sound to adjust and 'Exit

Game' will close the game. At any point during the gameplay, player may pause the gameplay to adjust the settings or exit the gameplay.

#### 3.2.2.3 Use case description

This section shows the use case description of each use cases illustrated in the use case diagram (Figure 3.36).

*Table 3.4 Start Game use case description*

| | |
|---|---|
| Use case name | Start Game |
| Short description | The player starts the game. |
| Actor | Player |
| Pre-condition(s) | None |
| Post-condition(s) | The player can start the gameplay. |
| Main flow | 1. The player selects 'Start Game' at the title screen. |
| Alternative flow | None |
| Exception flow | None |

*Table 3.5 Begin Gameplay use case description*

| Use case name | Begin Gameplay |
|---|---|
| Short description | The player starts the gameplay. |
| Actor | Player |
| Pre-condition(s) | The player must start the game. |
| Post-condition(s) | Ending scene is shown. |
| Main flow | 1. The NPC describe their symptoms through dialogue.<br>2. The player must prepare and serve the correct drinks based on NPC's condition and recipes.<br>3. The total score shown, marking the game completion. |
| Alternative flow | 1. The player quits the game. |
| Exception flow | None |

*Table 3.6 Credits use case description*

| Use case name | Credits |
|---|---|
| Short description | The player views the list of credits who contributed to the game. |
| Actor | Player |
| Pre-condition(s) | None |
| Post-condition(s) | The player can see list of credits. |
| Main flow | 1. The player selects 'Credits' at the title screen. |
| Alternative flow | None |
| Exception flow | None |

*Table 3.7 Settings use case description*

| Use case name | Settings |
|---|---|
| Short description | The player opens settings panel. |
| Actor | Player |
| Pre-condition(s) | None |
| Post-condition(s) | The player views the settings panel. |
| Main flow | 1. The player clicks ‘Settings’ at the title screen. |
| Alternative flow | None |
| Exception flow | None |

*Table 3.8 Volume Control use case description*

| Use case name | Volume Control |
|---|---|
| Short description | The player adjusts sound volume in the settings panel. |
| Actor | Player |
| Pre-condition(s) | ‘Settings’ panel is opened. |
| Post-condition(s) | Update modified settings. |
| Main flow | 1. The player adjusts the sound volume accordingly.<br>2. The game will update modified sound volume. |
| Alternative flow | None |
| Exception flow | None |

*Table 3.9 Exit Game use case description*

| Use case name | Exit Game |
|---|---|
| Short description | The player quits the game. |
| Actor | Player |
| Pre-condition(s) | None |
| Post-condition(s) | The game closes. |
| Main flow | 1. The player clicks ‘Exit Game’ at the title screen. |
| Alternative flow | None |
| Exception flow | None |

**3.2.2.4 Sequence diagram**

A sequence diagram illustrates the interactions between different objects within a system over time. It provides a dynamic view of a system's behaviour by showing the sequence of messages exchanged between objects in response to a use case.

Figure 3.37 shows the sequence diagram for ‘Start Game’, ‘Credits’, ‘Settings’ and ‘Exit Game’ at the title screen.

When the player launches the game, the title screen is displayed, serving as the main menu where different options are available. If the player selects “Start Game,” the game transitions into the actual gameplay, loading necessary assets and initiating the first scene, such as a cutscene or an introductory sequence. This marks the beginning of the player's interaction with the game world.

If the player selects “Settings,” the game loads the settings menu, allowing the player to adjust various configurations such as audio. After making modifications, the player confirms the changes, and the system saves the updated settings before returning to the previous menu.

When choosing “Credits,” the game loads a menu displaying acknowledgments for developers, contributors, and other relevant parties involved in the game's creation. The player can view this information before returning to the main menu.

If the player selects “Exit,” the game initiates the closing sequence, shutting down the application and returning the player to their device’s operating system. This process ensures a smooth exit from the game.

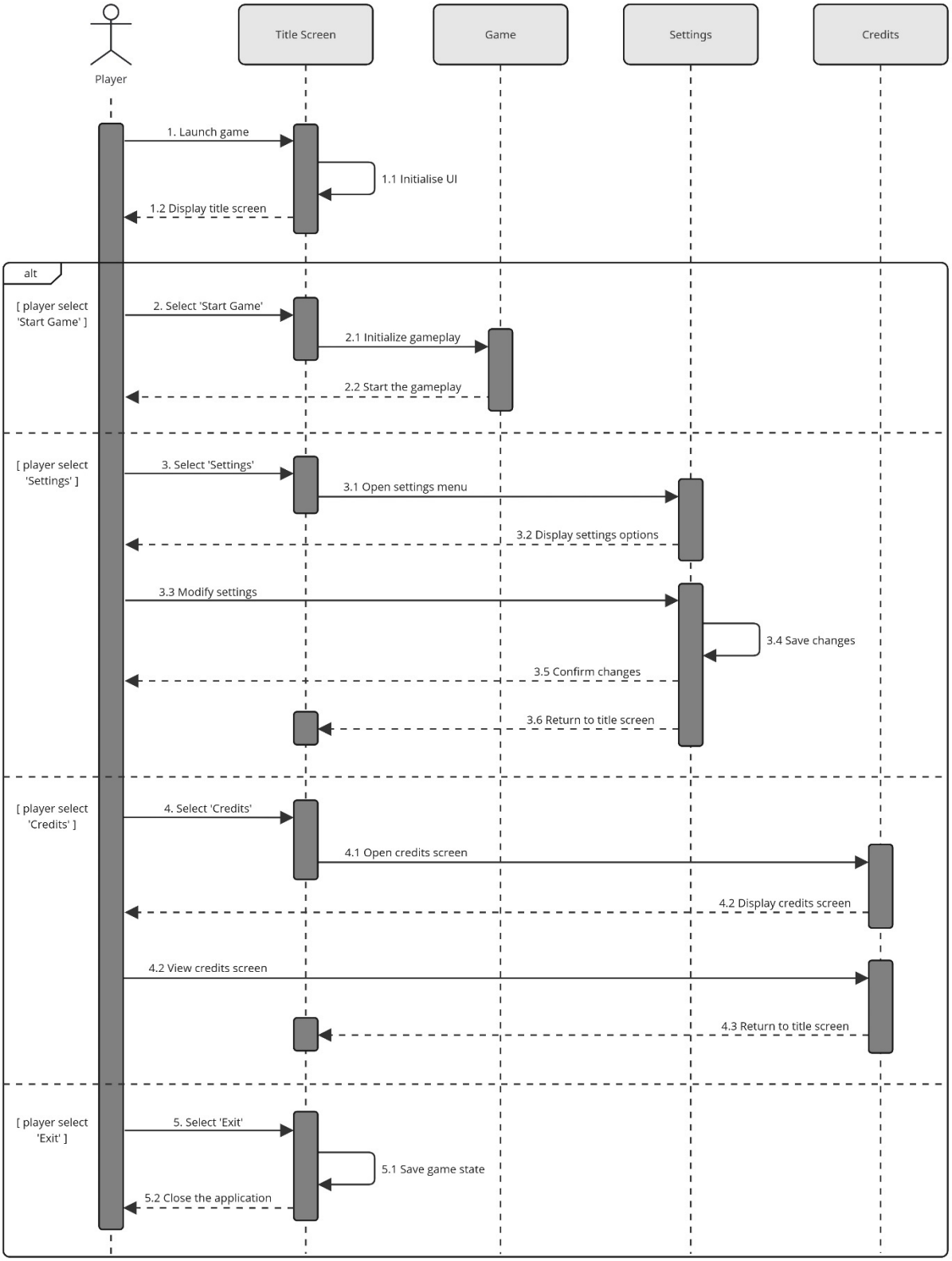


*Figure 3.37 Sequence diagram at the title screen*

Figure 3.38 shows the sequence diagram for the gameplay. The game maintains a database of correct tea remedy recipes, ensuring that each NPC's health condition corresponds to a specific herbal tea solution. When an NPC appears, the game system prompts the player with the NPC's health condition, guiding them to determine the appropriate herbs. The player then selects and adds herbs one at a time into the cup, gradually creating the herbal mixture. Throughout the process, the game continuously updates the player on the status of the tea mixture, providing feedback on the ingredients added. Once the tea is fully prepared, the game notifies the player that it is ready to be served. The player then serves the tea to the NPC, who drinks it while the game system compares the player's chosen recipe with the correct remedy stored earlier. Based on the accuracy of the herbal selection, the NPC reacts with satisfaction if the remedy is correct or displays dissatisfaction if it is incorrect. The game then provides feedback, indicating how well the player's recipe matched the optimal solution.

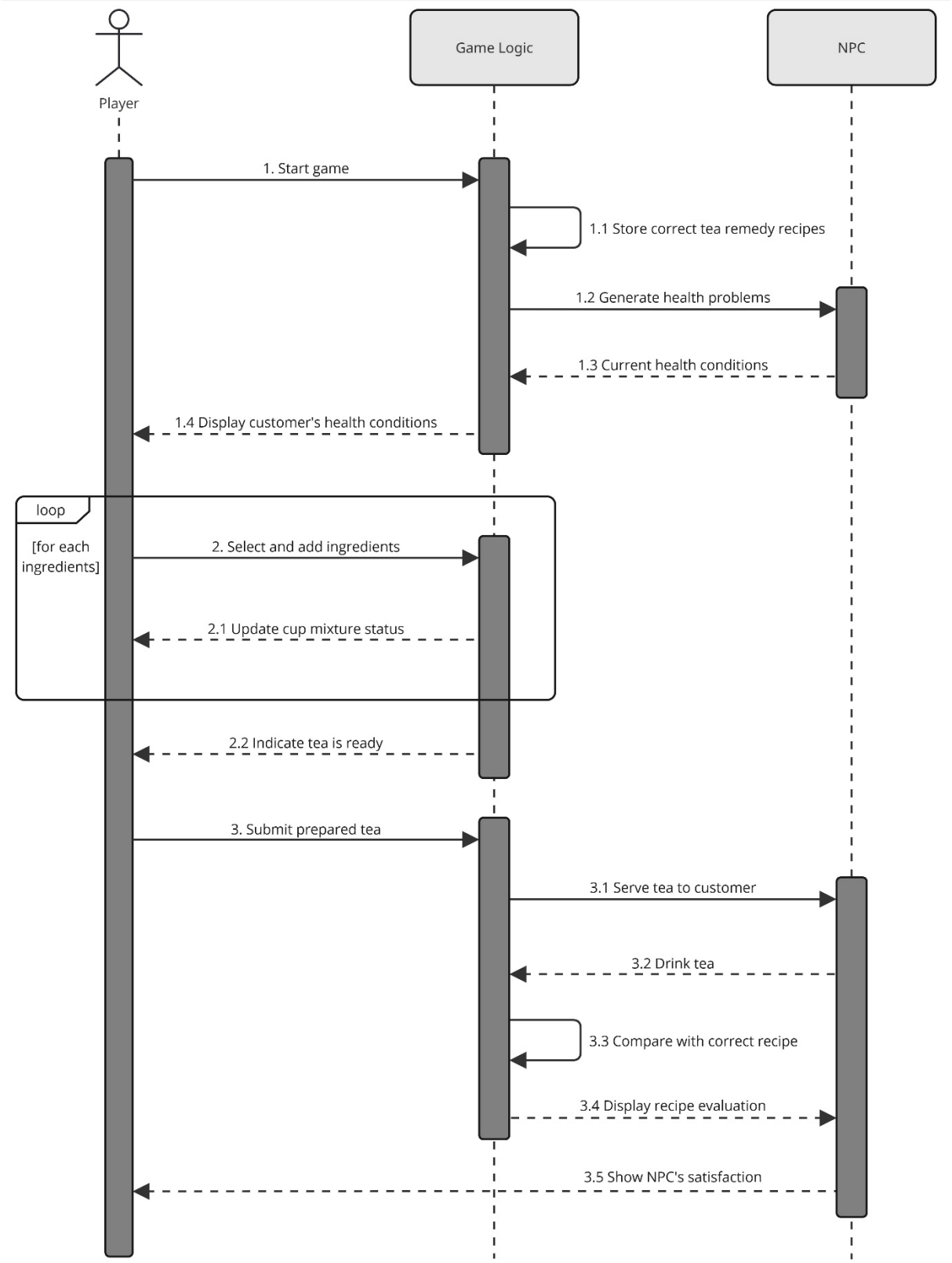


*Figure 3.38 Sequence diagram for the gameplay*

#### 3.2.2.5 Class diagram

A class diagram provides a visual representation of the structure and relationships among classes in a system. It serves as a blueprint for the system's objects, their attributes, methods, and associations. Figure 3.39 shows 10 classes.

The game provides options such as viewing credits, modifying settings, exiting the game, or starting gameplay. When the Gameplay class is initiated, the NPC class generates a character who presents their health concern through a dialogue system. The Player class interacts with the Cup class, selecting and combining ingredients into the object. The Gameplay system then compares the player's drink with predefined tea recipes stored in the Tea Recipe class to determine if the correct ingredients were used. Based on this evaluation, the NPC class responds with feedback from the system, influencing the player’s performance and progression.

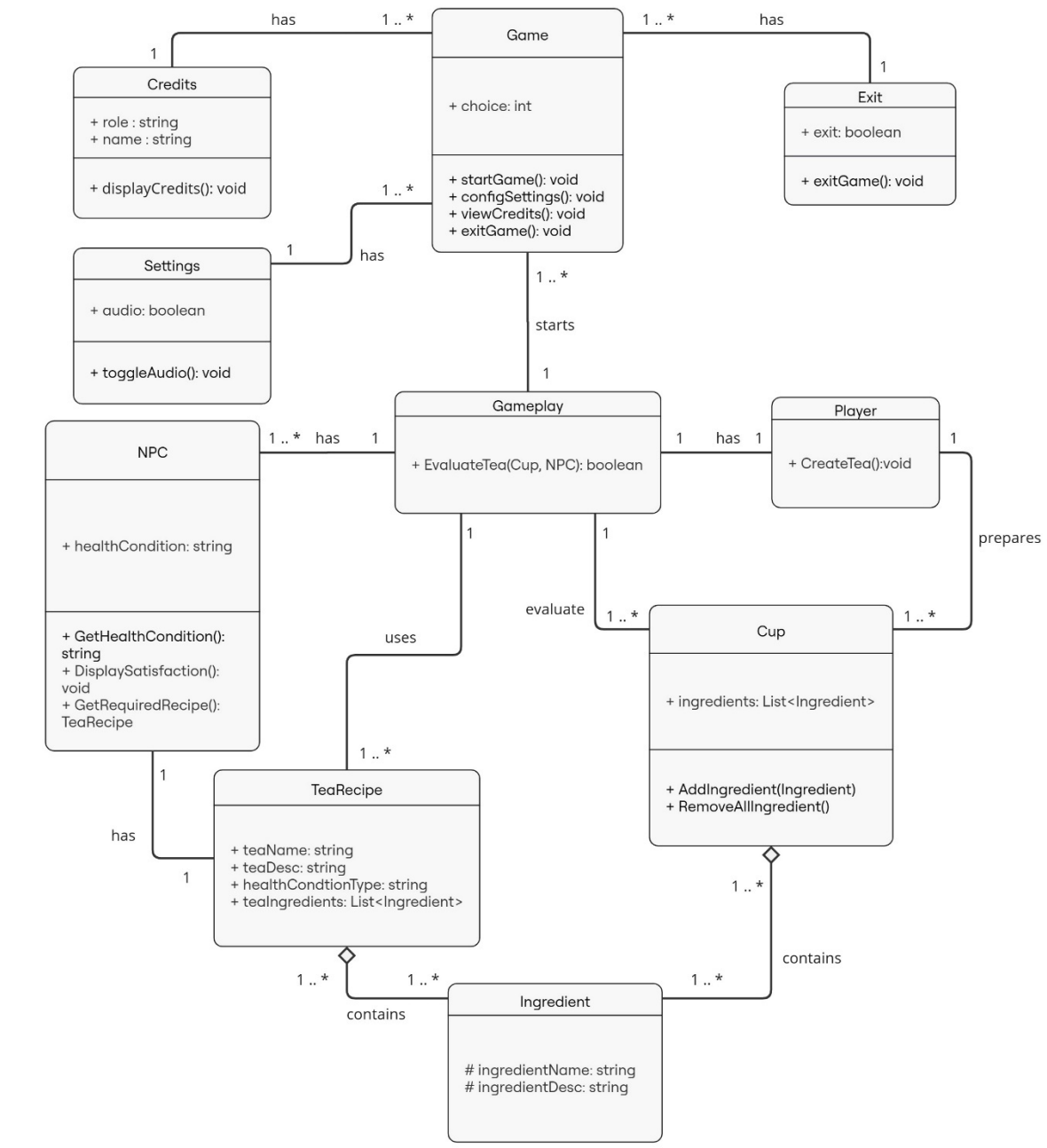


*Figure 3.39 Class diagram*

### 3.2.2.6 Storyboard

Figure 3.40 illustrates the Title Screen of the proposed game. It will feature the game's main theme art and presents a user interface with buttons for ‘Start Game’, ‘Settings’, ‘Credits’, and ‘Quit’, allowing players to navigate to different game functions or exit the game.

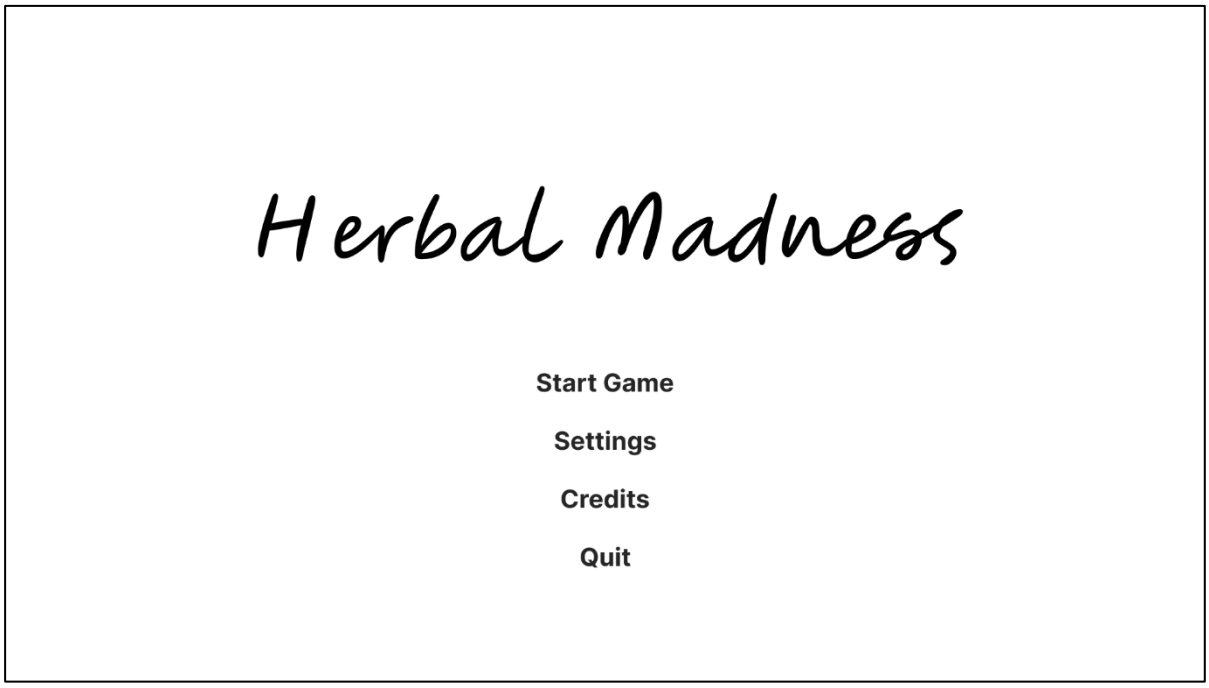


*Figure 3.40 Title screen*

Figure 3.41 displays the Settings Screen, where players can adjust game volume and save their preferences.

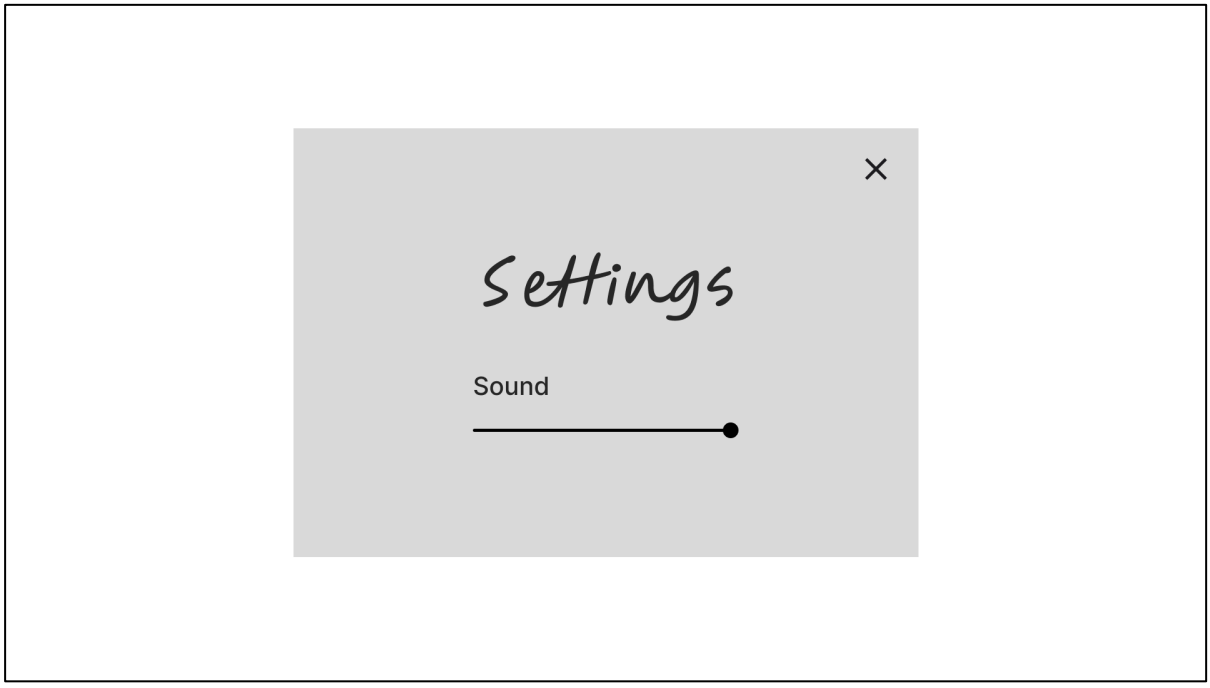


*Figure 3.41 Settings screen*

Figure 3.42 shows the Credits Screen, where players can view a list of contributors and their roles in the development of the game.

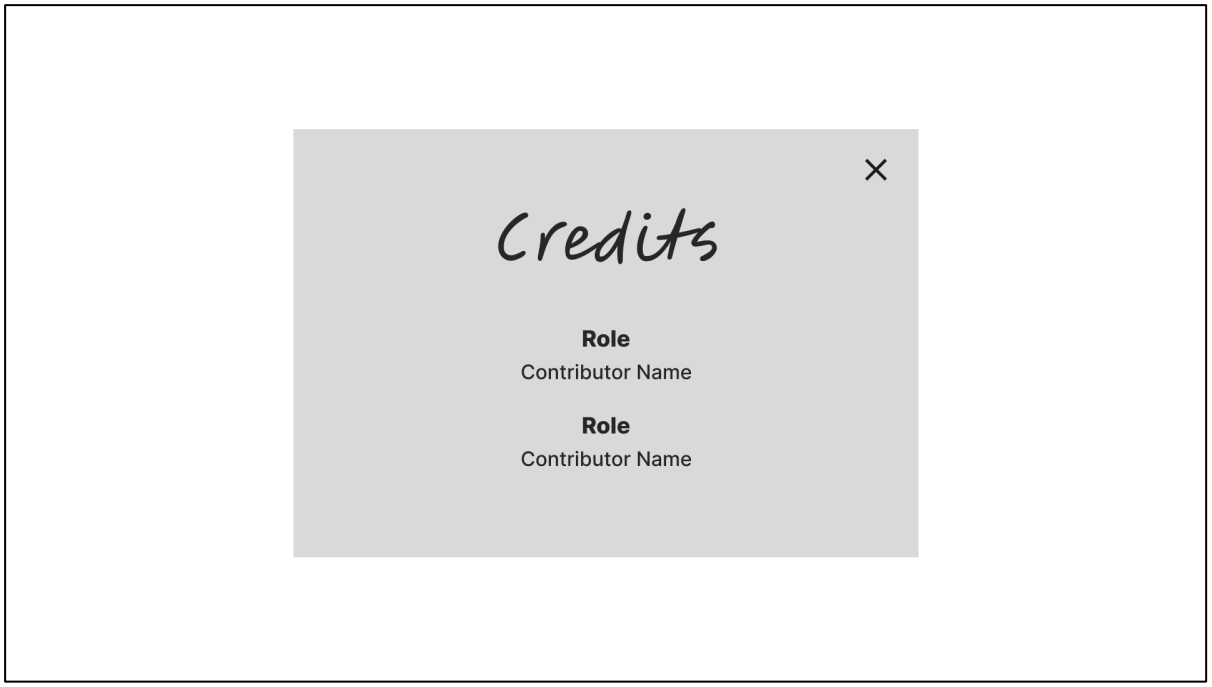


*Figure 3.42 Credits screen*

Figure 3.43 illustrates NPC dialogues that challenge players to identify appropriate drinks based on described symptoms.

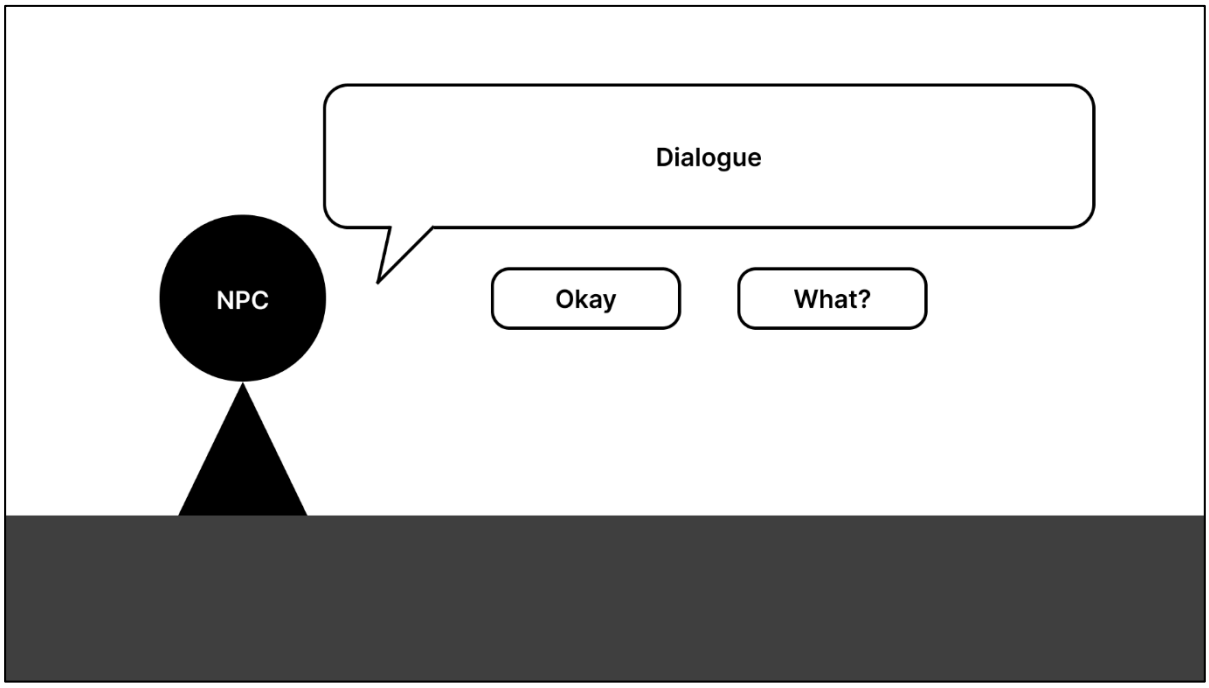


*Figure 3.43 NPC dialogue interface*

Figure 3.44 depicts the kitchen, where the player crafts a herbal drink remedy after identifying the NPC's described symptoms.

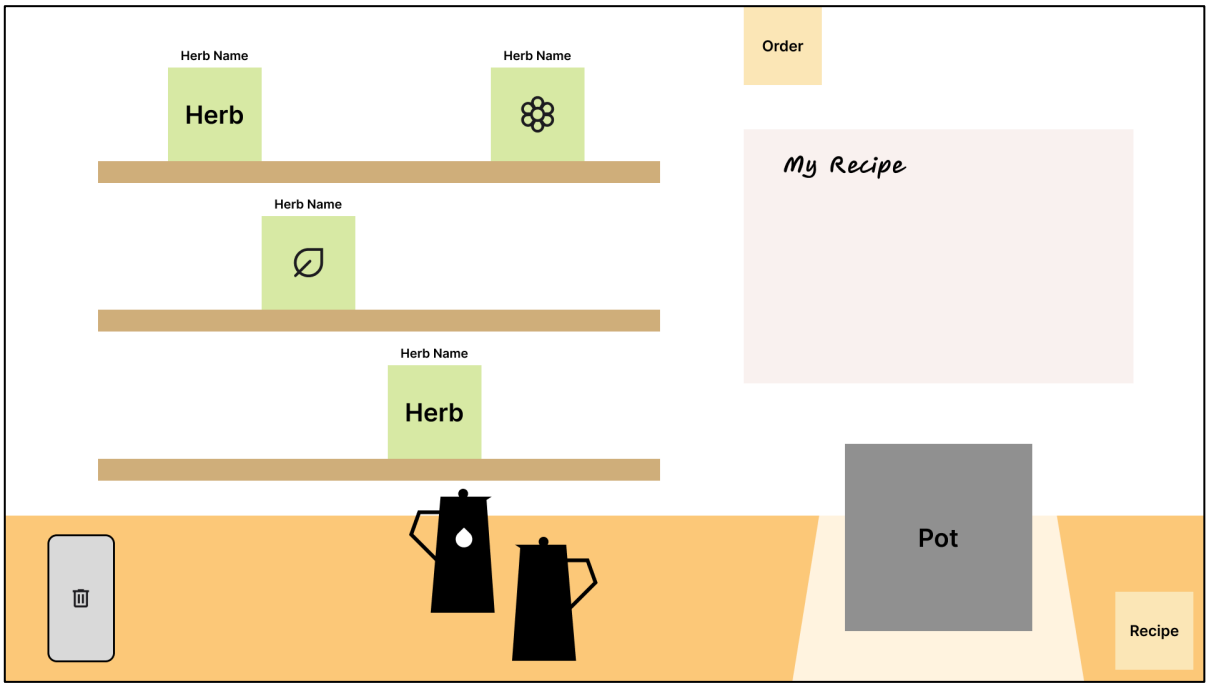


*Figure 3.44 The kitchen where player craft the drinks*

Figure 3.45 showcases the recipe book, allowing the player to look up remedies for NPCs' health concerns and learn about various herbs.


*Figure 3.45 Book recipe*

Figure 3.46 highlights the core gameplay mechanic, which involves selecting the correct herbs to craft a suitable tea remedy based on the NPC’s symptoms.

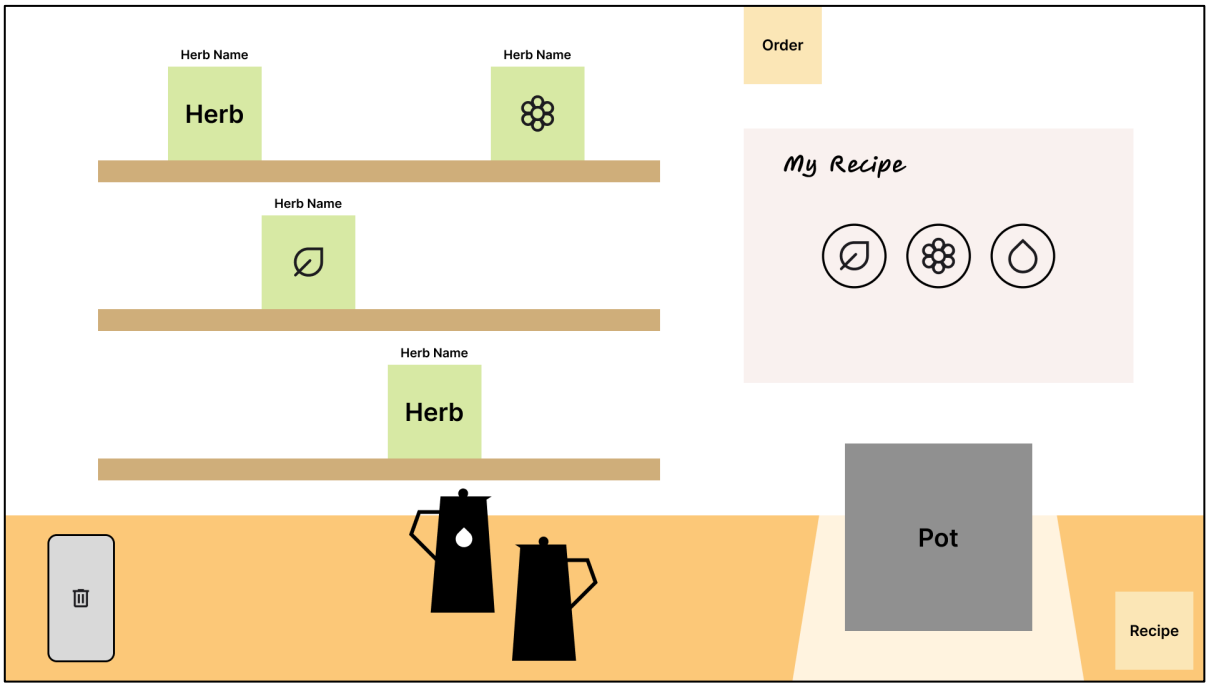


*Figure 3.46 Core gameplay mechanic interface*

Figure 3.47 illustrates the interface when the player successfully serves the correct drink to an NPC, accurately addressing their symptoms and health concerns.

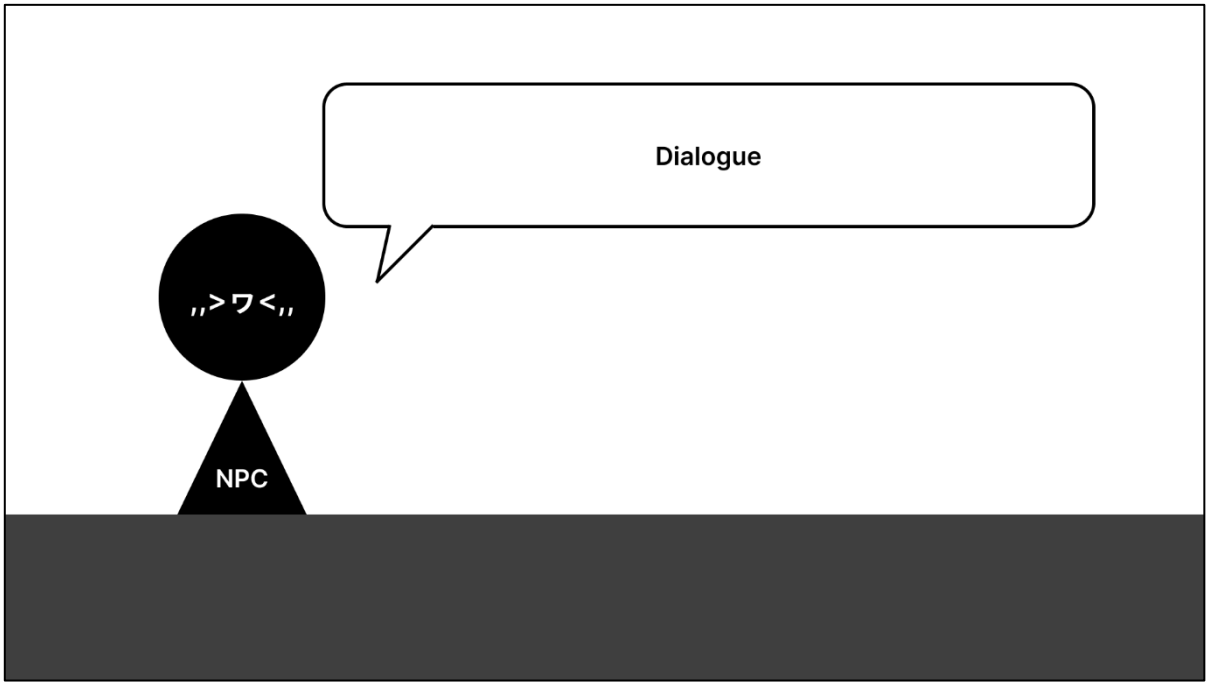


*Figure 3.47 Interface for serving the correct drink with the right combination of herbs*

Figure 3.48 illustrates the interface when the player serves an incorrect drink, failing to match the NPC's symptoms and health concerns.

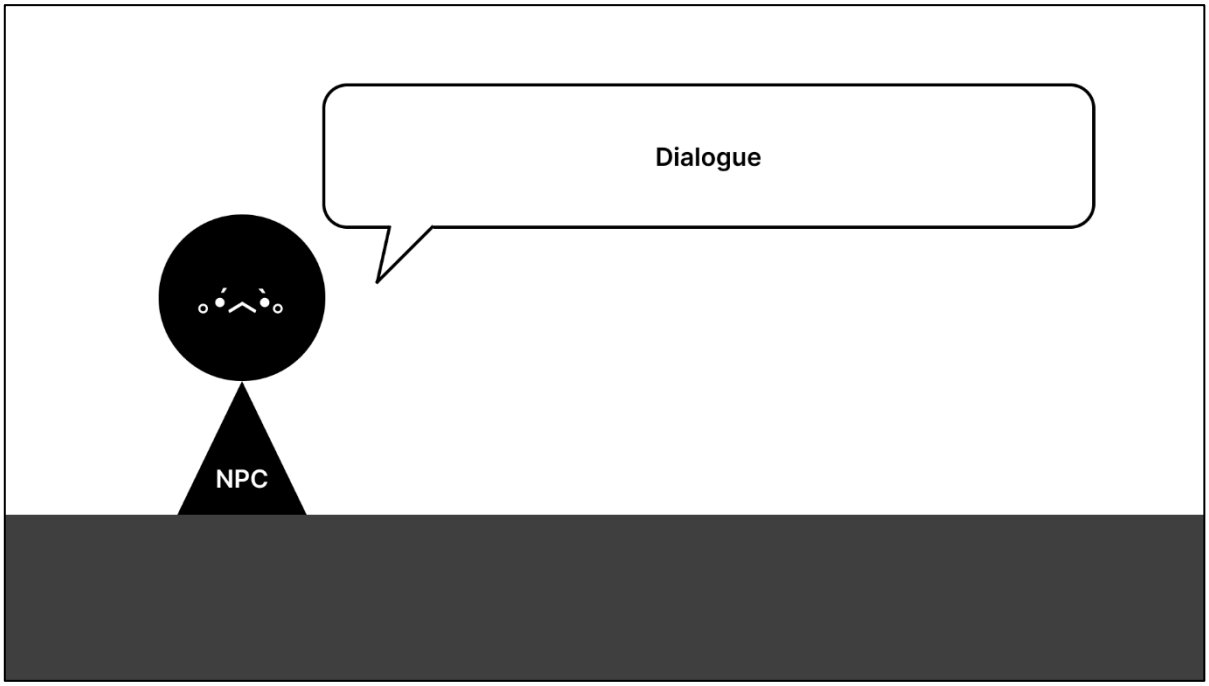


*Figure 3.48 Interface for serving the incorrect combination of herbs*

### 3.2.3 Phase 3: Post game

The final phase involves integrating the latest code into the game. Game manual documentation is created during this phase. The document includes a game overview, installation and gameplay guides. The game will be launched on PC and made available to the public. User feedback will be collected from young adults using a System Usability Scale (SUS) questionnaire distributed via Google Forms.

## 3.3 Summary

This chapter explores the Scrum methodology employed in the development of Herbal Madness, providing a detailed overview of each phase. User requirements for the game were determined through data collection, including surveys distributed to potential players. Activity, use case, sequence, and class diagrams were created to understand the game's workflow. A storyboard was also sketched out to visualise the game's features and overall appearance.

# Chapter 4 Implementation

## 4.1 Introduction

Chapter 4 presents the implementation phase of the game project, Herbal Madness. This chapter based upon the analysis of user requirements and design considerations previously discussed in Chapter 3. It outlines the development tools and software utilized, explains the structure and flow of the game, and describes the main functionalities implemented throughout the development process.

## 4.2 Game Implementation

This section outlines the overall game flow. To better achieve the intended objectives, the final prototype includes several modifications from the initial drafts presented in Chapter 3. The game consists of the following main components:

1. Title Screen
2. Settings Screen
3. Credits Screen
4. Scenes in the Gameplay

### 4.2.1 Title Screen

Figure 4.1 presents the main title screen of *Herbal Madness* which serves as the primary navigation hub for the game.


*Figure 4.1 Title screen of Herbal Madness*

The interface design employs a clean, user-friendly layout with four clearly labeled navigation buttons arranged vertically in the center of the screen. The “Start Game” button is positioned at the top of the menu options, making it the most accessible choice for players ready to begin their gaming experience. Below this, players can access “Settings” for sound configuration options, “Credits” to view development information, and “Quit” to exit the application for Window platform.

On the left side of the screen, two additional interactive elements are visible: a teacup icon and a trophy icon, which represent the Tea Book and Leaderboard functions respectively. These icons provide quick access to supplementary features such as herbs and herbal tea information and player achievements or high scores.

### 4.2.2 Settings Screen

Figure 4.2 displays the Settings interface of *Herbal Madness* which appears as a panel box overlaying the main title screen.

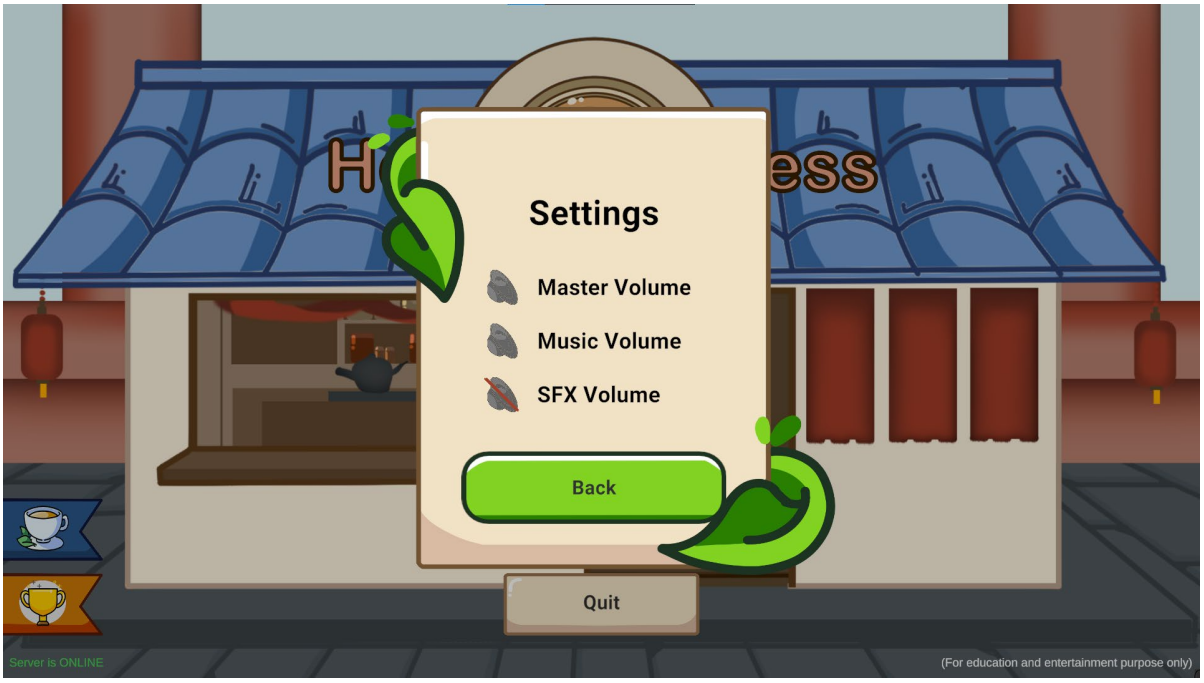


*Figure 4.2 Setting screen*

The settings panel features a clean, minimalist design with a cream-colored background that maintains visual consistency with the game's overall aesthetic. The interface is elegantly framed and positioned centrally on the screen, ensuring easy accessibility and readability.

The settings menu provides three distinct audio control options, each clearly labelled and accompanied by intuitive icons. The “Master Volume” option allows players to control the overall audio output level of the game. Below this, the “Music Volume” setting enables players to specifically adjust the background music intensity independently from other audio elements. The third option, “SFX Volume,” allows fine-tuning of sound effects volume, giving players granular control over their audio experience.

### 4.2.3 Credit Screen

Figure 4.3 presents the Credits screen of *Herbal Madness* which provides comprehensive acknowledgment of all contributors involved in the game's development.

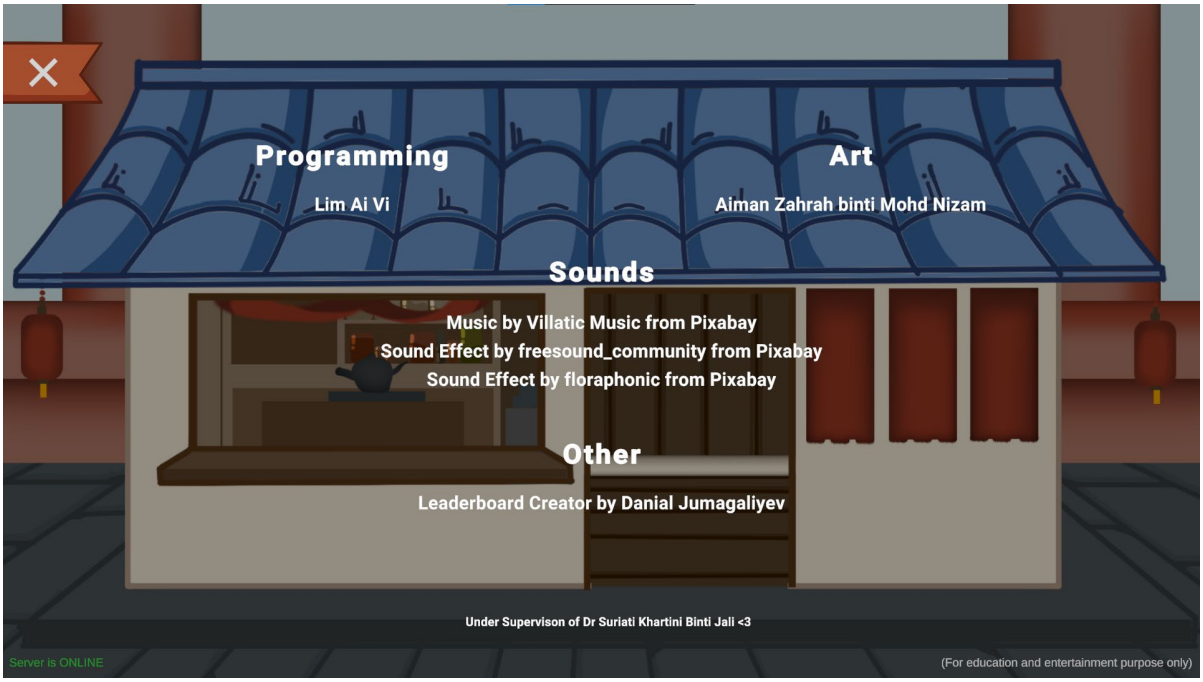


*Figure 4.3 Credits screen*

The credits are organized into four distinct categories, each clearly labelled with bold white headings against the storefront background. The ‘Programming’ section credits Lim Ai Vi (myself) for the technical development and coding aspects of the game. The ‘Art’ section acknowledges Aiman Zahrah binti Mohd Nizam for the visual design and artistic elements that give the game its distinctive aesthetic appeal.

The ‘Sounds’ section provides detailed attribution for the audio components, crediting multiple sources from Pixabay. This comprehensive audio attribution demonstrates the game's commitment to proper licensing and acknowledgment of creative resources. The ‘Other’ section recognizes Danial Jumagaliyev for creating the leaderboard functionality.

This credits screen reflects professional development practices by providing transparent acknowledgment of all contributors while maintaining the game's thematic visual consistency.

### 4.2.4 Scenes in the Gameplay

Figure 4.4 showcases the main gameplay environment of *Herbal Madness* set within a traditional tea cafe that serves as the primary interaction space between players and NPCs.


*Figure 4.4 Cafe environment*

The central focus of the screen is an NPC customer who expressing his symptoms through dialogue. This interaction demonstrates the game's core mechanic where players must listen to customer complaints and symptoms to determine the appropriate herbal tea remedy.

The interface includes several functional elements: number of NPCs and score at the upper left corner, tutorial instructions button, pause button and tea book in the upper right corner. The “Okay” button prompt indicates player interaction capabilities, allowing them to respond to customer requests and progress through the dialogue system. This screen effectively demonstrates how the game combines educational content about TCM with engaging character interactions in an immersive café environment.

Figure 4.5 presents the kitchen interface of *Herbal Madness* which serves as the primary crafting environment where players prepare customized herbal tea remedies.


*Figure 4.5 Kitchen environment*

The screen displays a well-organized herbal apothecary setup with 18 different ingredient containers arranged on three wooden shelves that line the walls on both sides of the workspace. Each jar is clearly labelled with the herb's name.

The central workspace features a traditional black teapot positioned on a heating element, which serves as the primary crafting tool for combining selected herbs. By hovering over each jar, the player can view the herb’s name and function. They can select and drag the desired herbs into the teapot to create the remedy.

The interface includes a top-centred scroll displaying teapot contents with a herb icon. Below it is a hint button for NPC dialogue with hint keywords and a delete button to clear teapot contents. Tutorial and pause buttons are in the upper right corner.

Figure 4.6 presents the tea evaluation interface of *Herbal Madness* which appears after players complete the herbal tea crafting process. This screen provides comprehensive feedback on the player's herbal tea preparation, displaying the results in a clear, educational format.

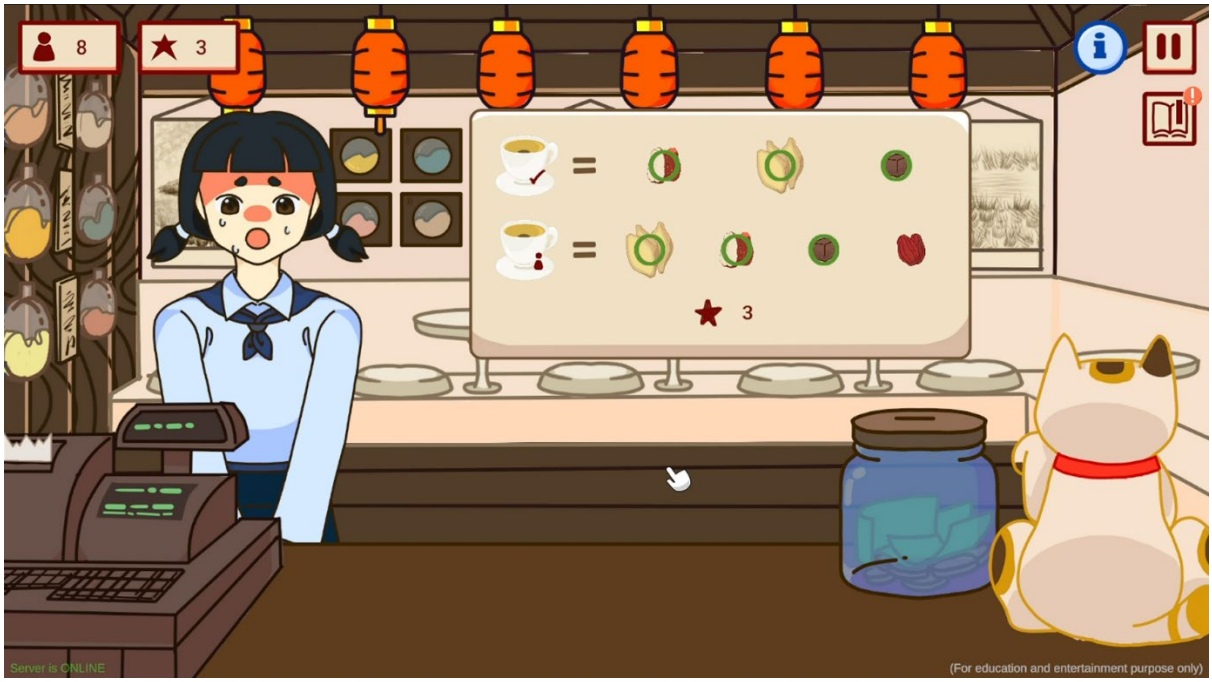


*Figure 4.6 Visual presentation of tea evaluation system*

The central evaluation panel displays a recipe comparison system using visual icons to represent different herbs. Two teacup icons are shown on the left side, each followed by an equal sign and a series of circular herb icons arranged horizontally. This layout allows players to compare their selected herb combinations against the correct recipes for the customer's specific ailments. The herbs are represented by distinctive coloured icons with green circular backgrounds, making it easy to identify different ingredients and their placement in the recipe.

Figure 4.7 presents the Leaderboard interface of *Herbal Madness* which displays the ranking system that allows players to compare their scores with other users worldwide. This online leaderboard system encourages replayability and competitive engagement by allowing players to see how their TCM knowledge compare to others. The scoring system is based on the accuracy of the matched herbs, with extra points awarded for perfectly matched herbs. This interface motivates players to improve their understanding of herbal remedies to achieve higher rankings.

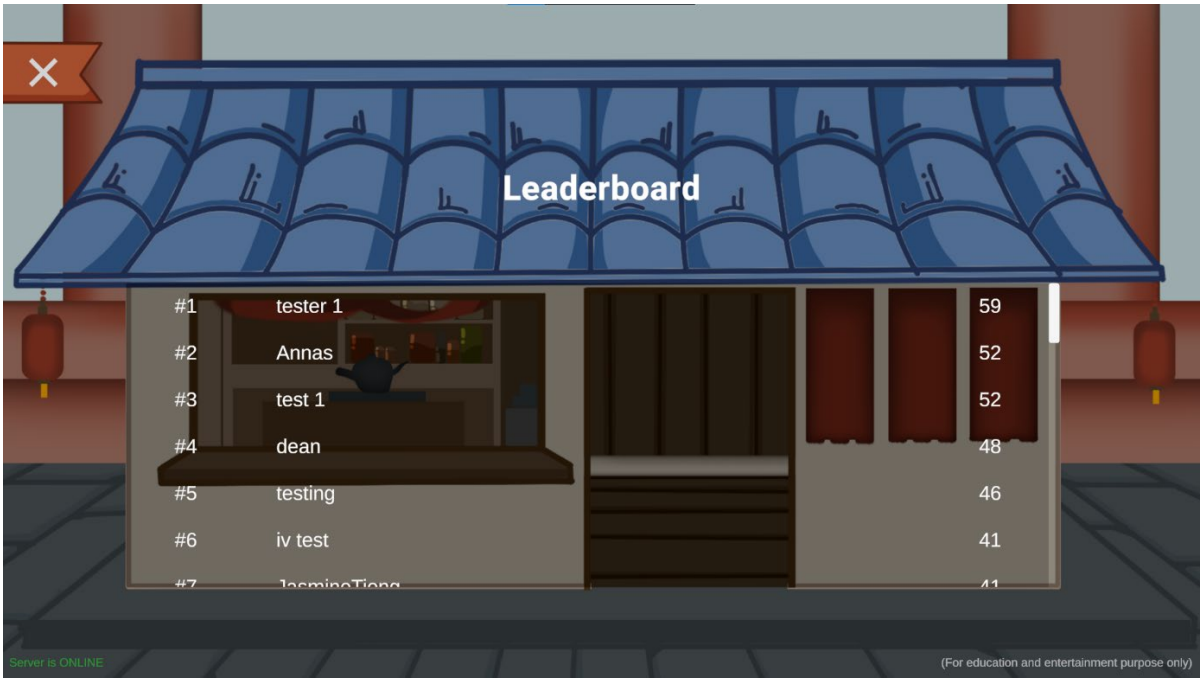


*Figure 4.7 Leaderboard screen*

The leaderboard functionality requires players to submit their scores, creating a sense of achievement within the educational gaming environment. This feature effectively combines learning outcomes with gamification elements, encouraging players to repeatedly engage with the educational content to improve both their TCM knowledge and their competitive standing.

Figure 4.8 illustrated Leaderboard Creator that is created by Danial Jumagaliyev. It is a lightweight, easy-to-integrate tool for adding online leaderboards to Unity, Unreal Engine and Godot games without needing a custom backend. The free tier lets developers quickly create and manage leaderboards through a web interface, using public and secret keys for secure access. The free tier supports up to 1,000 entries per leaderboard and allows adding, editing, and retrieving scores, including an optional metadata field. It offers basic functionality ideal for indie developers.

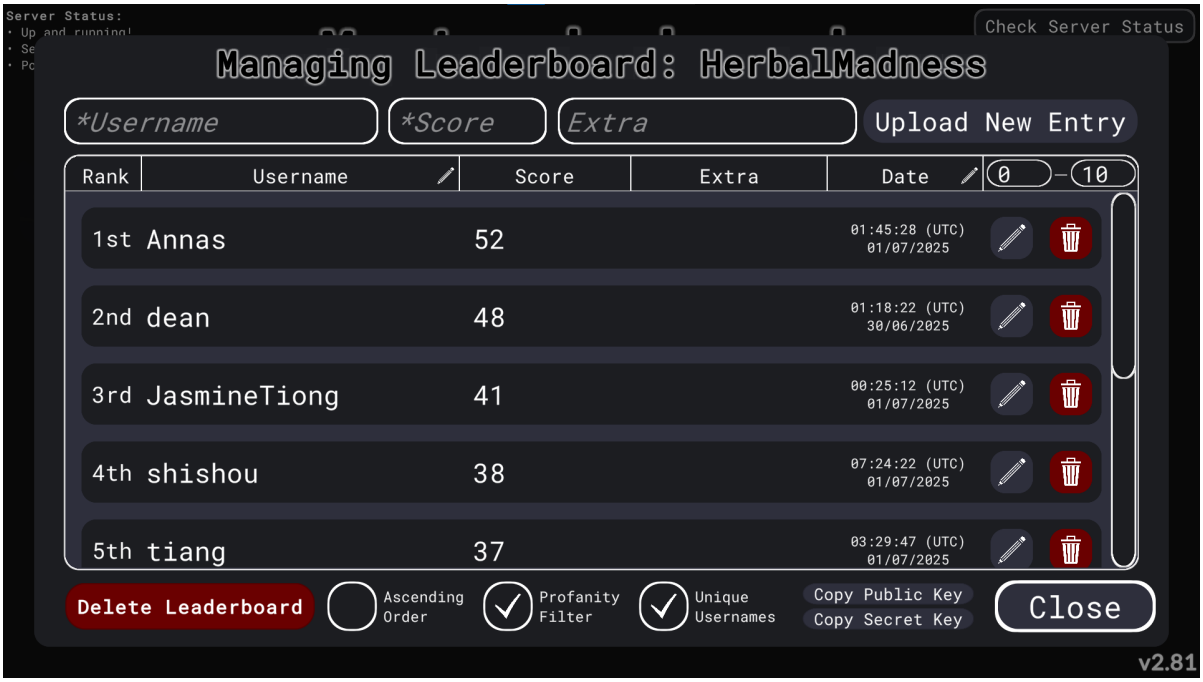


*Figure 4.8 Leaderboard Creator dashboard*

Based on Figure 4.9, the GetLeaderboard() function fetches and displays the current leaderboard entries by instantiating UI rows for each player and highlights the last submitted user if present.

```
124     public void GetLeaderboard()
125     {
126         LeaderboardCreator.GetLeaderboard(publicLeaderboardKey, ((
              entries) =>
127         {
128             ClearLeaderboardEntries();
129 
130             for (int i = 0; i < entries.Length; i++)
131             {
132                 var entry = entries[i];
133 
134                 GameObject rowGO = Instantiate(leaderboardEntryPrefab,
                      leaderboardContentTransform);
135                 LeaderboardEntryRow row =
                      rowGO.GetComponent<LeaderboardEntryRow>();
136 
137                 highlightImage = row.backgroundContainer;
138                 row.rank.text = "#" + (i + 1).ToString();
139                 row.playerName.text = entry.Username;
140                 row.score.text = entry.Score.ToString();
141 
142                 if (!string.IsNullOrEmpty(lastSubmittedUsername) &&
143                 entry.Username.Equals(lastSubmittedUsername,
                      StringComparison.OrdinalIgnoreCase))
144                 {
145                     highlightImage.color = Color.black;
146                     highlightedRow = row.GetComponent<RectTransform>();
147                 }
148             }
149 
150             if (highlightedRow != null)
151             {
152                 StartCoroutine(HighlightAfterFrame());
153             }
154             else
155             {
156                 scrollRect.verticalNormalizedPosition = 1f;
157             }
158         }));
159     }
```

*Figure 4.9 Code snippet for displaying the current leaderboard*

Based on Figure 4.10, the SetLeaderboardEntry() function checks if the server is online, verifies that the submitted username doesn't already exist, and then uploads a new score. After a successful upload, it refreshes the leaderboard and resets the player's score. The logic ensures no duplicate usernames are added and provides visual feedback for both success and common issues. The full source code can be found in Appendix D.

```
168     // Upload new entry
169     public void SetLeaderboardEntry(string username, int score)
170     {
171         CheckServerStatus((isOnline) =>
172         {
173             if (!isOnline)
174             {
175                 ShowServerStatusMsg(false);
176                 DisplayMsgFromDev();
177 
178                 // Save pending score locally inside the queue
179                 SavePendingScore(username, score);
180                 return;
181             }
182             else
183             {
184                 ShowServerStatusMsg(true);
185             }
186 
187             // Fetch the leaderboard when the server is ONLINE
188             LeaderboardCreator.GetLeaderboard(publicLeaderboardKey,
                  (entries) =>
189             {
190                 // Check if username already exists
191                 bool usernameExists = entries.Any(entry =>
                      entry.Username.Equals(username,
                      StringComparison.OrdinalIgnoreCase));
192 
193                 if (usernameExists)
194                 {
195                     // Show a visual warning to the player
196                     ShowUsernameExistsWarning();
197                     return;
198                 }
199 
200                 // If not exists, proceed to upload
201                 lastSubmittedUsername = username;
202 
203                 LeaderboardCreator.UploadNewEntry(publicLeaderboardKey,
                      username, score, (msg) =>
204                 {
205                     LeaderboardCreator.ResetPlayer();
206                     GetLeaderboard();
207                     Debug.Log("Score is submitted");
208                 });
209 
210                 Debug.Log("Resetting score after submission");
211                 ScoreManager.instance.overallScore = 0;
212                 ScoreManager.instance.UpdateCurrentScore();
213             });
214         });
215 
216 
217     }
```

*Figure 4.10 Code snippet for uploading a new score entry*

Figure 4.11 presents the in-game reference book, which can be accessed via the Main Menu by selecting the tea icon marked with a blue bookmark located at the bottom-left corner of the screen. This feature provides a comprehensive list of herbs, including their names and properties, along with ten herbal tea recipes for common ailments upon completing the entire

gameplay. The included recipes are based on real-world formulations, enhancing the educational value of the game.


*Figure 4.11 Tea recipes from the book*

### 4.2.5 Summary

This chapter presents the implementation phase of Herbal Madness, offering a comprehensive account of the game's flow and core features. A revised UML diagrams are included to reflect design updates made during development.

# Chapter 5 Evaluation and Testing

## 5.1 Introduction

This chapter details the testing phase, a critical step in evaluating the proposed game. This evaluation aims to determine the game aligns with user expectations and fulfils its core objectives. Additionally, the testing process actively collects user feedback, which is vital for optimizing the game's design and functionality. The two main types of testing conducted were in-house testing and usability testing.

## 5.2 In-house Testing

In-house testing refers to the internal evaluation of the proposed game, Herbal Madness, conducted within the development team. This process involves the developer testing the game to verify its core functionality, identify potential issues, and assess the overall quality prior to external user testing or public release. The functionalities of the proposed game have been tested and are documented in the test cases presented below.

### 5.2.1 Test Cases

*Table 5.1 Test Case of Launch Game Functionality*

<table>
<tr><td colspan="2">Project Name: Herbal Madness: Discover the Healing Power of Chinese Herbs through Interactive Gameplay</td><td colspan="2">Test Designed by: Lim Ai Vi</td></tr>
<tr><td colspan="2">Module Name: Game</td><td colspan="2">Test Designed Date: 18th June 2025</td></tr>
<tr><td colspan="4">Test Title: To verify the launch of the title screen.</td></tr>
<tr><td>Test ID</td><td>Input Data</td><td>Expected Outcome</td><td>Result Status</td></tr>
<tr><td>HM01</td><td>Launch the game.</td><td>The user should be able to see the title screen.</td><td>Pass</td></tr>
</table>

*Table 5.2 Test Case of Settings Screen and Sound Control Functionality*

| **Project Name:** Herbal Madness: Discover the Healing Power of Chinese Herbs through Interactive Gameplay | | **Test Designed by:** Lim Ai Vi | |
|---|---|---|---|
| **Module Name:** Game | | **Test Designed Date:** 18th June 2025 | |
| **Test Title:** To verify the launch of the settings screen. | | | |
| **Test ID** | **Input Data** | **Expected Outcome** | **Result Status** |
| HM02 | Press "Settings" | The user should be able to see the settings screen. | Pass |
| **Test Title:** To verify the volume control can be adjusted. | | | |
| **Test ID** | **Input Data** | **Expected Outcome** | **Result Status** |
| HM03 | Toggle the sound. | The user should be able to turn on and off the sound settings. | Pass |

*Table 5.3 Test Case of Credits Screen Functionality*

| **Project Name:** Herbal Madness: Discover the Healing Power of Chinese Herbs through Interactive Gameplay | | **Test Designed by:** Lim Ai Vi | |
|---|---|---|---|
| **Module Name:** Game | | **Test Designed Date:** 18th June 2025 | |
| **Test Title:** To verify the launch of credits screen. | | | |
| **Test ID** | **Input Data** | **Expected Outcome** | **Result Status** |
| HM04 | Press "Credits" | The user should be able to see the credits screen. | Pass |

*Table 5.4 Test Case of the Gameplay Functionality*

| **Project Name:** Herbal Madness: Discover the Healing Power of Chinese Herbs through Interactive Gameplay | | **Test Designed by:** Lim Ai Vi | |
|---|---|---|---|
| **Module Name:** Game | | **Test Designed Date:** 18th June 2025 | |
| **Test Title:** To verify the gameplay by hovering, clicking and dragging. | | | |
| **Test ID** | **Input Data** | **Expected Outcome** | **Result Status** |
| HM05 | Click to interact. | The user should be able to see immediate feedback or response the game provides. | Pass |
| HM06 | Hover the herb jar. | The user should be able to see the description of the herbs. | Pass |
| HM07 | Click on the herb jar. | The user should be able to spawn the herb. | Pass |
| HM08 | Dragging the spawned herb. | The user should be able to drag around the spawned herb. | Pass |

## 5.3 Outsource Testing

Outsource testing in games refers to the process of evaluating a game by involving external users outside the development team. In this study, outsource testing was conducted through a Google Form questionnaire containing both close-ended and open-ended questions to assess the game's usability, user experience, and educational effectiveness. The evaluation gathered feedback on User Interface (UI) Design, User Experience (UX), game strengths and weaknesses, suggested improvements, and included the System Usability Scale (SUS) assessment. A total of 30 responses were collected.

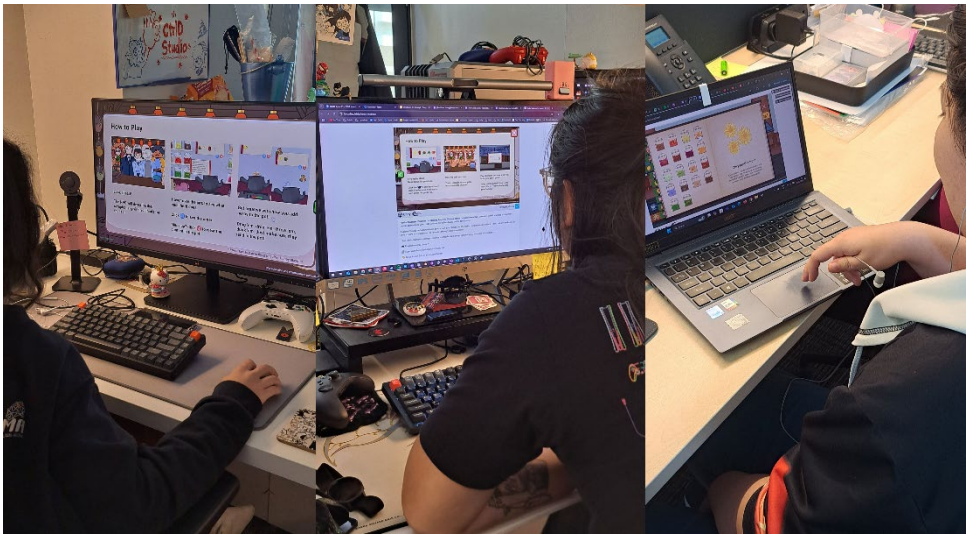

*Figure 5.1 User testing*

### 5.3.1 Demographic Information

Based on figure 5.2, the gender distribution shows that 60% were female and 40% were male. This relatively balanced representation ensures that feedback was gathered from both male and female players, helping to assess the game's usability and appeal across different gender groups for a more inclusive and accurate evaluation.

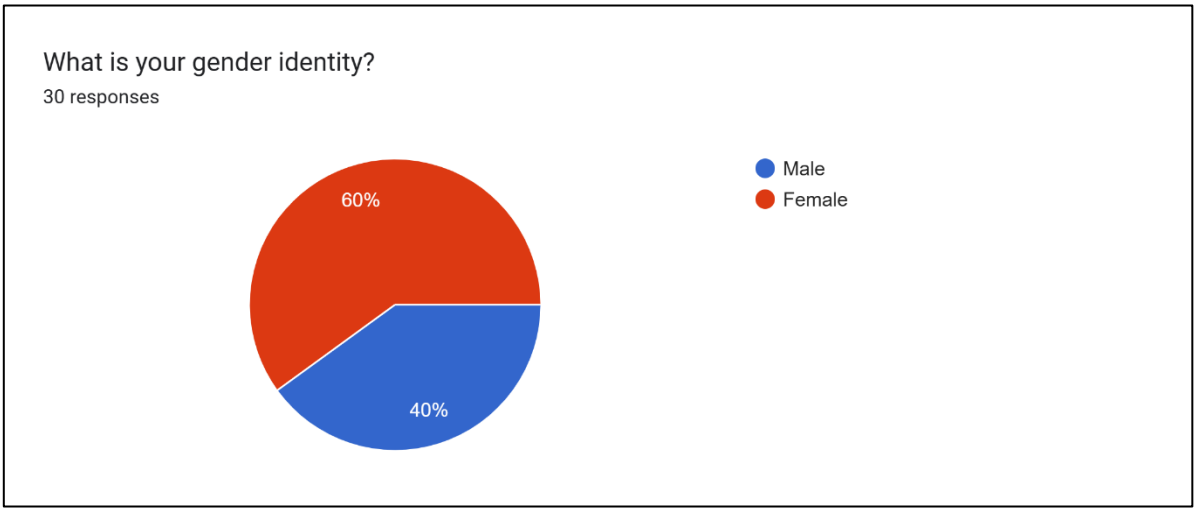


*Figure 5.2 Gender Distribution of Players*

Based on Figure 5.3, majority of players who participated in the survey were between the ages of 23–29, accounting for 83.3% of the total respondents. A smaller proportion fell

within the 30–39 age range at 10%, while 3.3% were aged between 18–22 and 40–49. This indicates that the game primarily appealed to or was tested by young adults, which aligns with the target demographic for casual educational games. The age diversity, though limited, still provides insights across multiple age groups.

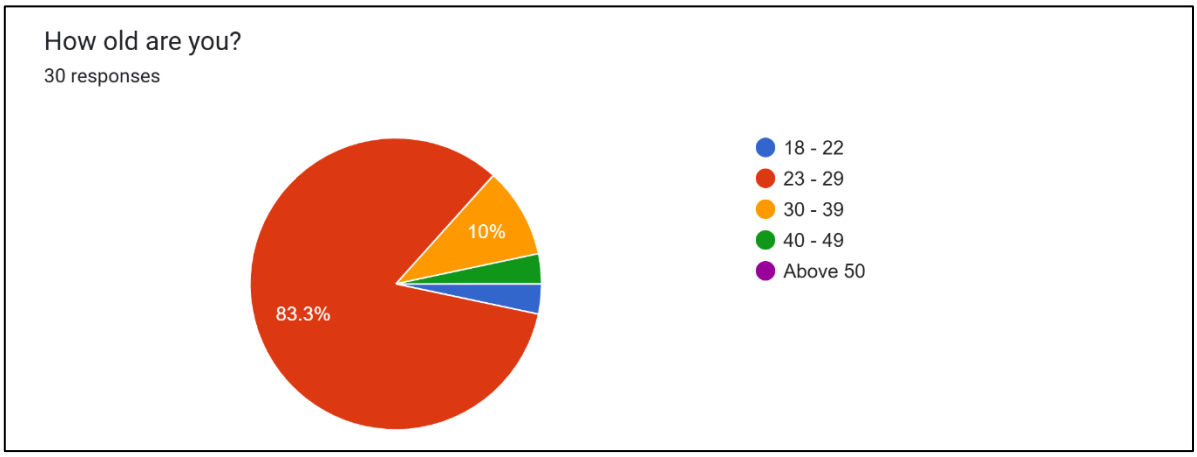


*Figure 5.3 Age range of surveyed players.*

The racial distribution of players in Figure 5.4 shows that the majority were Chinese (60%), followed by Malays (20%). The remaining participants identified as Indian and Iban respectively at 10%. This indicates a diverse pool of respondents, with a strong representation from ethnic groups commonly associated with Traditional Chinese Medicine awareness and cultural relevance, particularly among the Chinese demographic.

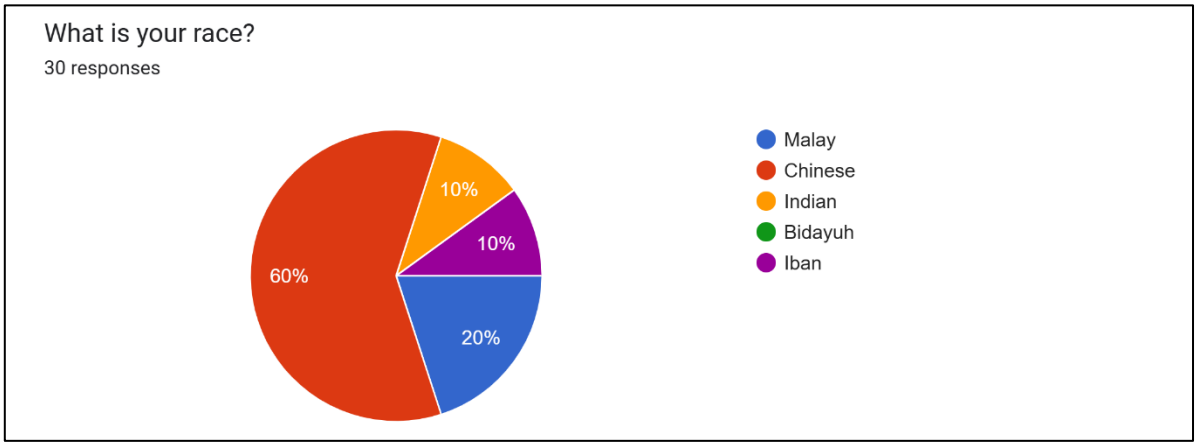


*Figure 5.4 Player demographics by race*

### 5.3.2 User Interface Feedback

Based on Figure 5.5, the game demonstrates strong performance across all assessed dimensions, with mean scores consistently above 4.0 on a 5-point scale.

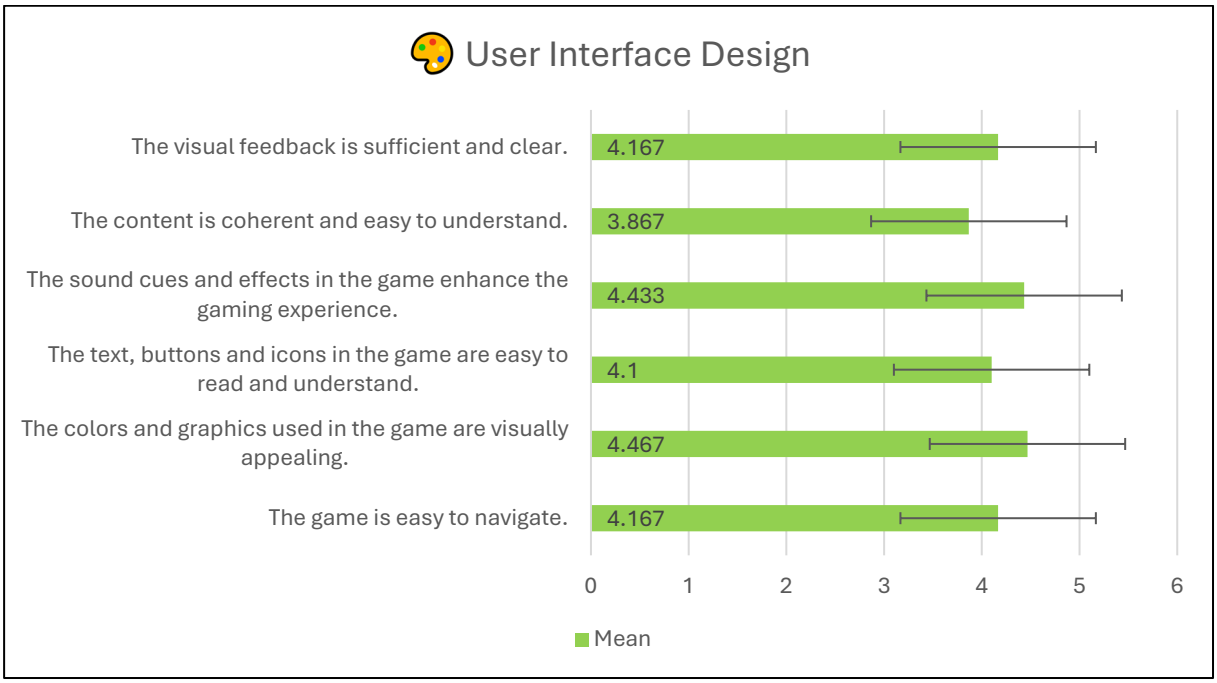


*Figure 5.5 User Interface Design Feedback*

The sound design emerges as the standout feature, receiving the highest rating of 4.433, indicating that audio cues and effects significantly enhance the gaming experience. Visual elements also performed well, with graphics and colours scoring 4.467 and visual feedback clarity at 4.167.

The standard deviation(SD) values reveal interesting patterns in user consensus. Navigation ease (Mean = 4.167, SD = 0.874) and graphics and colours (Mean = 4.467, SD = 0.730) show strong user agreement, with relatively low variability indicating consistent positive opinions across evaluators. Text/button readability also demonstrates good consensus (Mean = 4.1, SD = 0.885). However, sound effects (Mean = 4.433, SD = 0.728) shows the strongest agreement despite having the highest mean score, suggesting users consistently appreciated the audio design.

Content coherence exhibits the highest variability (Mean = 3.867, SD = 1.042), indicating more diverse opinions among users about how well the game content flows and makes sense. Visual feedback also shows notable variation (Mean = 4.167, SD = 0.986), suggesting that while most users found the visual cues clear, there were some differences in individual experiences. Overall, the results indicate a well-designed interface with particular strengths in audio design and visual appeal, though content organization may benefit from refinement given the mixed user opinions.

### 5.3.3 User Experience Feedback

Based on Figure 5.6, the game demonstrates strong effectiveness as an educational tool for TCM, with all dimensions scoring above 4.0 on the 5-point scale.

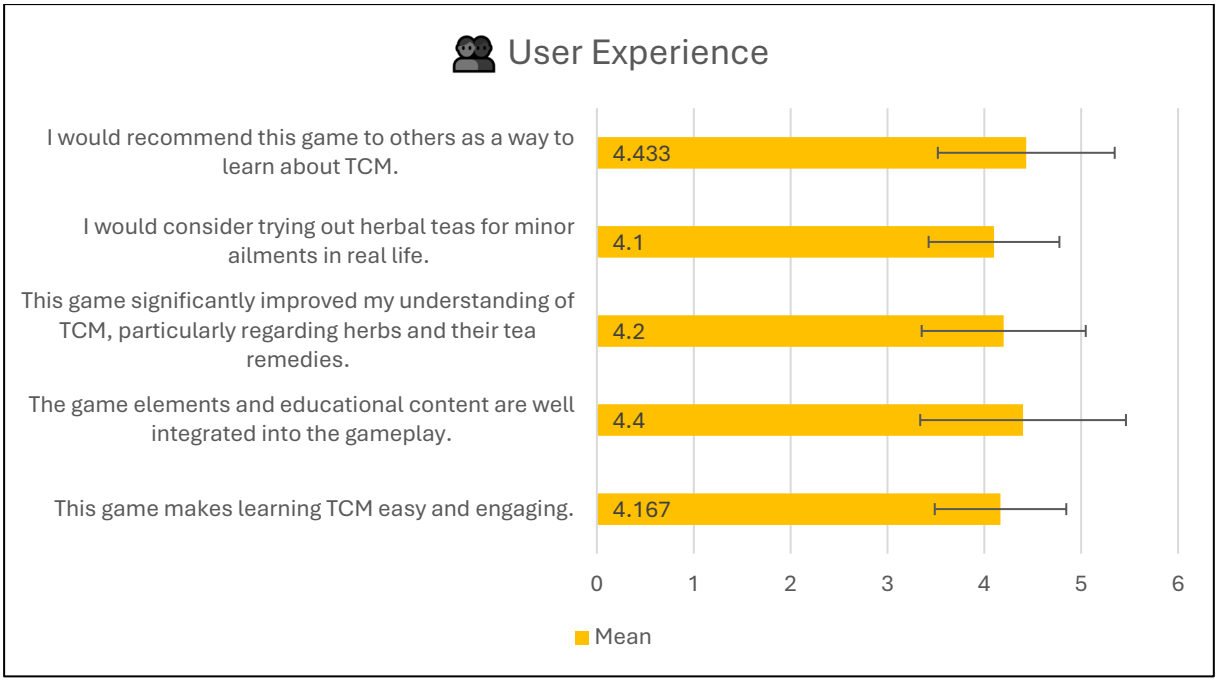


*Figure 5.6 User Experience Feedback*

The game excels particularly in educational integration, with users rating the integration of game elements and educational content highest at 4.4, indicating successful gamification of learning materials. Close behind, users strongly agreed that the game significantly improved

their understanding of TCM, especially regarding herbs and tea remedies (Mean = 4.2), and would recommend it to others as a learning tool (Mean = 4.433).

The standard deviation values reveal varying levels of user consensus across different aspects. The game's ability to make TCM learning easy and engaging (Mean = 4.167, SD = 0.913) and users' improved understanding of TCM concepts (Mean = 4.2, SD = 0.847) show moderate variability, suggesting that while most users found the educational approach effective, individual learning experiences varied somewhat. Educational content integration demonstrates strong user agreement (SD = 0.675), indicating consistent positive feedback about how well the game balances entertainment with learning.

The recommendation aspect shows the strongest consensus (Mean = 4.433, SD = 0.679), suggesting users consistently viewed the game as worth sharing with others. However, willingness to try herbal teas in real life exhibits the highest variability (Mean = 4.1, SD = 1.062), indicating more diverse opinions about translating game knowledge into practical application. This suggests that while users appreciated the educational value, their comfort level with implementing TCM practices varied considerably. Overall, the results indicate a successful educational game that effectively teaches TCM concepts while maintaining user engagement, though individual readiness to apply learned knowledge in real-world contexts shows notable variation.

### 5.3.4 Open-ended Feedback

Based on Figure 5.7, players highlighted key game features that enhancing knowledge of Chinese herbs and remedies.


*Figure 5.7 Key Game Features enhancing Knowledge of Chinese Herbs and Remedies.*

The in-game book was frequently mentioned as a valuable reference, with users describing it as informative and engaging. NPC interactions and dialogues played a significant role in contextualizing symptoms and guiding players toward appropriate remedies, especially when paired with customer feedback. The crafting system, including dragging herbs into the pot and receiving outcome responses, helped reinforce understanding of how herbs are used in combination. Additionally, tooltips, notes, and the herb collection on the menu page supported learning by providing accessible descriptions.

While one participant noted they did not gain herbal knowledge through the game, the majority found that combining interactive elements like crafting and feedback with informative resources greatly supported their learning experience.

Based on Figure 5.8, players highlighted several strengths of Herbal Madness, with many praising its educational value, particularly its ability to introduce and teach Traditional Chinese Medicine (TCM) in an engaging and accessible way.

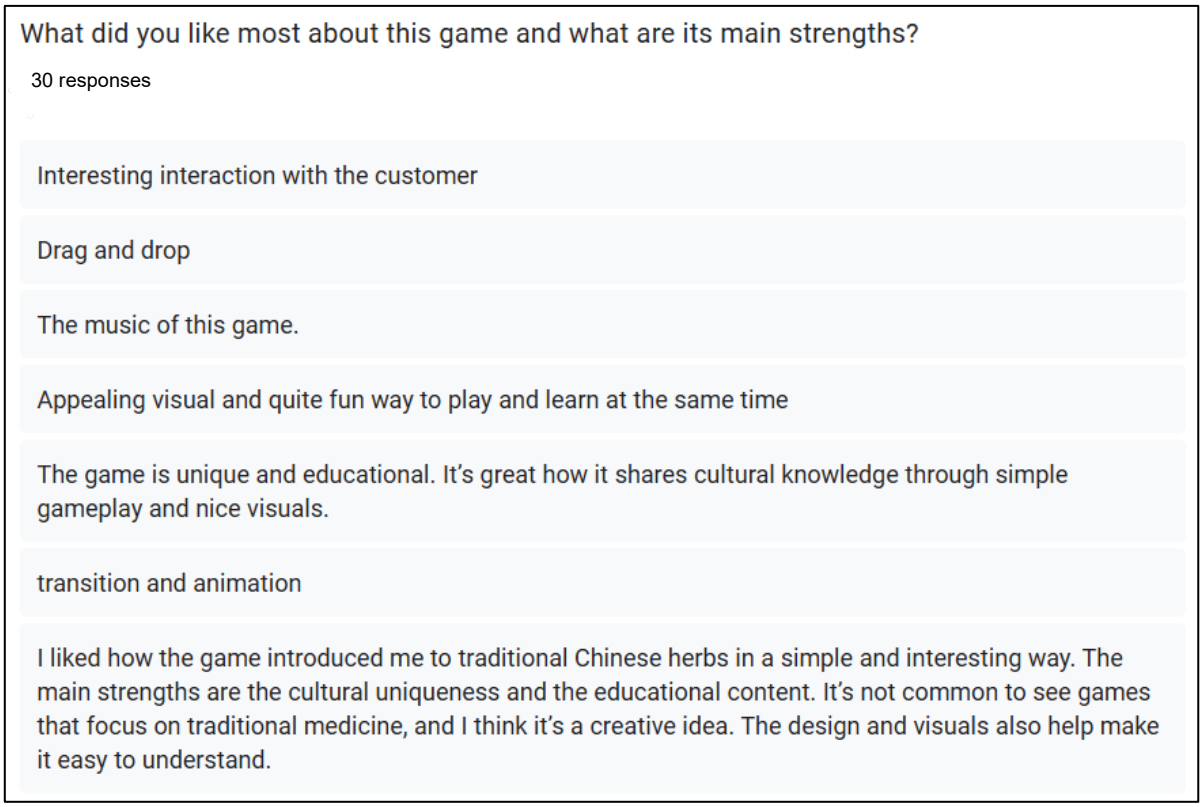


*Figure 5.8 Key player insights highlighting the game's strengths and most appealing features.*

The crafting system, especially the drag-and-drop mechanics and interactive customer feedback, stood out as enjoyable and informative, helping players understand how different herbs work together. The game's appealing visuals, cute art style, and immersive music were frequently mentioned as elements that enhanced the gameplay experience. Many users also appreciated the NPC interactions and interesting scenarios, which added depth to the learning process. The inclusion of a mini herb book and clear gameplay flow further contributed to the game's effectiveness in combining cultural education with entertainment.

Overall, the game was praised for its unique concept, fun gameplay, and creative integration of cultural knowledge, making it both enjoyable and meaningful for players.

While Herbal Madness offers valuable educational content, many players found it overwhelming for beginners, especially without prior knowledge of Chinese herbs.

Based on Figure 5.9, common concerns included long and dense text, unclear instructions, and confusing herb similarities. Some felt that NPC dialogues were too lengthy, and the lack of a tutorial or in-game guidance made it harder to get started. Interface issues such as missing navigation buttons and unclear feedback or scoring were also noted.

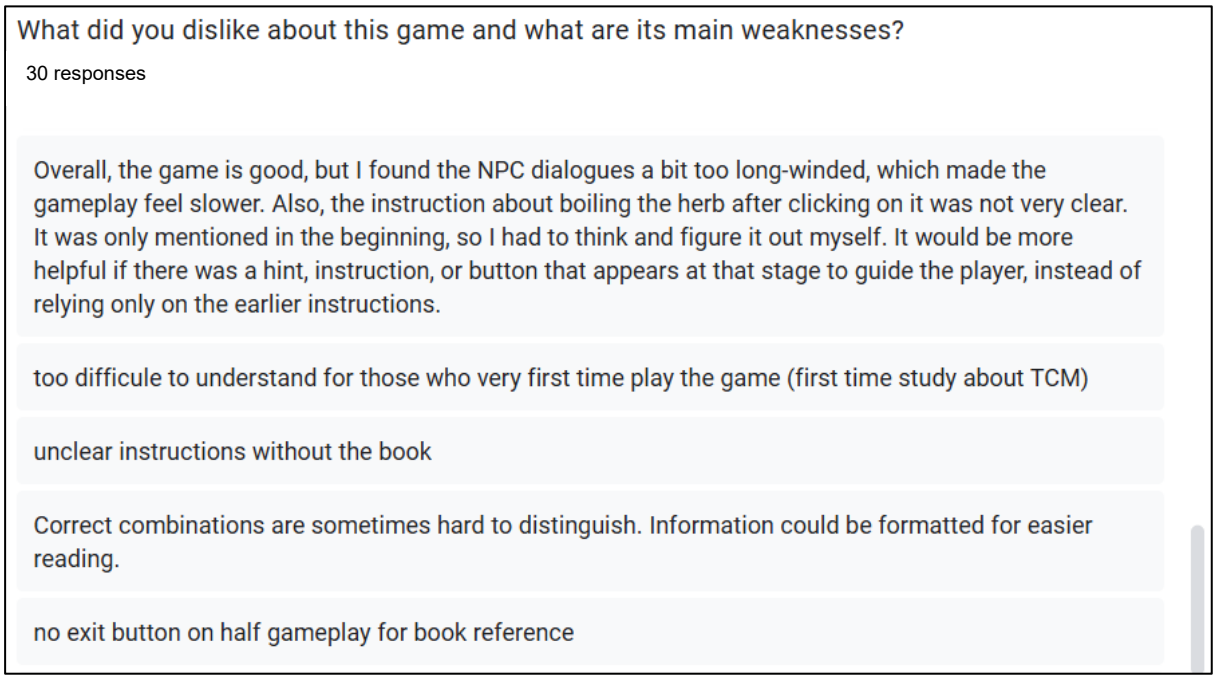


*Figure 5.9 Key insights into the game's weaknesses as perceived by players*

Overall, the game would benefit from streamlined instructions, a beginner-friendly tutorial, and clearer UI elements to improve accessibility and engagement.

Based on Figure 5.10, players suggested improving Herbal Madness by making it more beginner-friendly with tutorials, gradual herb introductions, and level-based recipe unlocks. Many recommended shortening dialogues, highlighting keywords, and using clearer formatting for herb info. Other ideas included easier book access during gameplay, visual feedback for correct or wrong choices, and more engaging features like a scoring system, sound effects, and varied NPC personalities. Adding more herbs, fixing UI issues, and providing fun facts or voice guidance were also suggested to enhance learning and gameplay.

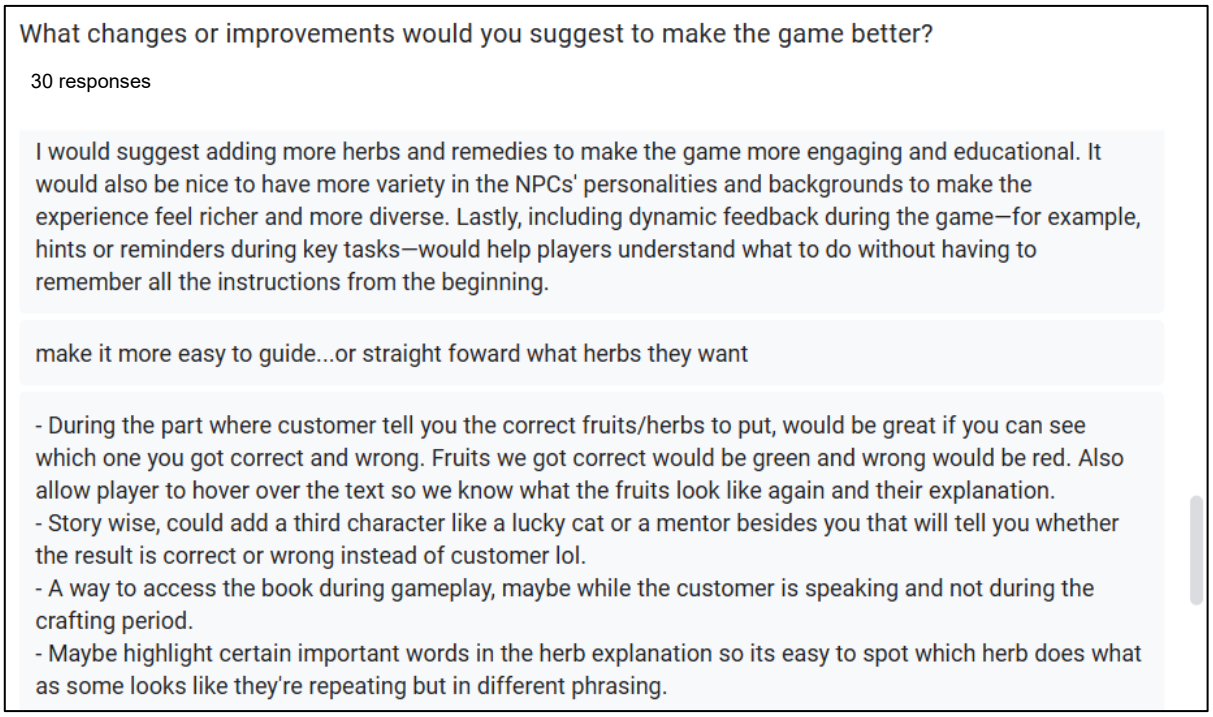


*Figure 5.10 Key player suggestions for future game development and refinement*

### 5.3.5 Usability Testing

The System Usability Scale (SUS) is a widely used questionnaire-based tool in UX research for evaluating the usability of a system or product through a set of standardized questions (Soegaard, M. (2024). The System Usability Scale (SUS) questionnaire has 10 questions, with responses ranging from strongly disagree (1) to strongly agree (5). Table 5.5 shows the 10 SUS items used.

*Table 5.5 System Usability Scale Items*

| | |
|---|---|
| 1 | I think that I would play this game frequently. |
| 2 | I found the game is unnecessarily complex. |
| 3 | I thought the game was easy to use. |
| 4 | I think that I would need to support of a technical person to play this game. |
| 5 | I found various functions in this game were well integrated. |
| 6 | I thought there was too much inconsistency in this game. |
| 7 | I would imagine that most people would learn to play this game very quickly. |

| | |
|---|---|
| 8 | I found the game was very difficult to play. |
| 9 | I felt very confident playing the game. |
| 10 | I would need to learn a lot of things before I could get going with this game. |

*Table 5.6 Descriptive Statistic for Herbal Madness*

| SUS Score | Value |
|---|---|
| Mean | 69.08 |
| Standard Deviation | 18.33 |
| Minimum | 27.50 |
| Maximum | 100.00 |

*Table 5.7 Adjective Rating and Score*

| SUS Score | Grade | Adjective Rating |
|---|---|---|
| > 80.3 | A | Excellent |
| 68 – 80.3 | B | Good |
| 68 | C | Okay |
| 51 – 68 | D | Poor |
| < 51 | F | Awful |

Table 5.6 presents the System Usability Scale (SUS) scores for *Herbal Madness*. The average score was **69.08**, with a standard deviation of **18.33**. Individual scores ranged from a minimum of **27.50** to a maximum of **100.00**. Based on this average, the overall SUS score of **69.08** is considered **Good** (as referenced in Table 5.7).

**5.4 Summary**

This chapter presented two types of testing that were used to test *Herbal Madness*: in-house testing, which focused on verifying the core functionality of the game, identifying potential

issues, and assessing overall quality before external release; and outsourced testing, conducted via a Google Form questionnaire. The external testing gathered both close-ended and open-ended user responses to evaluate the game's usability, user experience, and educational effectiveness. The evaluation included feedback on User Interface (UI) Design, User Experience (UX), the game's strengths and weaknesses, suggested improvements, and the results of the System Usability Scale (SUS) assessment. Some adjustments were implemented following the received feedback.

# Chapter 6 Implementation

## 6.1 Introduction

This chapter presents the conclusion of the proposed project. It evaluates the overall outcomes and achievements of the developed game to determine the extent to which the initial objectives were met. Additionally, it outlines the limitations encountered during development and highlights potential areas for future enhancement. Suggestions for future work are also discussed to support the ongoing improvement and expansion of the game.

## 6.2 Objective Achievements

*Table 6.1 Objective Achievements*

| Objectives | Achievements |
|---|---|
| To analyse existing traditional medicine games for their relevance to the design of Herbal Madness. | A review of existing traditional medicine games provided key insights into gameplay and learning strategies, which directly informed the design of *Herbal Madness*. |
| To develop a game to improve learning about the traditional Chinese herbs and its remedies. | *Herbal Madness* was developed as an interactive educational game with user feedback confirming its effectiveness in enhancing understanding of TCM herbs. |
| To evaluate the game effectiveness and functionality through usability testing and feedback from target audiences. | *Herbal Madness* was evaluated through testing and feedback, which confirmed its overall usability and educational value while identifying areas for future improvement. |

### 6.3 Project Limitations and Constraints

This section outlines the limitations of the game, based on the feedback before the refinement.

1. Overwhelming Herb Information. Long descriptions and similar herb functions made it difficult for beginners to differentiate and select the correct remedies.
2. Inaccessible Reference Material During Gameplay. Players could not access the herb book while crafting, which hindered real-time learning and decision-making.
3. Unclear or Lengthy NPC Feedback. NPC reactions were sometimes vague or too wordy, making it hard to understand the outcome of choices.

### 6.4 Future Works

Based on the identified limitations, here are some suggestions to enhance the game's functionality:

1. Simplify Herb Information. Shorten the descriptions and highlight keywords to make herb properties easier to read and remember.
2. Enable In-Game Access to the Herb Book. Allow players to refer to the herb guide during certain gameplay scene for better decision-making.
3. Clarify NPC Feedback. Make NPC responses shorter and more direct, with visual cues to show which herbs were correct or incorrect.

### 6.5 Conclusion

This chapter concludes by summarizing the achievements, limitations, and potential improvements of the proposed game. The discussion reflects on player feedback to evaluate the game's effectiveness and identify areas for enhancement. Recommendations for future development have been outlined, providing a foundation for possible continuation and refinement of the project.

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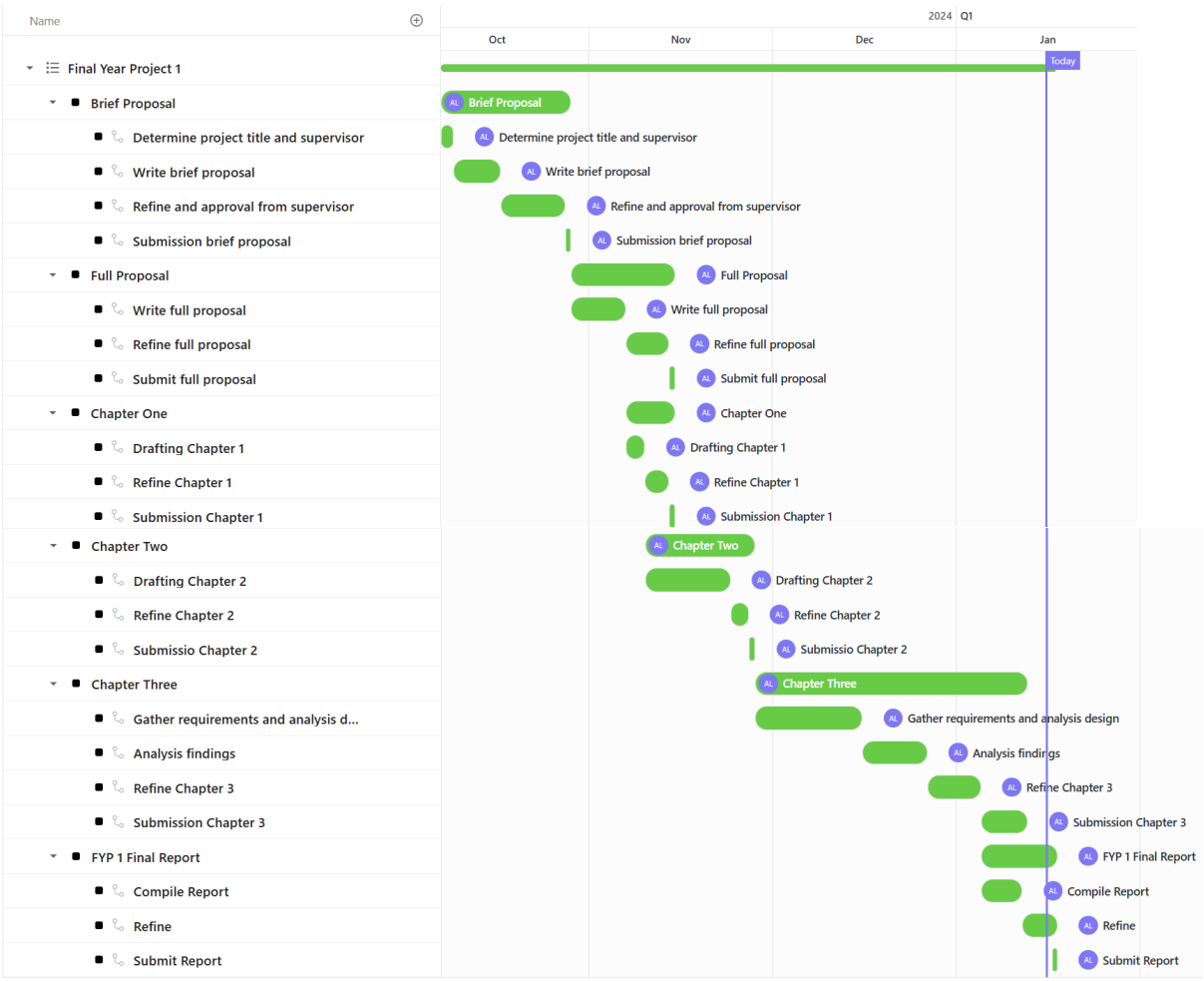
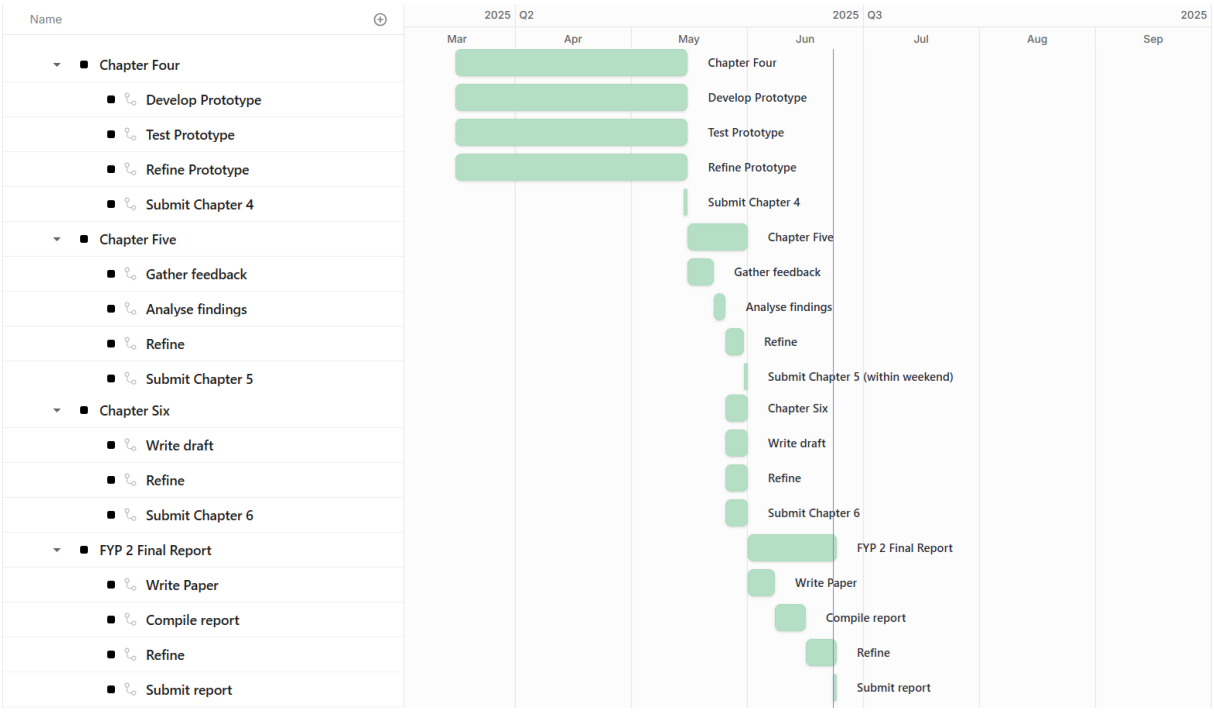
# APPENDIX A: Gantt Chart

Herbal Madness / Final Year Project 1 ···

| Name | Priority | Start date | Due date | Sprint points | Assignee |
|---|---|---|---|---|---|
| Brief Proposal 4 0/7 | Normal | 10/7/24 | 10/28/24 | 44 | AL |
| Determine project title and supervisor | Normal | 10/7/24 | 10/8/24 | 4 | AL |
| Write brief proposal | High | 10/9/24 | 10/16/24 | 16 | AL |
| Refine and approval from supervisor | High | 10/17/24 | 10/27/24 | 22 | AL |
| Submission brief proposal | Normal | 10/28/24 | 10/28/24 | 2 | AL |
| Full Proposal 3 0/9 | High | 10/29/24 | 11/14/24 | 34 | AL |
| Write full proposal | High | 10/29/24 | 11/6/24 | 18 | AL |
| Refine full proposal | High | 11/7/24 | 11/13/24 | 14 | AL |
| Submit full proposal | Normal | 11/14/24 | 11/14/24 | 2 | AL |
| Chapter One 3 | High | 11/7/24 | 11/14/24 | 20 | AL |
| Drafting Chapter 1 | High | 11/7/24 | 11/9/24 | 10 | AL |
| Refine Chapter 1 | High | 11/10/24 | 11/13/24 | 8 | AL |
| Submission Chapter 1 | Normal | 11/14/24 | 11/14/24 | 2 | AL |
| Chapter Two 3 | High | 11/10/24 | 11/27/24 | 30 | AL |
| Drafting Chapter 2 | High | 11/10/24 | 11/23/24 | 16 | AL |
| Refine Chapter 2 | High | 11/24/24 | 11/26/24 | 12 | AL |
| Submissio Chapter 2 | Normal | 11/27/24 | 11/27/24 | 2 | AL |
| Chapter Three 4 | High | 11/28/24 | 5 days ago | 72 | AL |
| Gather requirements and analysis desi... | Urgent | 11/28/24 | 12/15/24 | 22 | AL |
| Analysis findings | Urgent | 12/16/24 | 12/26/24 | 28 | AL |
| Refine Chapter 3 | High | 12/27/24 | Jan 4 | 14 | AL |
| Submission Chapter 3 | Normal | Jan 5 | 5 days ago | 8 | AL |
| FYP 1 Final Report 3 | Urgent | Jan 5 | Today | 48 | AL |
| Compile Report | Urgent | Jan 5 | 6 days ago | 28 | AL |
| Refine | Urgent | 5 days ago | Today | 18 | AL |
| Submit Report | High | Today | Today | 2 | AL |
| Chapter Three 4 | High | 11/28/24 | Jan 5 | 46 | AL |
| Gather requirements and analysis desi... | Urgent | 11/28/24 | 12/15/24 | 10 | AL |
| Analysis findings | Urgent | 12/12/24 | 12/26/24 | 24 | AL |
| Refine Chapter 3 | High | 12/26/24 | Jan 4 | 10 | AL |
| Submission Chapter 3 | Normal | Jan 4 | Jan 5 | 2 | AL |
| FYP 1 Final Report 3 | Urgent | Jan 5 | Jan 17 | 48 | AL |
| Compile Report | High | Jan 5 | Jan 15 | 28 | AL |
| Refine | High | Jan 16 | Jan 17 | 18 | AL |
| Submit Report | High | Jan 17 | Jan 17 | 2 | AL |
| Chapter Four 4 | High | Mar 16 | May 15 | 160 | AL |
| Develop Prototype | High | Mar 16 | May 15 | 52 | AL |
| Test Prototype | High | Mar 16 | May 15 | 52 | AL |
| Refine Prototype | Urgent | Mar 16 | May 15 | 52 | AL |
| Submit Chapter 4 | Normal | May 15 | May 15 | 4 | AL |

| | | | | | |
|---|---|---|---|---|---|
| Chapter Five 4 | High | May 16 | May 31 | 38 | AL |
| Gather feedback | Normal | May 16 | May 22 | 18 | AL |
| Analyse findings | High | May 23 | May 25 | 6 | AL |
| Refine | Normal | May 26 | May 30 | 10 | AL |
| Submit Chapter 5 | Normal | May 31 | May 31 | 4 | AL |
| Chapter Six 3 | High | May 26 | May 31 | 24 | AL |
| Write draft | Normal | May 26 | May 31 | 10 | AL |
| Refine | Urgent | May 26 | May 31 | 10 | AL |
| Submit Chapter 6 | Normal | May 31 | May 31 | 4 | AL |
| FYP 2 Final Report 4 | High | Jun 1 | Today | 28 | AL |
| Write paper | High | Jun 1 | Jun 7 | 7 | AL |
| Compile report | High | Jun 8 | Jun 15 | 10 | AL |
| Refine | Urgent | Jun 16 | Today | 7 | AL |
| Submit report | Normal | Today | Today | 4 | AL |




Name
2025 Q2
2025 Q3
2025
Mar
Apr
May
Jun
Jul
Aug
Sep
Chapter Four
Develop Prototype
Test Prototype
Refine Prototype
Submit Chapter 4
Chapter Five
Gather feedback
Analyse findings
Refine
Submit Chapter 5
Chapter Six
Write draft
Refine
Submit Chapter 6
FYP 2 Final Report
Write Paper
Compile report
Refine
Submit report
Chapter Four
Develop Prototype
Test Prototype
Refine Prototype
Submit Chapter 4
Chapter Five
Gather feedback
Analyse findings
Refine
Submit Chapter 5 (within weekend)
Chapter Six
Write draft
Refine
Submit Chapter 6
FYP 2 Final Report
Write Paper
Compile report
Refine
Submit report

## APPENDIX B: Official Letter for FYP 1 and FYP 2 Data Collection

**Fakulti Sains Komputer dan Teknologi Maklumat**
*Faculty of Computer Science and Information Technology*

UNIMAS
UNIVERSITI MALAYSIA SARAWAK

UNIMAS/NC-19.03/04-32 Jld. 2 (41)

6 Disember 2024

**Kepada Sesiapa Yang Berkenaan**

Tuan/Puan

**Kerja Lapangan Pelajar Tahun Akhir dari Universiti Malaysia Sarawak**
**- Lim Ai Vi**

Dengan segala hormatnya perkara di atas adalah dirujuk.

Sukacita dimaklumkan bahawa pelajar berikut akan mengumpul maklumat untuk projek beliau.

Berikut adalah butir-butir pelajar:

| | | |
|---|---|---|
| Nama Penuh | : | Lim Ai Vi |
| No. Matrik | : | 79877 |
| No. Kad Pengenalan | : | 020101140060 |
| Program | : | Pengkomputeran Multimedia |
| Tahun Pengajian | : | 4 |
| Tajuk Projek | : | *Herbal Madness : Discover the Healing Power of Chinese Herbs through Interactive Gameplay* |
| Penyelia | : | Ts. Dr Suriati Khartini binti Jali |
| Emel | : | jskhartini@unimas.my |
| Telefon | : | 082 – 592647 |

Sehubungan itu, sukacita kiranya pihak tuan/puan dapat memberikan kerjasama kepada pelajar berkenaan untuk menyalurkan maklumat yang diperlukan bagi memenuhi syarat kursus. Segala maklumat yang diperolehi akan hanya digunakan untuk tujuan akademik semata-mata dan akan dijamin kerahsiaannya.

Ini adalah sebagai makluman kepada pihak tuan dan sekiranya ada sebarang pertanyaan, sila hubungi penyelia pelajar tersebut.

Sekian, terima kasih.

Siti Lydiawati binti Sahmat
**Penolong Pendaftar Kanan**

s.k. - **Timbalan Dekan, Prasiswazah,** FSKTM

94300 Kota Samarahan, Sarawak, MALAYSIA
Tel + 60 82 583 781/ + 60 82 583 783

## APPENDIX C: FYP 1 Questionnaire

# Traditional Chinese Herbal Medicine with Interactive Learning

👋 **Hello and thank you for participating in this survey!** 📝

My name is Lim Ai Vi, and I am currently in my final year pursuing a degree in Multimedia Computing at the Faculty of Computer Science and Information Technology (FCSIT), Universiti Malaysia Sarawak (UNIMAS). I am currently working on my final year project to develop an engaging game about Traditional Chinese Herbal Medicine, incorporating interactive elements to enhance users' understanding of Chinese herbs and their practical applications. This survey is part of my research on modern perceptions of Traditional Chinese Herbal Medicine and the level of interest in interactive gameplay as a learning medium among individuals in Sarawak, Malaysia.

The survey is divided into five sections:

- **Section A:** Demographic Information 👥
- **Section B:** Overall Experience with Traditional Chinese Medicine 😊
- **Section C:** Chinese Herbs' Knowledge 🧠
- **Section D:** Gaming Preference 🎮
- **Section E:** Herbal Awareness through Gaming 🌿

Your participation is highly valued and will greatly contribute to my research. I sincerely appreciate your time and honesty in sharing your thoughts. This survey will take approximately 10-15 minutes to complete. Please take your time and kindly answer the questions based on what you really think and really do.

By participating in this survey, you have given your consent to answer the questions given. All responses will be kept private and confidential for the mean of research analysis purposes only. Your consent and confidentiality will not be taken for granted. There will be no third party having the knowledge of knowing what you have written in this survey.

If you have any questions or concerns about this survey, please feel free to reach out to me at **79877@siswa.unimas.my**

* Indicates required question

1. I understand that my participation in this study is entirely voluntary and that I may choose to withdraw from the study at any time without penalty. I have read and understood the information provided. By clicking "I agree" below, I consent to participate in this study. *

   *Tick all that apply.*

   ☐ I agree

## Section A: Demographic Information

This section consists of information regarding about yourself and your background.

2. What is your gender identity? *

*Mark only one oval.*

- ◯ Male
- ◯ Female

3. How old are you? *

*Mark only one oval.*

- ◯ 18 - 22
- ◯ 23 - 29
- ◯ 30 - 39
- ◯ 40 - 49
- ◯ Above 50

4. What is your race? *

*Mark only one oval.*

- ◯ Malay
- ◯ Chinese
- ◯ Indian
- ◯ Bidayuh
- ◯ Iban
- ◯ Other: _____

5. What religion do you identify with? *

*Mark only one oval.*

- ◯ Islam
- ◯ Buddhism
- ◯ Hinduism
- ◯ Christianity
- ◯ Atheism
- ◯ Other: _____

6. What is the primary language spoken in your home? *

*Mark only one oval.*

- ◯ English
- ◯ Malay
- ◯ Chinese
- ◯ Tamil
- ◯ Bidayuh
- ◯ Iban
- ◯ Other: _____

7. What is your level of education? *

*Mark only one oval.*

- ◯ Primary school
- ◯ Secondary school
- ◯ College/Pre-University/Diploma
- ◯ Bachelor's degree
- ◯ Postgraduate degree
- ◯ No formal education

8. What is your employment status? *

*Mark only one oval.*

- ◯ Student
- ◯ Employed
- ◯ Unemployed
- ◯ Self-employed
- ◯ Retired

9. Area of Living *

*Mark only one oval.*

- ◯ Urban
- ◯ Sub-urban
- ◯ Rural

## Section B: Overall Experience with Traditional Chinese Medicine 😌

The question aims to determine whether you have prior experience with Traditional Chinese Herbal Medicine or herbal remedies.

10. Have you ever used traditional Chinese herbal medicine or remedy before? *

*Mark only one oval.*

- ◯ Yes
- ◯ No *Skip to question 16*

## Section B: Overall Experience with Traditional Chinese Medicine (For User 😔)

This section asks you about your personal experience with Traditional Chinese Medicine.

11. For which of the following conditions have you used traditional Chinese herbal medicine or remedy? *(Select all that apply)* *

*Tick all that apply.*

- [ ] Respiratory problems (e.g., cough, cold)
- [ ] Digestive issues (e.g., indigestion, constipation)
- [ ] Mental health issues (e.g., stress, anxiety, sleeping disorders)
- [ ] Menstrual issues (e.g., irregular periods, menstrual cramps, premenstrual syndrome)
- [ ] Rehabilitation (e.g., post-stroke recovery, chronic pain)
- [ ] Pain relief (e.g., back pain, arthritis)
- [ ] Beauty and anti-aging (e.g., skin, hair)
- [ ] Detoxification and Cleansing
- [ ] General wellness and prevention of illness
- [ ] Other: _____

12. How often do you use traditional Chinese herbal medicine or remedy? *

*Mark only one oval.*

- ◯ Daily
- ◯ Weekly
- ◯ Monthly
- ◯ Occasionally
- ◯ Rarely
- ◯ As needed

13. What factors influenced your decision to use traditional Chinese herbal medicine or remedy? *(Select all that apply)* *

*Tick all that apply.*

- [ ] Accessibility and affordability.
- [ ] Recommendation from a friend, family member, or healthcare professional.
- [ ] Dissatisfaction with conventional medicine.
- [ ] Perceived effectiveness for specific conditions.
- [ ] Positive personal experience.
- [ ] Holistic approach to health and wellness.
- [ ] Cultural beliefs and traditions.
- [ ] Other: _____

14. Which of the following sources did you use to learn about Traditional Chinese Medicine? *(Select all that apply)* *

*Tick all that apply.*

- [ ] Healthcare professional (doctor, acupuncturist, herbalist)
- [ ] Family and friends
- [ ] Books and magazines
- [ ] Internet and online resources
- [ ] TV and other media
- [ ] Cultural or community organizations
- [ ] Other: _____

15. How satisfied are you with the effectiveness of traditional Chinese medicine or remedy? *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Very | ◯ | ◯ | ◯ | ◯ | ◯ | Very satisfied |

*Skip to question 19*

## Section B: Experience with Traditional Chinese Medicine (For Non-User 😔)

This section asks you about your interest with Traditional Chinese Medicine.

16. What is the main reason you haven't used Traditional Chinese Medicine or remedy before? *

*Mark only one oval.*

- ◯ I don't believe in its effectiveness.
- ◯ I prefer modern medicine.
- ◯ I haven't heard much about it and don't know how or where to access it.
- ◯ I'm concerned about safety or side effects.
- ◯ I'm hesitant about trying something outside of conventional medicine.
- ◯ Other: _____

17. Are you interested in learning about Chinese herbal remedy? *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Not | ◯ | ◯ | ◯ | ◯ | ◯ | Very interested |

18. What would you like to learn about Chinese herbal remedy? *(Select all that apply)* *

*Tick all that apply.*

- ☐ How Chinese herbal remedies are prepared and consumed
- ☐ Their benefits for specific health conditions
- ☐ The types of herbs commonly used
- ☐ The cultural and historical context
- ☐ Safety and side effects
- ☐ How to incorporate them into daily life
- ☐ Common myths or misconceptions about Chinese herbal remedies
- ☐ Other: _____

## Section B: Overall Experience with Traditional Chinese Herbal Medicine 😔

This question seeks to identify the main challenges that may prevent the younger generation from using Traditional Chinese Herbal Medicine or Chinese remedies.

19. What do you think are the biggest barriers to use traditional Chinese herbal medicine among younger generation? *(Select all that apply)* *

*Tick all that apply.*

- [ ] Lack of knowledge or awareness about Traditional Chinese Herbal Medicine or remedies
- [ ] Distrust or skepticism towards its effectiveness and safety
- [ ] Preference for modern or pharmaceutical medicine
- [ ] Difficulty finding reliable sources, practitioners, or products
- [ ] Cultural perceptions or stigma around using it
- [ ] Concerns about how it works or potential side effects
- [ ] Fear of using something outside of conventional medicine
- [ ] Higher cost compared to modern treatments
- [ ] Other: _____

## Section C: Chinese Herbs' Knowledge 🧠

This section begins by assessing your familiarity with Traditional Chinese herbs.

20. Are you aware of the existing common traditional Chinese herbs? *

*Mark only one oval.*

- ◯ Yes
- ◯ No

21. If you are aware of any common traditional Chinese herbs, please list them out below. *

*(eg. Ginseng, Goji Berries, Jujube, Ginger, etc.)*

## Section C: Chinese Herbs' Knowledge 🧠

In this section, you will be tested on your knowledge on Chinese Herbs.

22. This herb specializes in clearing internal heat, supporting liver detoxification, and providing specific relief for eye-related problems like dryness and redness. *

*Mark only one oval.*

Rose

Chrysanthemum

Jasmine

Hawthorn

23. A comprehensive wellness herb that boosts immune response, improves vision, and enhances blood circulation while supporting both internal health and external appearance. *

*Mark only one oval.*

Dried Longan

Goji Berry

Mulberries

Jujube

24. This herb focuses on calming mental states, improving sleep quality, and supporting women's hormonal health, particularly effective in addressing mental fatigue. *

*Mark only one oval.*

Solomon's Seal

Poria Cocos

Dried Longan

Rose

25. Specializing in digestive system optimization, this herb stimulates appetite, regulates internal energy, and alleviates various digestive discomforts. *

*Mark only one oval.*

Osmanthus

Dried Tangerine Peel

Hawthorn

Lily Bulb

26. A respiratory comfort herb that provides targeted relief for coughs, reduces phlegm, manages throat inflammation, and soothes airways. *

*Mark only one oval.*

Snow Pear

Apricot Kernel

Lily Bulb

Solomon's Seal

27. This herb works on strengthening liver and kidney functions through enhanced scalp circulation. *

*Mark only one oval.*

Mulberries

Black Sesame

Goji Berries

Jujube

28. Focused on lung nourishment and immunity, this herb moisturizes internal systems and treats respiratory challenges. *

*Mark only one oval.*

Cassia Seeds

Solomon's Seal

Lily Bulb

Apricot Kernel

29. A powerful detoxification herb that provides heat-clearing, body detoxification, skin health improvement, and immune system enhancement. *

*Mark only one oval.*

Jasmine

Honeysuckle

Chrysanthemum

Rose

30. This herb excels in blood nourishment, skin health, immunity boosting, and providing crucial energy support during menstruation. *

*Mark only one oval.*

Longan

Goji Berries

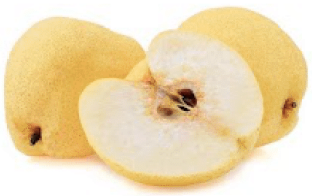
Jujube

Mulberries

31. A fungus that works on strengthening the spleen, resolving internal dampness and improving sleep quality. *

*Mark only one oval.*

Poria Cocos



Snow Pear

Cassia Seeds

Hawthorn

## Section D: Gaming Preference 🎮

These questions ask you about your gaming preference.

32. Do you play video games? *

*Mark only one oval.*

Yes

No

33. How often do you play video games? *

*Mark only one oval.*

- ◯ Daily
- ◯ Weekly
- ◯ Monthly
- ◯ Occasionally
- ◯ Rarely
- ◯ Never

34. What is/are your preferred gaming platforms? *(Select all that apply)* *

*Tick all that apply.*

- ☐ PC/Desktop/Laptop
- ☐ Mobile/Tablet
- ☐ Console (PlayStation, Xbox, Nintendo Switch, etc)
- ☐ Other: _____

35. How would you describe your gaming habits? *

*Mark only one oval.*

- ◯ Casual gamer
- ◯ Competitive gamer
- ◯ Both >:D

36. What are your favorite game genres? *(Select all that apply)* *

*Tick all that apply.*

- [ ] Action
- [ ] Adventure
- [ ] Role-playing games (RPGs)
- [ ] Simulation
- [ ] Strategy
- [ ] Visual novels or narrative-focused games
- [ ] Sports and racing
- [ ] Puzzle and casual games
- [ ] Sandbox and creative games
- [ ] Rhythm
- [ ] Other: _____

37. What feature do you enjoy the most in a game? *

*Mark only one oval.*

- ◯ Storyline
- ◯ Graphics
- ◯ Game difficulty
- ◯ Engaging gameplay and attractive design

38. What aspect of a game keeps you most engaged? *

*Mark only one oval.*

- ◯ Challenging gameplay
- ◯ Engaging puzzles and riddles
- ◯ Progression and achievement
- ◯ Multi-level and replayability

## Section E: Herbal Awareness Through Gaming

This section seeks to understand your views on how games, particularly casual simulations involving Traditional Chinese Herbal Medicine, can raise awareness and engage players in learning about herbal remedies.

39. Are you aware of any existing games that promote herbal awareness? *


*Mark only one oval.*

- ◯ Yes
- ◯ No

40. Would you be interested in playing a casual simulation game? *

*Mark only one oval.*

- ◯ Yes
- ◯ No

41. What gameplay features would you find most engaging in a casual simulation game? *(Select all that apply)* *

*Tick all that apply.*

- [ ] Time-based challenges (e.g., serving customers quickly while creating the right remedy for their symptoms)
- [ ] A variety of symptoms and conditions that require different teas and herbal combinations
- [ ] A progression system where you unlock new herbs and recipes as you advance
- [ ] Visuals of tea preparation (e.g., herb picking, mixing, boiling)
- [ ] Mini-games or challenges within the main gameplay (e.g., memory-based puzzles or herbal knowledge tests)
- [ ] A system to measure effectiveness of the teas based on customer satisfaction
- [ ] Real-life tea recipes inspired by Traditional Chinese Herbal Medicine
- [ ] Other: _____

42. Which types of educational content would you like to see included in a casual simulation game? *(Select all that apply)* *

*Tick all that apply.*

- [ ] A journal or in-game encyclopedia with information about different herbs, their uses, and benefits
- [ ] Pop-up facts and tips about history, herbal remedies, and symptom management of Traditional Chinese Herbal Medicine
- [ ] Tutorials that teach you how to mix herbs for different health conditions
- [ ] Real-life TCM information, such as the history and cultural significance of certain herbs
- [ ] Instant results or customer feedback within the game that helps me understand if I've used the correct herbs and remedies
- [ ] Engaging challenges or quizzes that assess my knowledge about teas and herbs' function
- [ ] Other: _____

43. Do you think a casual simulation game could help raise public awareness about Traditional Chinese Herbal Medicine? *

*Mark only one oval.*

- ◯ Yes
- ◯ No

44. Why do you think that a game *could* help raise public awareness about Traditional Chinese Herbal Medicine? *

*e.g., games make learning fun and easier to absorb, can engage younger audiences, etc*

45. Why do you think that a game *could not* help raise public awareness about Traditional Chinese Herbal Medicine? *

*e.g., games might oversimplify its complexity, does not trust the accuracy of game-based information, etc*

## APPENDIX D: Code Snippets of Leaderboard Script

...dness-fyp\HerbalMadness\Assets\Scripts\Leaderboard.cs 1

```
1  using System.Collections;
2  using System.Collections.Generic;
3  using UnityEngine;
4  using TMPro;
5  using Dan.Main;
6  using System.Linq;
7  using UnityEngine.UI;
8  using System;
9
10 [System.Serializable]
11 public class PendingScoreEntry
12 {
13     public string username;
14     public int score;
15 }
16
17 [System.Serializable]
18 public class PendingScoreList
19 {
20     public List<PendingScoreEntry> entries = new List<PendingScoreEntry>
       ();
21 }
22
23 public class Leaderboard : MonoBehaviour
24 {
25     public static Leaderboard instance;
26
27     private string publicLeaderboardKey =
         "478e1d80af64e1e530c384c5e2816a6c4608071ebb858404d409849df774c152";
28
29     [Header("Checking Purpose")]
30     [SerializeField]
31     private bool lastServerStatusOnline = false;
32     [SerializeField]
33     private float serverCheckTimer = 0f;
34     private float serverCheckInterval = 5f;
35
36     [SerializeField]
37     private GameObject leaderboardEntryPrefab;
38     [SerializeField]
39     private Transform leaderboardContentTransform;
40     [SerializeField]
41     private ScrollRect scrollRect;
42     [SerializeField]
43     private RectTransform highlightedRow;
44     [SerializeField]
45     private TextMeshProUGUI warningText;
46     [SerializeField]
47     private Image highlightImage;
```

```
48      [SerializeField]
49      private string lastSubmittedUsername;
50
51      [Header("Error Handling")]
52      [SerializeField]
53      private TextMeshProUGUI serverStatusMsg;
54      [SerializeField]
55      private CanvasGroup msgFromDevPanel;
56      [SerializeField]
57      private TextMeshProUGUI playerScore;
58
59      private void Awake()
60      {
61          if(instance == null)
62          {
63              instance = this;
64              DontDestroyOnLoad(this);
65          }
66          else
67          {
68              Destroy(gameObject);
69          }
70      }
71
72      private void Start()
73      {
74          CheckServerStatus((isOnline) =>
75          {
76              if (isOnline)
77              {
78                  ShowServerStatusMsg(true);
79                  GetLeaderboard();
80              }
81              else
82              {
83                  ShowServerStatusMsg(false);
84              }
85          });
86      }
87
88      private void Update()
89      {
90          serverCheckTimer += Time.deltaTime;
91          if (serverCheckTimer >= serverCheckInterval)
92          {
93              serverCheckTimer = 0f;
94
95              CheckServerStatus((isOnline) =>
96              {
```

```
 97                 if (isOnline && !lastServerStatusOnline)
 98                 {
 99                     // Server came back online
100                     TryUploadAllPendingScores();
101                 }
102 
103                 lastServerStatusOnline = isOnline;
104                 ShowServerStatusMsg(isOnline);
105             });
106         }
107     }
108 
109     // display server status on bottom left
110     private void ShowServerStatusMsg(bool isOnline)
111     {
112         if (isOnline)
113         {
114             serverStatusMsg.faceColor = new Color32(0, 255, 0, 150);
115             serverStatusMsg.text = "Server is ONLINE";
116         }
117         else
118         {
119             serverStatusMsg.faceColor = new Color32(255, 0, 0, 150);
120             serverStatusMsg.text = "Server is OFFLINE";
121         }
122     }
123 
124     public void GetLeaderboard()
125     {
126         LeaderboardCreator.GetLeaderboard(publicLeaderboardKey, ((
              entries) =>
127         {
128             ClearLeaderboardEntries();
129 
130             for (int i = 0; i < entries.Length; i++)
131             {
132                 var entry = entries[i];
133 
134                 GameObject rowGO = Instantiate(leaderboardEntryPrefab,
                      leaderboardContentTransform);
135                 LeaderboardEntryRow row =
                      rowGO.GetComponent<LeaderboardEntryRow>();
136 
137                 highlightImage = row.backgroundContainer;
138                 row.rank.text = "#" + (i + 1).ToString();
139                 row.playerName.text = entry.Username;
140                 row.score.text = entry.Score.ToString();
141 
142                 if (!string.IsNullOrEmpty(lastSubmittedUsername) &&
```

```
143                 entry.Username.Equals(lastSubmittedUsername,
                      StringComparison.OrdinalIgnoreCase))
144                 {
145                     highlightImage.color = Color.black;
146                     highlightedRow = row.GetComponent<RectTransform>();
147                 }
148             }
149 
150             if (highlightedRow != null)
151             {
152                 StartCoroutine(HighlightAfterFrame());
153             }
154             else
155             {
156                 scrollRect.verticalNormalizedPosition = 1f;
157             }
158         }));
159     }
160 
161     IEnumerator HighlightAfterFrame()
162     {
163         yield return new WaitForEndOfFrame();
164         SnapTo(highlightedRow);
165         MenuControl.instance.OffEnterYourNameScreen();
166     }
167 
168     // Upload new entry
169     public void SetLeaderboardEntry(string username, int score)
170     {
171         CheckServerStatus((isOnline) =>
172         {
173             if (!isOnline)
174             {
175                 ShowServerStatusMsg(false);
176                 DisplayMsgFromDev();
177 
178                 // Save pending score locally inside the queue
179                 SavePendingScore(username, score);
180                 return;
181             }
182             else
183             {
184                 ShowServerStatusMsg(true);
185             }
186 
187             // Fetch the leaderboard when the server is ONLINE
188             LeaderboardCreator.GetLeaderboard(publicLeaderboardKey,
                      (entries) =>
189             {
```

```
190                 // Check if username already exists
191                 bool usernameExists = entries.Any(entry =>
                      entry.Username.Equals(username,
                      StringComparison.OrdinalIgnoreCase));
192
193                 if (usernameExists)
194                 {
195                     // Show a visual warning to the player
196                     ShowUsernameExistsWarning();
197                     return;
198                 }
199
200                 // If not exists, proceed to upload
201                 lastSubmittedUsername = username;
202
203                 LeaderboardCreator.UploadNewEntry(publicLeaderboardKey,
                      username, score, (msg) =>
204                 {
205                     LeaderboardCreator.ResetPlayer();
206                     GetLeaderboard();
207                     Debug.Log("Score is submitted");
208                 });
209
210                 Debug.Log("Resetting score after submission");
211                 ScoreManager.instance.overallScore = 0;
212                 ScoreManager.instance.UpdateCurrentScore();
213             });
214         });
215
216
217     }
218
219     //display the panel
220     private void DisplayMsgFromDev()
221     {
222         msgFromDevPanel.alpha = 1f;
223         msgFromDevPanel.interactable = true;
224         msgFromDevPanel.blocksRaycasts = true;
225
226         playerScore.text = ScoreManager.instance.overallScore.ToString();
227     }
228
229     public void HideMsgFromDev()
230     {
231         msgFromDevPanel.alpha = 0f;
232         msgFromDevPanel.interactable = false;
233         msgFromDevPanel.blocksRaycasts = false;
234
235         MenuControl.instance.OffEnterYourNameScreen();
```

```
236         MenuControl.instance.OffLeaderboard();
237     }
238
239     private void ClearLeaderboardEntries()
240     {
241         foreach (Transform child in leaderboardContentTransform)
242         {
243             Destroy(child.gameObject);
244         }
245     }
246
247     private void ShowUsernameExistsWarning()
248     {
249         warningText.text = "This name already exists! Please choose another.";
250         warningText.gameObject.SetActive(true);
251
252         // Cancel any previous call when it is triggered multiple times quickly
253         CancelInvoke(nameof(HideWarning));
254         Invoke(nameof(HideWarning), 3f);
255     }
256
257     private void HideWarning()
258     {
259         warningText.gameObject.SetActive(false);
260     }
261
262     public void SnapTo(RectTransform target)
263     {
264         Canvas.ForceUpdateCanvases();
265
266         float contentHeight = leaderboardContentTransform.GetComponent<RectTransform>().rect.height;
267         float viewportHeight = scrollRect.viewport.rect.height;
268
269         float rowY = Mathf.Abs(target.anchoredPosition.y);
270
271         float offset = viewportHeight * 0.5f;
272         float adjustedRowY = Mathf.Max(0f, rowY - offset);
273
274         float scrollRange = contentHeight - viewportHeight;
275         float normalizedPosition = 1f - (adjustedRowY / scrollRange);
276
277         normalizedPosition = Mathf.Clamp01(normalizedPosition);
278
279         scrollRect.verticalNormalizedPosition = normalizedPosition;
280     }
```

```
281
282     // check server status
283     public void CheckServerStatus(Action<bool> callback)
284     {
285         LeaderboardCreator.GetLeaderboard(publicLeaderboardKey, (entries)
              =>
286         {
287             bool isOnline = entries != null && entries.Length > 0;
288             callback(isOnline);
289         });
290     }
291
292     // Save the score when server is down
293     private void SavePendingScore(string username, int score)
294     {
295         string key = "PendingScores";
296
297         // Try to load the existing list from PlayerPrefs
298         PendingScoreList scoreList;
299         if (PlayerPrefs.HasKey(key))
300         {
301             string existingJson = PlayerPrefs.GetString(key);
302             scoreList = JsonUtility.FromJson<PendingScoreList>
                  (existingJson);
303         }
304         else
305         {
306             scoreList = new PendingScoreList();
307         }
308
309         // Add the new score entry
310         scoreList.entries.Add(new PendingScoreEntry
311         {
312             username = username,
313             score = score
314         });
315
316         // Convert the updated list back to JSON and store it
317         string updatedJson = JsonUtility.ToJson(scoreList);
318         PlayerPrefs.SetString(key, updatedJson);
319         PlayerPrefs.Save();
320     }
321
322     // Upload Scores stored in the PlayerPrefs
323     private void TryUploadAllPendingScores()
324     {
325         string key = "PendingScores";
326         if (!PlayerPrefs.HasKey(key)) return;
327
```

```
328         string json = PlayerPrefs.GetString(key);
329         PendingScoreList scoreList =
              JsonUtility.FromJson<PendingScoreList>(json);
330
331         if (scoreList == null || scoreList.entries.Count == 0) return;
332
333         StartCoroutine(UploadAllScoresCoroutine(scoreList));
334     }
335
336     IEnumerator UploadAllScoresCoroutine(PendingScoreList scoreList)
337     {
338         string key = "PendingScores";
339
340         foreach (var entry in scoreList.entries)
341         {
342             bool isDone = false;
343             LeaderboardCreator.UploadNewEntry(publicLeaderboardKey,
                  entry.username, entry.score, (msg) =>
344             {
345                 isDone = true;
346             });
347
348             yield return new WaitUntil(() => isDone);
349         }
350
351         // Clear local queue after all uploads complete
352         PlayerPrefs.DeleteKey(key);
353         PlayerPrefs.Save();
354
355         GetLeaderboard();
356     }
357 }
358
```

## APPENDIX E: Usability Testing Survey

# **[Post-Game Survey]** Herbal Madness – Discover The Healing Power Of Chinese Herbs Through Interactive Gameplay

👏 **Hello again and Welcome to the Post-Testing Survey!**

Thank you for participating in the gameplay experience! Again, I'm **Lim Ai Vi**, a final-year student in **Multimedia Computing** at **Faculty of Computer Science and Information Technology (FCSIT), Universiti Malaysia Sarawak (UNIMAS)**. This survey is part of my final year project, which involves developing an engaging and educational game focused on **Traditional Chinese Herbal Medicine**. The game aims to enhance public understanding of Chinese herbs and their practical uses through interactive and enjoyable gameplay. This final year project is conducted under the supervision of Dr Suriati Khartini Binti Jali.

This **post-survey** aims to evaluate any changes in your understanding of Chinese herbs and their herbs combination **after playing the educational game**. By comparing your answers with the pre-game survey, I can assess the effectiveness of the game in enhancing your knowledge. The questions also include your overall game experience and usability of features. Your responses are valuable in helping me to improve future versions of the game and educational content.

**The game can be accessed though the emoji below:**
‼️✨👉HERBAL MADNESS GAMELINK👈✨‼️

Your participation involves completing the attached survey above. This survey consists of four sections:

- **Section A: Demographic Information** 👥
- **Section B: User Interface Design and User Experience** 🎮
- **Section C: System Usability Scale (SUS)** ⚖️
- **Section D: Knowledge Assessment** 👁️

By participating in this survey, you have given your consent to answer the questions given. All responses will be kept private and confidential for the mean of research analysis purposes only. Your consent and confidentiality will not be taken for granted. There will be no third party having the knowledge of knowing what you have written in this survey.

If you have any questions or concerns about this survey, please feel free to reach out to me at **79877@siswa.unimas.my**

* Indicates required question

1. I understand that my participation in this study is entirely voluntary and that I may choose to withdraw from the study at any time without penalty. I have read and understood the information provided. By clicking "I agree" below, I consent to participate in this study. *

*Tick all that apply.*

- [ ] I agree

## Section A: Demographic Information

This section consists of brief information about you and your background.

2. What is your gender identity? *

*Mark only one oval.*

- ◯ Male
- ◯ Female

3. How old are you? *

*Mark only one oval.*

- ◯ 18 - 22
- ◯ 23 - 29
- ◯ 30 - 39
- ◯ 40 - 49
- ◯ Above 50

4. What is your race? *

*Mark only one oval.*

- ◯ Malay
- ◯ Chinese
- ◯ Indian
- ◯ Bidayuh
- ◯ Iban
- ◯ Other: _____

5. What is your level of education? *

*Mark only one oval.*

- ◯ College/Pre-University/Diploma
- ◯ Bachelor's degree
- ◯ Postgraduate degree
- ◯ No formal education

## Section B: User Interface Design 🎨

In this section, you will be question about interface design of the game.

6. **The game is easy to navigate.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

7. **The colors and graphics used in the game are visually appealing.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

8. **The text, buttons and icons in the game are easy to read and understand.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

9. **The sound cues and effects in the game enhance the gaming experience.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

10. **The content is coherent and easy to understand.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

11. **The visual feedback is sufficient and clear.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

## Section B: User Experience 🔍 *(continued)*

In this section, you will be question about your overall game experience.

12. **This game makes learning Traditional Chinese Medicine (TCM) easy and engaging.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

13. **The game elements and educational content are well integrated into the gameplay.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

14. **This game significantly improved my understanding of TCM, particularly regarding herbs and their tea remedies.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

15. **I would consider trying out herbal teas for minor ailments in real life.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

16. **I would recommend this game to others as a way to learn about TCM.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

## Section B: Feedback 💬 *(continued)*

*Any feedback are welcome here :D*

17. Which features of the game helped you learn about Chinese herbs and remedies the most? *

*The book, NPC interactions, crafting system, feedback, etc.*

18. What did you like most about this game and what are its main strengths? *

*Fun gameplay, interesting scenarios, appealing visuals, educational value, etc.*

19. What did you dislike about this game and what are its main weaknesses? *

*Unclear instructions, complex gameplay, educational effectiveness, etc.*

20. What changes or improvements would you suggest to make the game better? *

*Dynamic feedback, more herbs and remedies, more varied personality and background of NPCs, etc.*

## Section D: System Usability Scale(SUS) 🛠

The **System Usability Scale (SUS)** is a widely adopted instrument for evaluating system usability. It offers an efficient and dependable method to quantify usability, facilitating the identification of areas for enhancement and enabling comparative assessments across various systems.

21. **I think that I would play this game frequently.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

22. **I found the game is unnecessarily complex.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

23. **I thought the game was easy to use.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

24. **I think that I would need to support of a technical person to play this game.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

25. **I found various functions in this game were well integrated.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

26. **I thought there was too much inconsistency in this game.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

27. **I would imagine that most people would learn to play this game very quickly.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

28. **I found the game was very difficult to use.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

29. **I felt very confident playing the game.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

30. **I would need to learn a lot of things before I could get going with this game.** *

*Mark only one oval.*

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Stro | ◯ | ◯ | ◯ | ◯ | ◯ | Strongly agree |

## Section D: Knowledge Assessment

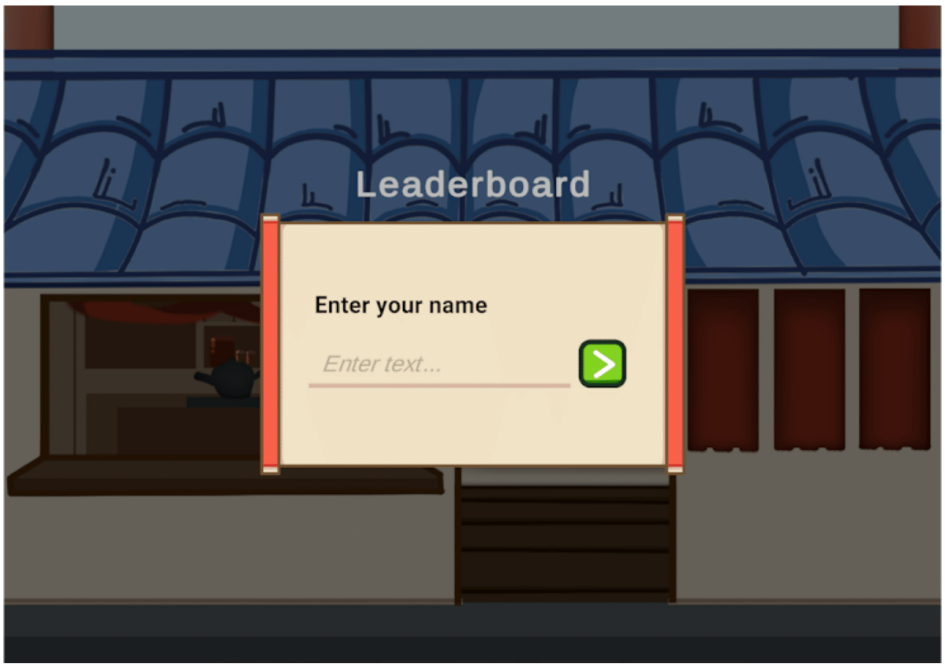
In this section, you will be question about your scores from pre-testing session and in-game session.

31. What is your score in your pre-testing survey? *

e.g., 0, 1, ..., 10.

32. Based on the game, what is your final score in the leaderboard? *

*e.g., n/10, where n = 0, 1,...,10*



## Section D: Knowledge Assessment *(continued)*

In this section, you will be question about your knowledge retention after the gameplay.

33. For someone with both anxiety and digestive issues, which herb addresses both? *

*Mark only one oval.*

- Lavender
- Goji Berry
- Rose
- Mint

34. In Traditional Chinese Medicine, which organ system governs eye health? *

*Mark only one oval.*

- Heart
- Kidney
- Liver
- Spleen

35. What does "qi stagnation" typically cause? *

*Mark only one oval.*

- Excessive sweating and fever.
- Bloating, mood swings, and digestive issues.
- Dry cough and throat irritation.
- Cold hands and feet.

36. Which concept describes insufficient moistening fluids in the body? *

*Mark only one oval.*

- Blood stasis
- Yin deficiency
- Yang deficiency
- Qi stagnation

37. "Phlegm-dampness" in Traditional Chinese Medicine is often caused by what? *

*Mark only one oval.*

- Greasy foods and irregular eating
- Excessive screen time
- Emotional stress and anxiety
- Lack of sleep and overwork

38. Which of the following picture is known as Cassia Seeds? *

*Mark only one oval.*

Picture 1

Picture 2

Picture 3

Picture 4

39. What is Roselle particularly beneficial for? *

*Mark only one oval.*

- Cooling the body and supporting cardiovascular health.
- Digestive health and blood building.
- Mental clarity and focus.
- Warming the uterus and easing cramps.

40. Which herb combination would be most synergistic for treating both eye problems AND skin issues? *

*Mark only one oval.*

- Cassia Seed with Ginger
- Hawthorn with Dandelion
- Mint with Lavender
- Chrysanthemum with Goji Berry

41. What is the main therapeutic action of Rose in herbal medicine? *

*Mark only one oval.*

- Clears heat and reduces fever.
- Tonifies blood and strengthens immunity.
- Regulates qi and promotes blood circulation.
- Moistens lungs and stop cough.

42. Goji Berry primarily nourishes which organ systems according to Traditional Chinese Medicine? *

*Mark only one oval.*

- Spleen and Stomach
- Liver and Heart
- Heart and Lungs
- Liver and Kidney