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DEVELOPMENT OF A 3D APPLICATION:

A RAMEN EXPERIENCE

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Abstract

With the increasing accessibility of immersive technologies, Virtual Reality (VR) and gamified experiences have emerged as powerful tools for enhancing user engagement and learning, particularly in educational and cultural contexts. However, few applications effectively combine instructional content with a calming, culturally immersive experience.

This project, entitled *Ramen Experience*, presents an interactive, gamified MVP designed to offer users a relaxing journey inspired by Japanese culture and cuisine.

Following a user-centered design approach, the development process involved research into existing literature, branding and graphic identity creation, 3D environment modeling (Blender), iterative prototyping across Figma (2D interface design), and Unity (3D VR implementation), and usability evaluation through task-based testing, interviews, and System Usability Scale (SUS) questionnaires to gather user feedback.

Key findings from user testing revealed that participants found the experience intuitive and visually coherent, though improvements in navigation and onboarding were necessary. These insights informed iterative enhancements to both usability and interaction design.

Although the result is an early-stage MVP rather than a fully featured game, the project demonstrates the viability of integrating gamification, cultural storytelling, and technologies to craft meaningful learning experiences. Future developments will focus on expanding interactivity, deepening narrative elements, and optimizing the experience for broader audiences through further iteration and testing.

Keywords: Virtual Reality, Gamification, SUS, Figma, VR experience, Virtual Environments, User-Centered Design.

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List of Acronyms and Abbreviations

HMD - Head Mounted Display

IA - Information Architecture

MVP - Minimum Viable Product

SUS - System Usability Scale

UCD - User-Centered Design

UI - User Interface

UX - User Experience

VR - Virtual Reality

VRE - Virtual Reality Environment

VRTK - Virtual Reality Toolkit

1. Introduction

1.1 Context

Over the last decade, the integration and use of gamification and Virtual Reality (VR) technologies in educational and training environments has grown across sectors, such as healthcare, information technology, and education.

Gamification emerged as a powerful strategy to increase engagement by creating interactive and rewarding experiences in non-gaming contexts (Mohanty and Christopher, 2023).

Simultaneously, VR evolved from cumbersome early hardware to accessible stand-alone devices, such as the Oculus Quest and Pico Neo, enhancing its usability and potential as a learning tool (Barnard, 2023). This technological advancement led researchers and businesses to develop various services for this technology.

By immersing users in a 3D environment, VR minimizes external distractions and boosts learning retention through experimental engagement (Kharoub et al. 2019). This makes VR particularly effective for skill-based learning and cultural education.

With the gaming industry and video games becoming one of the most engaging forms of entertainment (Palmas et al., 2019) and education, the use of VR and 3D environments in Portugal expanded significantly in recent years (Caçador, 2021). However, many 3D VR applications still faced limitations, including simplistic interactions and usability issues (Kharoub et al. 2019), presenting an opportunity to explore the VR cooking simulation genre further.

Cultural games gained renewed interest, particularly during the pandemic, due to their ability to connect users to traditions, values, and experiences in an engaging way (Theodoropoulos and Antoniou, 2022).

The combination of gamification and VR demonstrated promising results in promoting engagement, reflection, and user interpretation, reinforcing the potential of these technologies for educational purposes.

This Master's project was built on this trend by exploring how gamified VR experiences could foster learning in the context of Traditional Japanese Cuisine, specifically by guiding users through the preparation of Ramen while promoting cultural immersion and basic cooking skills.

1.2 Objectives

The primary objective of this project was to design and develop an immersive and educational VR prototype, *Ramen Experience*, that taught users how to prepare ramen while offering insights into Japanese culture.

The application was developed using a User-Centered Design (UCD) approach to ensure that it was engaging, usable, and accessible, especially for first-time VR users.

Additionally, the project also aimed to:

- Identify and address usability challenges, especially for first-time VR users;
- Integrate gamification principles to enhance user engagement and learning outcomes;
- Incorporate Japanese cultural elements into the experience to provide context and deeper meaning;
- Develop a Minimum Viable Product (MVP) that could serve as a foundation for future iterations and larger-scale educational platforms.

With these objectives defined, the next section introduces the research questions that guided the project's development.

1.3 Research Questions

This project was driven by the following research questions:

- Q1: Was the developed application/prototype perceived as usable?
- Q2: What were the most common usability issues encountered by beginner Virtual Reality users in educational applications like this one?
- Q3: Could users easily understand the steps involved in ramen preparation within the Virtual Environment?

1.4 Methodology Overview

To address these objectives and research questions, the project employed a methodology combining comparative analysis, user interviews, and iterative prototyping, aligned with User-Centered Design (UCD) principles.

The process was divided into three major phases:

- **Comparative Analysis**: Examination of similar applications that blended gamification, VR, and cultural learning to identify gaps and effective strategies;
- **User Research:** Interviews with potential users to define expectations, frustrations, and ideal features;
- **Prototyping:**

    - Model of a Japanese-style environment and cooking elements in Blender;
    - Design the interaction flow using Figma to create a high-fidelity prototype;
    - Develop a VR MVP using Unity and test it on Meta's Oculus Quest 2 headset.

Each phase included evaluation steps, such as usability testing and feedback questionnaires, that guided design decisions and refinements.

1.5 Document Structure

The remainder of this thesis is organized as follows:

- **Chapter 2:** The Literature Review explored the theoretical foundations of gamification and VR, including their use in learning and cultural experience;
- **Chapter 3:** Methodology detailed the user-centered Design process, including comparative analysis, user interviews, and persona development;
- **Chapter 4:** Implications for Design discussed insights gathered from both research and user interviews and how they informed the design decisions
- **Chapter 5:** Design described the process of creating the Figma and VR prototypes, from initial wireframes to interactive MVPs
- **Chapter 6:** Usability tests detailed the testing phase, user feedback, and iterations made to improve usability and engagement
- **Chapter 7:** Conclusions and Future Work summarized the findings and suggests directions for continued development.

Searches were conducted primarily through databases such as Google Scholar, SJR, ScienceDirect, books, and other relevant references.

The search terms included Gamification, Learning, and Virtual Reality.

2. Literature Review

This chapter reviewed the literature relevant to the development of a gamified educational Virtual Reality prototype. It focused on gamification principles, immersive VR environments, and their integration in educational settings, particularly those related to culinary learning.

This foundation helped establish the basis for subsequent methodology and design choices made during the prototype development.

2.1 Gamification & Learning

Gamification refers to the integration of game elements, such as progression systems, feedback mechanisms, rewards, and challenges into non-game contexts to foster motivation, engagement, and user interaction (Deterding et al., 2011; Schöbel et al., 2021). While the term itself gained popularity in recent decades, its conceptual roots extended back to the 19th-century educational practices (Mohanty and Christopher, 2023)

In educational settings, gamification has been shown to improve knowledge retention, foster active participation, and promote the development of skills such as problem-solving and critical thinking. It also increases users' motivation and their sense of accomplishment (Hamari et al., 2014; Hudson et al., 2022; Zichermann & Cunningham, 2011; Deterding et al., 2011). These outcomes can also be linked to users psychological needs, particularly autonomy, competence, and relatedness, which have been identified as key factors in sustaining intrinsic motivation and meaningful engagement (Huang et al., 2019). Gamified environments can support these needs by offering user agency, clear and responsive feedback, and culturally resonant content, fostering not only task completion but also personal investment and long-term learning engagement.

This shift from passive to active learning models enabled by gamified environments encourages deeper learner involvement and satisfaction, aligning with user-centered educational strategies.

In the following subsection, further discussion is provided on how gamification is shaped into game-specific mechanics.

2.1.1 Game Design & Feedback

Effective gamified learning environments typically rely on game design elements such as clear objectives, real-time feedback, user progression paths, and narrative structures to support sustained engagement. These components transform learning into an active and rewarding process (Schöbel et al., 2021).

Feedback mechanisms, including visual indicators such as progress bars and levels, provide users with information on their performance and guide them on how to improve (Hong et al., 2024).

Narrative design also plays a critical role in gamification. Storytelling was found to improve user engagement by offering a personal and emotional context through which users can relate to the material (Hong et al., 2024). Environments embedded with cultural or thematic narratives enable users to follow structured and meaningful learning paths.

Research further suggested that competitive elements, while common in gamified platforms, are not always necessary or beneficial. Non-competitive systems that emphasize progress, exploration, and self-paced learning have been proven to be valuable in inclusive and diverse learning environments (Mohanty and Christopher, 2023).

These principles lead to their application in immersive technologies, namely, Virtual Reality, which is explored in the next section.

2.2 Virtual Reality

Virtual Reality represents a significant evolution in digital interaction by enabling users to engage with fully simulated 3D environments. It is defined as the computer-generated environments that simulate physical presence and enable user interaction within a simulated digital space (Jerald, 2015).

A unique strength of VR lies in its ability to provide both physical and mental immersion, distinguishing it from traditional forms of media such as books or films. Immersion was primarily achieved through headsets that enveloped the user's visual and auditory fields, creating a compelling sense of presence within the virtual environment (Girvan, 2018; Theodoropoulos and Antoniou, 2022).

Technological advances, from early head-mounted displays in the mid-20th century to modern devices such as the Meta Oculus Quest, have made VR more accessible and intuitive for educational applications (Barnard, 2023; Kharoub et al., 2019).

With companies such as Meta and Sony developing affordable consumer-grade headsets, VR has expanded from research laboratories into the mainstream market, particularly in gaming and education. Today, VR devices are integrated into training programs in fields such as medicine, engineering, and cultural heritage, where immersive learning environments can enhance skill acquisition and engagement (Webster & Dues, 2017; Schöbel et al.,2021; Hardawar, 2023).

In education, VR has demonstrated the ability to enhance concentration, promote active learning, and reduce external distraction through its headset (Rahimi et al., 2018; Won

et al., 2023). In particular, VR allows users to explore historical, spatial, and temporal scenarios beyond the limitations of traditional learning, thereby offering a unique opportunity for experiential education.

However, VR is not without limitations. Issues such as motion sickness, cognitive overload, interface complexity, and the learning curve associated with unfamiliar controls can hinder the user experience.

Prior research emphasized the importance of applying user-centered design to VR, suggesting the use of simplified navigation, paced content delivery, and visually calming environments to improve user comfort (Theodoropoulos and Antoniou, 2022; Schöbel et al., 2021; Rahimi et al., 2018).

Aesthetic design has also been identified as a crucial element in supporting immersion. According to Theodoropoulos and Antoniou (2022), beyond visual fidelity, emotional resonance and cultural relevance are shown to enhance user enjoyment and engagement, particularly in VR cultural heritage applications. In their study, participants appreciated the opportunity to explore spaces that would otherwise be inaccessible, whether in real historical locations, past events, or fictional narratives.

These principles laid the groundwork for understanding how VR could be integrated with gamified systems for educational purposes, which is explored in the next section.

2.3. Gamification and VR in Learning

The combination of gamification and VR offers new possibilities for educational innovation, particularly in domains requiring procedural skill acquisition, such as cooking. When combined, the learning environment becomes interactive, multisensory, and contextually richer. This enables users to physically engage with tasks while receiving real-time feedback in an immersive space (Palmas et al., 2019).

The integration of these two concepts, in genres such as culinary education, shows a strong potential. Users can manipulate virtual ingredients, observe cooking processes, and follow structured recipes, without any physical limitations. For example, some simulators allow to learn chopping techniques or time-sensitive operations, simulating real-world kitchen scenarios. By progressing through increasingly complex tasks, users build confidence and procedural knowledge that can be transferred to real-world practices (Érica et al., 2020).

In gamified VR environments, real-time responses and a sense of achievement enhance engagement and knowledge retention (Theodoropoulos and Antoniou, 2022).

This is more effective when usres are placed in scenarios where the difficulty of tasks matches their skill level, an approach that encourages deep focus, sustained motivation, and

immersive learning. Such balance creates conditions for highly engaging sense described as *flow*, where users experience a sense of fluid involvement and intrinsic enjoyment without distraction (Vann and Tawfik, 2020). Features such as clear goals, immediate feedback, and seamless interaction contribute to this state. In the context of VR, spatial immersion and embodied interaction further reinforce this deep engagement, allowing users to become fully absorbed in the educational scenario.

These experiences can be enriched further by incorporating cultural and narrative elements, which make learning more relatable and emotionally compelling.

According to Champion and Bekele (2019), VR experiences in cultural heritage allow users to explore reconstructed spaces and scenarios from history.

These findings underscore the pedagogical strength of integrating VR and gamification, and form the basis for comparing the immersive approach with traditional educational models, as explored in the following section.

2.4 Comparing VR and Traditional Learning

A growing body of research has sought to evaluate how VR-based learning compares to traditional learning methods. According to Santilli et al. (2024), such comparisons highlight the distinct advantages of VR in terms of engagement and interactivity. Although VR does not entirely replace traditional methods, it complements them.

Their review highlighted that interactivity, rather than immersion alone, played a more decisive role in learning outcomes. In culinary education, for instance, VR could effectively deliver conceptual and procedural knowledge, while real-world kitchen practice remained vital for mastering fine motor skills (Wörner et al., 2022). This led to recommendations for blended learning models that combined digital and physical learning environments for optimal results.

Research also indicates that most studies have focused on the preparation of digital gamification rather than its implementation (Hong et al., 2024). While gamification generally enhances motivation and engagement in educational contexts, potential disadvantages include an increased sense of competition (Hamari et al., 2014). Such a drawback could be mitigated by designing systems that valued progress, exploration, and intrinsic motivations over external rewards.

Additionally, existing literature noted that many studies concentrated on the theoretical design of gamified learning, with fewer focusing on practical implementation and user outcomes (Hong et al., 2024). Scöbel et al. (2021) emphasized that while individual

gamified elements could enhance motivation, the effectiveness of VR education also depended on holistic design strategies that aligned gameplay with educational objectives.

These comparisons framed the methodological direction of this project, which adopted a user-centered, iterative design process. The following chapter outlines the methodology approach used to design and develop the prototypes, from initial research to implementation.

3. Methodology

This chapter outlines the methodology used to achieve the objectives of this project, which aimed to design and evaluate a gamified VR-based culinary learning experience focused on ramen preparation, incorporating user feedback at every development stage.

A User-Centered Design (UCD) approach guided the entire project. UCD emphasizes user involvement throughout the design and development process. This approach provided the framework for identifying user needs, creating context-appropriate solutions, and validating design decisions through iterative feedback and testing.

To this end, the project followed an iterative design process structured in four main phases.

1. **Comparative Analysis of Similar Applications**

   A review of existing VR cooking and educational applications was conducted to identify best practices, understand features, and highlight gaps in current offerings. This analysis guided decisions regarding the integration of gamified elements, instructional clarity, and immersive features tailored to this project's goal.

2. **User Interviews and Insight Collection**

   Initial interviews were conducted with potential users to identify their expectations, frustrations, and preferences for a VR cooking application. Questions focused on:

   - The desired balance between cultural immersion and practical learning
   - Preferred gamified elements, tutorial clarity, and interactive features
   - Key functionalities to create an effective and enjoyable VR learning experience

This step provided foundational insights into how users envisioned a culturally immersive and practical VR learning environment, thus providing important insights for persona creation.

3. **Data Analysis and Persona Development**

   Data gathered from interviews and comparative analyses were the basis for the creation of user personas. These personas represented the target users' needs and motivations, informing design decisions for the 3D house environment, Figma prototype, and later, VR application.

4. **Prototyping and Usability Testing**

   - **Figma Prototype Development:** The first iteration of the application design was developed as a mobile prototype, as shown in Figma. This prototype

served as a preliminary model to visualize user flow, navigation structure, and interface elements. User testing at this stage identified areas for improvement.

- **VR Prototype Creation:** Based on the insights from Figma testing, the VR prototype was developed for the Meta Oculus Quest 2. The VR environment simulated a Japanese-style home and kitchen, complete with culturally significant decor and utensils. The design also included an interactive learning path, enabling users to experience step-by-step instructions for preparing ramen at home.

The Figma and VR prototypes' usability testing employed the System Usability Scale (SUS) to measure their effectiveness (the users' ability to complete the set tasks), efficiency (the ease and speed of task completion), and satisfaction (the users' subjective enjoyment of the experience).

3.1 Comparative Analysis

Cooking is a central aspect of daily life and is frequently explored in both casual and educational video games. These range from highly realistic simulations to abstract, gamified competitive cooking games. Considering that this project was designed for the Meta Oculus Quest 2 device, the analysis focused mainly on VR cooking games available for this device.

A comparative analysis offers a structured approach to evaluate the market competitors in this genre. It serves as a tool to inform design decisions, prioritize essential features, and refine the User Experience (UX). By understanding the strengths and purpose of existing applications, it becomes possible to align the prototype more closely with user needs.

Meta's 2022 blog post highlighting the top VR cooking games served as a starting point. Among the games identified, *Counter Fight ICHIRAN, Cook-Out,* and *Lost Recipes* were selected for closer analysis due to their notability and gameplay style.

Additionally, the Nintendo Switch game *Cooking Mama: Cookstar* was included for its notability in the cooking genre game sphere, engaging gamification, and gameplay mechanics.

Common features among these games included visually appealing graphics, dynamic and interactive gameplay, and diverse actions for preparing dishes, which collectively provided a foundation for designing the Figma and VR Prototypes.

The primary goal of this analysis was to gain insights into existing applications, acknowledge their strengths and weaknesses, determine which features should or could be adapted for this project, and provide a base for the development of the prototype and, in the future, full implementation.

3.1.1. Applications

The following section introduces the selected cooking application used in this comparative analysis, each representing distinct gameplay styles, user interactions, and learning potentials. This part focuses on their individual characteristics, gameplay mechanics, that contributed to the genre. Together these applications offer concrete reference points for identifying design patterns, cultural elements, and user experiences could inform the development of the cultural immersive VR prototype.

Bellow is the analysis of each application and its defining features:

- **Counter Fight ICHIRAN**

Figure 1 - Counter Fight ICHIRAN screens

Counter Fight ICHIRAN is a VR simulation game based on the renowned Japanese ramen restaurant chain ICHIRAN, celebrated for its signature Tonkotsu ramen dish. This game immerses players in the fast-paced experience of managing their own ICHIRAN ramen shop.

In this game, users can step into the role of an ICHIRAN employee, taking on tasks that mirror real-life restaurant operations. The users must demonstrate their culinary skills by preparing ramen orders accurately and efficiently to satisfy customer demands and earn high scores. The gameplay consists of quick decision-making, multitasking, and precision.

- **Cook-Out: A Sandwich Tale**

Figure 2 - Cook-Out: A Sandwich Tale screen

Cook-Out: A Sandwich Tale is a cooperative VR cooking game developed by Resolution Games and released in 2020. This game is designed for multiplayer gameplay but also supports single-player mode. Users serve impatient and diverse customers, ranging from kings and princesses to werewolves and mice. The game challenges players to prepare

sandwiches under time constraints and escalating pressure. Users are not limited to sandwich assembly, they must also manage multiple tasks, creating a complex and immersive experience that tests multitasking skills. This light-hearted and colorful game, along with its quirky characters, was also mentioned on Meta's blog as one of the best VR cooking games.

- **Lost Recipes**

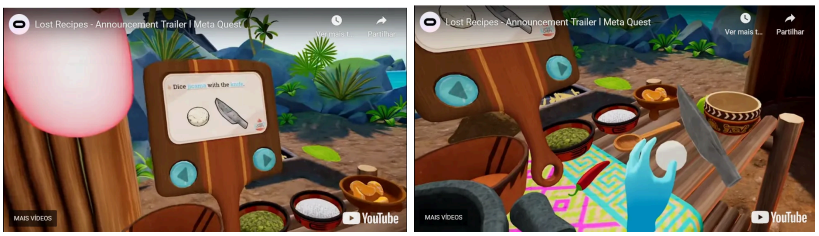

Figure 3 - Lost Recipes screens

Lost Recipes stood out from other VR cooking games due to its unique approach that prioritized learning and cultural immersion over fast-paced, high-pressure gameplay.

Developed by Shell Games, it combines elements of a game, a simulator, and an educational experience, inviting users to explore and recreate authentic recipes from three historically significant cultures: Greek, Chinese, and Mayan.

This game takes users on a cultural journey, teaching the historical significance behind each dish while guiding them through the preparation process. It allows users to take their time while cooking, encouraging a reflective and immersive experience. One of the game's standout features is its ability to teach users recipes that they can replicate in real life, bridging the gap between virtual and practical skills. It provides clear, step-by-step instructions that help users focus on learning and enjoying the process rather than competing against time or managing multiple tasks.

Lost Recipes had the most similar game concept to this project.

- **Cooking Mama: Cookstar**

Figure 4 - Cooking Mama: Cookstar screens

Cooking Mama is a well-established franchise that has shaped the cooking game genre since its debut on the Nintendo DS and 3DS. Cooking Mama: Cookstar, developed for

the Nintendo Switch, built upon the franchise's signature gameplay, offering enhanced user interaction with its controllers and a cozy and relaxed atmosphere.

This franchise stands out for its diverse range of recipes, covering various cuisines, and its visually appealing, vibrant graphics that show realistic-looking food. It offers a calm and enjoyable gaming experience, making it appealing for casual gamers seeking a low-stress, engaging activity.

3.1.2 Application Analysis

Cooking games have diversified over the years, and offer a broad spectrum of experiences, from realistic simulations to abstract and chaotic gameplay. In the VR cooking genre, titles stand out by adopting unique approaches to user interaction, aesthetics, and learning outcomes.

The comparative analysis focused on the four games discussed previously: *Counter Fight ICHIRAN, Cook-Out: A Sandwich Tale, Lost Recipes*, and *Cooking Mama: Cookstar.* To identify gameplay mechanics, visual design, and game elements that could inform this project's prototype, the following tables were made: Table 1 and Table 2.

The analysis highlighted distinct gameplay styles and objectives across the games, each catering to different user preferences, and provided critical design insights for this project's VR cooking prototype.

Counter Fight ICHIRAN and *Cook-Out* focus on fast-paced, high-pressure tasks, appealing to users seeking dynamic and chaotic gameplay. In contrast, *Lost Recipes* provides a slower, educational approach, focusing more on cultural immersion and learning, while *Cooking Mama* provides a balance between entertainment, simple mechanics, and vibrant visuals.

Realism played an important part in user immersion. *Counter Fight ICHIRAN* and *Lost Recipes* simulated real-world environments and tasks, fostering user engagement by providing transferable skills beyond the virtual environment.

Despite their differences, each game offered features that could be incorporated into this project's prototype. For example, *Lost Recipes'* emphasis on cultural education aligned with this project's goal of teaching users how to prepare traditional dishes in a culturally immersive setting, *Counter Fight ICHIRAN's* realistic simulation inspired house design choices, and *Cooking Mama: Cookstar's,* intuitive control system and step-by-step could be adapted to VR to improve accessibility and ease of use.

Many cooking games focus on competition or time-constrained gameplay, yet there was clear room for a calmer, more educationally immersive approach. This research provided

a foundation for identifying gameplay elements, aesthetic choices, and feature sets to inform this project's design.

The following tables show a direct analysis and a more visual way, the main features of the analysed applications, and the main features that the project aimed to focus on.

Table 1 compares features across the analysed applications, while Table 2 shows that none of the analysed applications have all the intended features for the application design.

	Counter Fight ICHIRAN	Cook-Out: A Sandwich Tale	Lost Recipes	Cooking Mama: Cookstar
Gameplay	Realistic simulation; Task-focused & repetitive gameplay centred on food preparation and customer service Single Player	Chaotic Multiplayer-focused Emphasizes teamwork, while juggling tasks such as grilling, assembling sandwiches, and washing dishes, all the while handling increasingly stressful conditions	Historical and educational simulation Creation of authentic dishes from Greek, Chinese, and Mayan cultures Focus on slower, methodical gameplay, allowing users to learn both the cooking process and the cultural significance behind the dishes	From a well-known franchise. Simple and easy mechanics, and cartoon aesthetics. Minimal time constraints and to be enjoyed at a leisurely pace
Key Features	Realistic culinary tasks (cooking ramen, serving customers) Focus on precision and speed	Cooperative multiplayer gameplay Fast-paced, action-heavy cooking mechanics Humour and fantasy elements in customer design (kings, werewolves)	Culturally immersive, historically accurate recipes Slow-paced, educational gameplay Calm and cozy atmosphere	Wide variety of recipes Cute, cozy, and relaxed gameplay Simple controls and short cooking tasks Family-friendly aesthetics
Comparison	More grounded in reality Not much freedom or narrative expansion	Multiplayer collaboration Less precision, more chaos management with friends	Most educational and laid-back game Aligns more with simulation and learning rather than just entertainment	Less realistic and immersive than Counter Fight ICHIRAN;

				Provides a cozy, simplified cooking experience Appeals to casual gamers

Table 1 - Thematic Analysis of Cooking Apps in the Market

App Name	VR	Gamification	Cultural Immersion (Space)	Step-By-Step Information
3D Ramen Experience	**Yes**	**Yes**	**Yes**	**Yes**
Counter Fight ICHIRAN: Cook Ramen in VR	Yes	Yes	No	Yes
Cook-Out: A Sandwich Tale	Yes	Yes	No	No
Lost Recipies	Yes	Yes	No	Yes
Cooking Mama: Cookstar	No	Yes	No	Yes

Table 2 - Application Feature Comparative Analysis

This comparative analysis served as a foundation for identifying gameplay and design elements that could be adapted into the Figma prototype and subsequent VR prototype.

3.2 User Interviews

Built upon insights from the comparative analysis, the next phase involved conducting user interviews with potential users.

User interviews are an essential research method that helps uncover information about users' needs, preferences, frustrations, and behaviours. They provide insights that inform the design process, ensuring user-centered outcomes. User Interviews also serve as the foundation for creating personas, which in turn help align design decisions that are user-focused, aligning with their needs and behaviours.

3.2.1 Interviews with Potential Prototype Users

To gather insights for this project, interviews were conducted with potential users who could represent the target audience. Participants were chosen from two age groups to capture different perspectives on preferences and expectations for a VR cooking experience, focused on ramen, but infused with Japanese cultural elements.

This process, which followed the principles of User-Centered Design, was fundamental to achieving this project's design goals.

Three individuals, two men and one woman, aged between 22 and 53, were interviewed. Participants were selected based on their interest in Japanese culture and cuisine, particularly ramen. Due to geographic constraints, all interviews were conducted via video call, with live annotations recorded during the process. Each interview lasted approximately 10 minutes and included 9 questions (see Appendix 3 for full transcripts). Some focused on design specifics, and others on general attitudes towards learning and gameplay. The interviews were conducted in Portuguese for ease of communication.

3.2.2 User Interviews Results

Following the interviews, the collected qualitative data were analyzed thematically. Patterns in user responses revealed common motivations, learning styles, and desired features of the application:

a) **Interest levels:** All respondents expressed varying degrees of interest in Japanese culture, with a generally positive view towards using games for learning. This suggests that there is a shared enthusiasm for culturally enriched, gamified experiences in education
b) **Familiarity with Ramen:** All participants have a basic understanding of ramen, indicating that the VR experience should focus on enhancing existing knowledge, with preparation techniques and cultural context, rather than introducing the dish from scratch.
c) **Learning preferences:** Participants favoured step-by-step tutorials with clear guidance and a blend of entertainment and educational value, reinforcing the need for an interactive and engaging learning structure. Participant 2# suggested having the ability to save the recipe to afterwards be able to use it in real life after the experience. Participant 3# wished to be able to see the ingredients and other kitchen utensils that they may use (such as chopsticks, for example); Participant 1# and 2# remarked that it would be interesting to learn other cultures in the experience, by having information on other aspects of the house as well.

3.2.3 Suggested Features

Through the initial user interviews, it was possible to gather some feature insights:

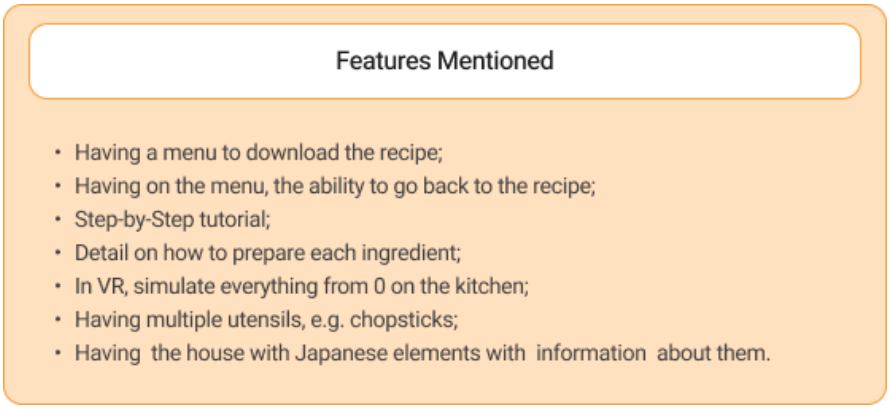

Figure 5 - Initial interviewees' suggested features

These findings helped align the prototype and the principles of UCD with the expectations of real users. Combined with the System Usability Scale (SUS) testing later in the development process, the project aims to develop a minimum viable VR product that is both culturally immersive and educationally effective.

3.3 Persona

Based on the user interviews, persona scenarios were developed to capture the common characteristics, goals, and preferences, representing the target audience. The personas included demographic data, shared interests, and motivations, offering a tangible reference throughout the design process.

Scenario 1

Figure 6 - Persona 1

Mariana, a 22-year-old master's student in language studies, is always on the lookout for new ways to immerse herself in Japanese Culture. Between studying and working part-time, she carves out time to engage in her passions, whether it's gaming, attending cosplay events, or finding out the best ramen restaurants in her city. Lately, she finds herself wanting a deeper experience, one that goes beyond just consuming culture, one that she can actively participate in.

When, on a convention, she hears about the Ramen Experience App in VR, she is instantly intrigued. The app offers her an unique opportunity: to learn how to make her favourite dish in an immersive Japanese-inspired house. She imagines herself not only preparing ramen virtually, but also feeling more confident to try it in real life. Although she does not have the habit of cooking, she prefers clear, guided instructions, the app's step-by-step format and interactive guidance appeal to her. It helps simplify the search through the overwhelming number of online recipes and lets her enjoy the process as part of a playful, gamified, culturally rich experience. Mariana sees the app as the perfect preparation for her next cosplay event. This time, she plans to impress not just with her outfit, but also with her newly discovered ramen-making skills.

Scenario 2

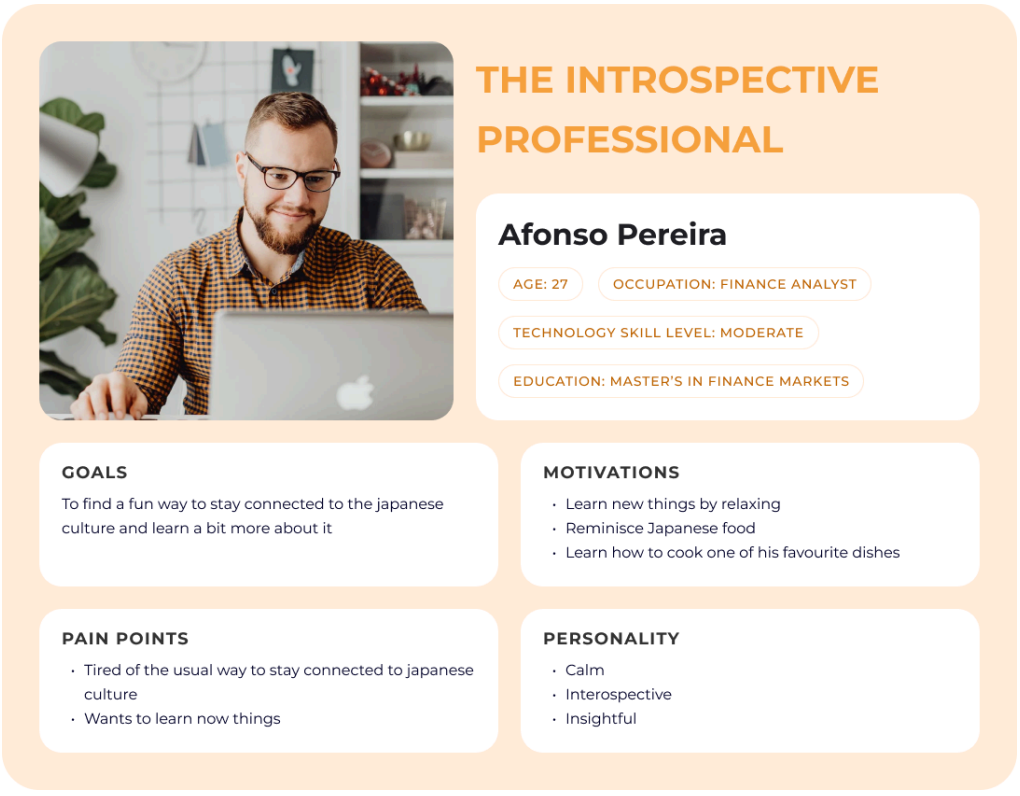

Figure 7 - Persona 2

Afonso, a 27-year-old finance analyst, leads a busy life running his small consultancy firm. With his packed schedule, one ritual helps him stay grounded: listening to Guzheng music while working. It reminds him of his trip to Japan he took a few years back. Since then, he's tried various ways to stay connected with Japanese Culture, but nothing quite reignited that spark. Traditional media and language apps feel too passive, and he's looking for something more meaningful, yet calming.

When he discovers the Ramen Experience App for VR, it feels like a refreshing alternative. The idea of entering a serene, Japanese-style home and being able to prepare ramen offers him both relaxation and cultural immersion. He's particularly drawn to the slow-paced, ambient flow of the experience, which contrasts with his fast-paced professional world. While experiencing the app, he not only rediscovers the flavours and memories of Japan, but also finds a meditative space to unwind and learn something new. For him, this app becomes more than a simple game, it turns into a bridge to reconnect with memories and ignites his will to incorporate some Japanese style aspects into his own real life.

By creating persona profiles (Figures 6 and 7), design decisions were informed for both the 3D environment in Blender, the interactive Figma Prototype, and the VR MVP.

3.4 Prototyping and Usability Testing

The evaluation process was divided into two stages: the creation and testing of the Figma-based mobile prototype and the Virtual Reality prototype developed for the Meta Oculus Quest 2. Both prototypes were iteratively evaluated using the System Usability Scale (SUS) and custom questionnaires designed to assess effectiveness, efficiency, and satisfaction.

An effective system design requires an early and sustained user focus, iterative development, and empirical evaluation through usability testing (Gould and Lewis, 1985). Both prototypes were tested using predefined tasks and a structured feedback system to support this process.

The SUS scientific method is a reliable and widely accepted method for evaluating user satisfaction and interface effectiveness (Brooke, 1995). This standardized questionnaire includes ten items rated on a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Strongly Disagree 1	2	3	4	Strongly Agree 5
○	○	○	○	○

Figure 8 - SUS Likert Scale example

Open-ended questions were also included to gather qualitative insights on users' perceptions, helping to identify both strengths and areas for improvement.

All questionnaire responses, including the SUS and supplementary questions, were collected immediately after each prototype test to ensure accurate and reflective feedback. The full set of questions and testing tasks is available in Annex 2.

These strategies align with the iterative design principles emphasized by Ribeiro (2007), particularly in educational and gamified applications (Theodoropoulos and Anoutinou, 2022).

Given the qualitative and exploratory nature of this study, 5 users were selected for the Figma usability testing, and 3 for the VR testing. Nielsen and Laudauer (2000; 2012) argue that by the third user, most usability issues are revealed, and their model shows diminishing returns after the fifth user, making further tests less efficient in early-stage design.

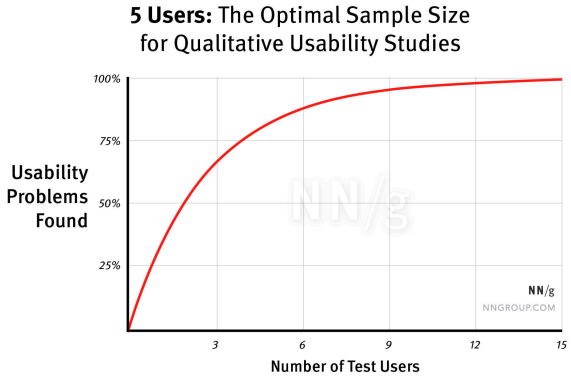

Figure 9 - Optimal sample size for usability studies (Image taken from NNG Group https://www.nngroup.com/articles/why-you-only-need-to-test-with-5-users/)

Throughout the process, data collection and iterative prototyping were fundamental in ensuring that the final design was informed by user feedback and best practices identified in the literature. This methodology supported the creation of a user-friendly and culturally immersive application, blending aesthetics and practical elements to enhance the learning experience.

The following sections outline how these principles were applied in the testing of the Figma and VR prototypes.

3.4.1 Figma Prototype

The Figma prototype served as a representation of the intended VR experience.

Participants

A total of 5 participants took part in the Figma usability tests. 3 from the original interview, and 2 new individuals. All participants had a basic level of digital literacy and were familiar with digital interfaces, but no specific knowledge of the project context was required. Prior involvement helped ensure informed feedback based on a deeper understanding of the system's intended purpose, nonetheless, the new Participants were given a context of the project.

Tasks

Users were asked to complete a set of predefined tasks representative of typical interactions within the Figma prototype. These tasks were designed to simulate real-world use cases and included:

- Select a type of Ramen;
- Access Cooking and Ingredient Instructions;
- Follow the step-by-step preparation process, as it showcases the intent of the full product.

Each task aimed to test interface clarity, button visibility, and the intuitiveness of the interaction flow.

3.4.2 Virtual Reality Prototype

The VR prototype, developed for the Meta Oculus Quest 2, simulated a Japanese-style home and kitchen. The environment incorporated culturally significant decor and utensils. Interactive sequences allowed users to perform tasks such as entering the house, interacting with the environment, and begin the ramen preparation process.

Participants

The same group of participants who tested the Figma prototype were also invited to test the VR version. 3 users participated in the VR usability tests. Before beginning, participants were briefly introduced to the VR setup and interaction mechanisms to ensure comfort with the technology. All testing sessions were supervised to provide assistance if needed and to maintain consistency across experiences.

Tasks

Users engaged in a sequence of tasks designed to reflect the spatial and interactive qualities unique to the VR environment. These tasks included:

- Navigate and enter the house, allowing the user to get used to the VR mechanics and environment;
- Learn about the Genkan (entryway), allowing the user to understand how the information would be displayed throughout the experience;
- Move to the kitchen and begin interacting with the ingredients, allowing the user to interact with the environment.

These tasks aimed to assess how effectively users could translate their expectations from a 2D interface into a 3D spacial context, and whether the VR interactions were perceived as natural and effective as intended.

This combined approach, spanning 2D, and VR interaction contexts, was structured to provide insights directly aligned with the aim of the project. The data gathered through usability testing, task performance, and qualitative feedback enabled an evaluation of how usable the application was, what challenges emerged for novice VR users, and how well the system communicated the steps of ramen preparation in an immersive environment.

Built upon these findings, the following section explores key design implications that emerged and how they influenced the final application.

4. Implications for Design

Following the collection of data from existing studies, the creation of the literature review, the comparative analysis of existing applications, and user interviews, several design implications were identified to guide the user-centered development process.

These sources allowed for a comprehensive understanding of user expectations, existing design patterns, and theoretical frameworks, allowing the design process to respond to practical and experiential user needs.

The application of the UCD methodology (Norman, 2013) structured the process, ensuring that user frustrations were addressed and solutions were iterated accordingly.

While the comparative analysis revealed best practices and desirable features from existing applications, the user interviews provided detailed insights into users' preferences, usability concerns, and ideas for improvement. These findings collectively informed a clear list of features and interaction patterns that were explored further during the prototype phase.

4.1 Features List and Categorization

Synthesizing insights from all three data sources resulted in a categorized list of core features. These were grouped into two main categories:

- **User-suggested interactions and gestures**, such as grabbing, slicing, and placing ingredients;
- **Engagement-enhancing features,** commonly observed in comparable applications, including progress tracking, environment customization, and guided step-by-step instructions.

These categories were evaluated to determine their feasibility and relevance for the two Minimum Viable Prototypes (MVPs), the Figma prototype and the VR prototype. Figure 10 illustrates the categorization of insights and selection of features:

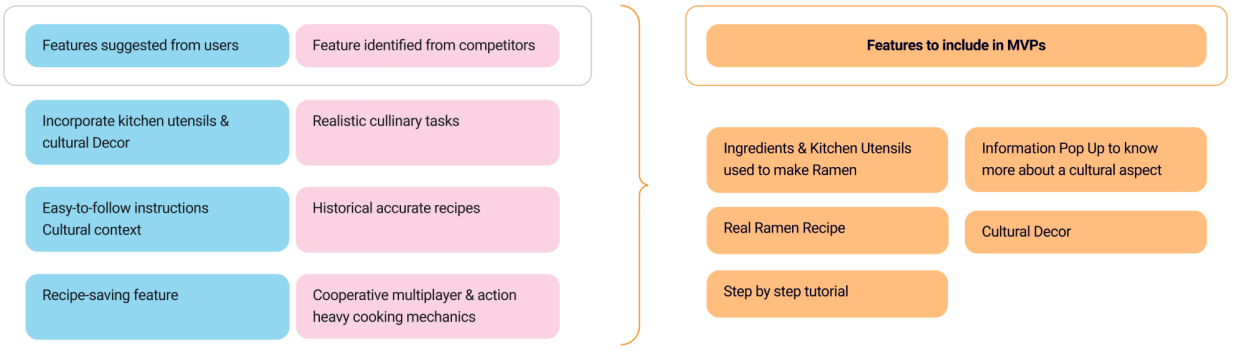

Figure 10 - Application Features

To further streamline the design process, these features were organized in the following subcategories.

4.1.1 Ingredients & Kitchen Utensils

Both prototypes featured a fully equipped kitchen environment designed to prepare a Ramen dish. In the VR prototype, the kitchen was modelled using Blender, and interaction functionality was implemented using Unity and VRTK. Users were able to pick up and place objects such as pots, ingredients, ladles, bottles, and kitchen knives, fostering natural and familiar interaction patterns.

This interaction design aimed to simulate real-world cooking scenarios, thereby enhancing authenticity and immersion. This aligned with Norman's (2013) principles of affordance and visibility, ensuring that users could intuitively understand what actions were more possible and how objects should be used, enhancing authenticity and immersion

These features directly addressed user concerns regarding realism and clarity, as expressed during the interview phase.

4.1.2 Ramen Recipe & Step-by-Step Process

To address varying levels of prior knowledge of Ramen, the recipe flow was broken into manageable steps.

In Figma, each step was introduced sequentially, supported by visual buttons, a progress bar, and instructional screens.

In the VR MVP version, the user could see all information from the start regarding the ingredients and cooking instructions.

This approach was inspired by Érica et al. (2020), who emphasize the importance of structured learning in educational design, and by Wörner et al. (2022), who highlight the benefit of virtual practice leading to real-world confidence.

This step-by-step layout allowed users to replicate the dish at home and reinforced learning through repetition and guidance.

4.1.3 Cultural Information Pop-Ups & Environment Decoration

To deepen cultural immersion, the VR environment integrated Japanese interior spaces such as the *Genkan, Tea Tatami Room, Kotatsu,* and *Tokonoma*. These areas were supplemented with informational cues detailing their historical and cultural significance. The design incorporated traditional elements, including shoji doors, hanging scrolls, and wooden textures to foster authenticity.

This decision was supported by Theodoropoulos and Antoniou (2022), who emphasize that storytelling and environment design contribute to deeper engagement.

Applying this to a culinary experience, integrating cultural narratives with interactive elements fosters both immersion and knowledge retention.

4.1.4 Gamification Elements

Gamification was implemented differently across the two prototypes, tailored to the interaction style and capabilities of each platform:

- **Figma Prototype:** The experience features a guided and clear recipe instructions and structure of the step-by-step process with a progress bar, interactive buttons, and visual indication of progress. This prioritised clarity, quick navigation, and information accessibility.
- **VR Prototype:** Gamification is delivered through direct interaction with objects and environment exploration. Built using Unity and VR toolkit (VRTK), users could interact with objects, manipulate ingredients, and explore the space organically. This method fostered autonomy and engagement through embodied interaction.

These strategies were guided by Schöbel et al (2022), who highlighted the importance of goal setting, progress tracking, and interactivity in game-based learning environments. Similarly, Palmas et al. (2019) emphasized the motivational power of embedded game mechanics in education tools. Together, these mechanics increase usability, retention, and enjoyment, especially for users who approach learning from a recreational or exploratory mindset.

In the VR version, additional sensory elements, such as Japanese music and dynamic lighting, were incorporated to enhance emotional engagement and spatial realism

By integrating these insights into the design and prototyping phase, the project ensures that design choices are not only creative and engaging but also balance cultural storytelling, education structure, and interactive immersion.

These design implications would guide further iterations of the Blender house creation, and the Figma and Unity3D VR prototypes, maintaining the focus on building a coherent, immersive experience that bridges interaction design with experiential learning.

5. Design

The design phase of this project focused on the development of an interactive application that enhances user engagement and learning through a structured interface.

The Blender house design reflected authentic spatial and cultural elements, while the Figma Prototype served as an interactive, gamified guide, simulating the step-by-step cooking processes. These elements laid the foundation for the VR MVP, where users could navigate, interact, and learn within an immersive environment.

Theodoropoulos & Antoniou (2022) emphasize the VR's ability to integrate cultural content with gamified interactions. This concept could be extended to this project by providing an immersive cultural space where users could navigate the virtual house, interact with the kitchen, and engage with the ingredients. Throughout the house, there was also available cultural information that enabled users to reinforce their understanding through exploration.

Han et al. (2021) highlight that creativity in design is a concept that involves novelty, usefulness, and surprise, elements that are important when crafting interactive applications. While some researchers may also consider functionality and aesthetics as core aspects of creativity, a balance must be present in VR environments.

This project embraced a low-poly, stylized aesthetic, which enhanced usability, engagement, and recognition of virtual objects while maintaining a more visually appealing visual identity. The decision to prioritize clear and intuitive interaction over hyperrealistic graphics is supported by Santilli et al. (2024), who argue that interactivity, rather than immersion alone, is the key factor in VR learning effectiveness. Wörner et al. (2022) also emphasize the value of blended learning, where digital interactions in VR are reinforced by real-world application, ensuring deeper comprehension.

Prototyping was a crucial step in refining design choices, enabling iterative testing of the interaction flows and UI elements. Prototypes ranged from low-fidelity sketches to high-fidelity digital mockups and finally a VR MVP. All aimed at gathering feedback and optimizing usability. The key components guiding the design phase included:

1. **Information Architecture**: Ensure users can move through the app seamlessly
2. **App Screens**: A detailed plan of each screen, outlining the content that will be presented, its spatial arrangement of content, and iterative elements
3. **User Interface (UI)**: Interface that is visually engaging, intuitive, and supports user learning.

5.1 Information Architecture

Establishing a structured Information Architecture (IA) was an essential step in ensuring the usability and effectiveness of both Figma and VR prototypes. Guizani (2022) refers to the structural design of digital environments, ensuring that the content is organized, labelled, and navigable to enhance usability, aid user understanding, and optimize learning outcomes.

An effective IA reduces cognitive load, allowing users to access and process information more efficiently, making it an important component in educational applications (Dekkers et al., 2019). Additionally, IA ensures a logical progression of tasks, which is also important in digital learning environments.

For this project, the Information Architecture was developed based on user interviews to map the user's journey within the Figma prototype (Figure 11) and VR MVP (Figure 12). These structured pathways were designed to ensure that users, regardless of prior experience, could intuitively navigate the platform and engage with the learning elements effectively.

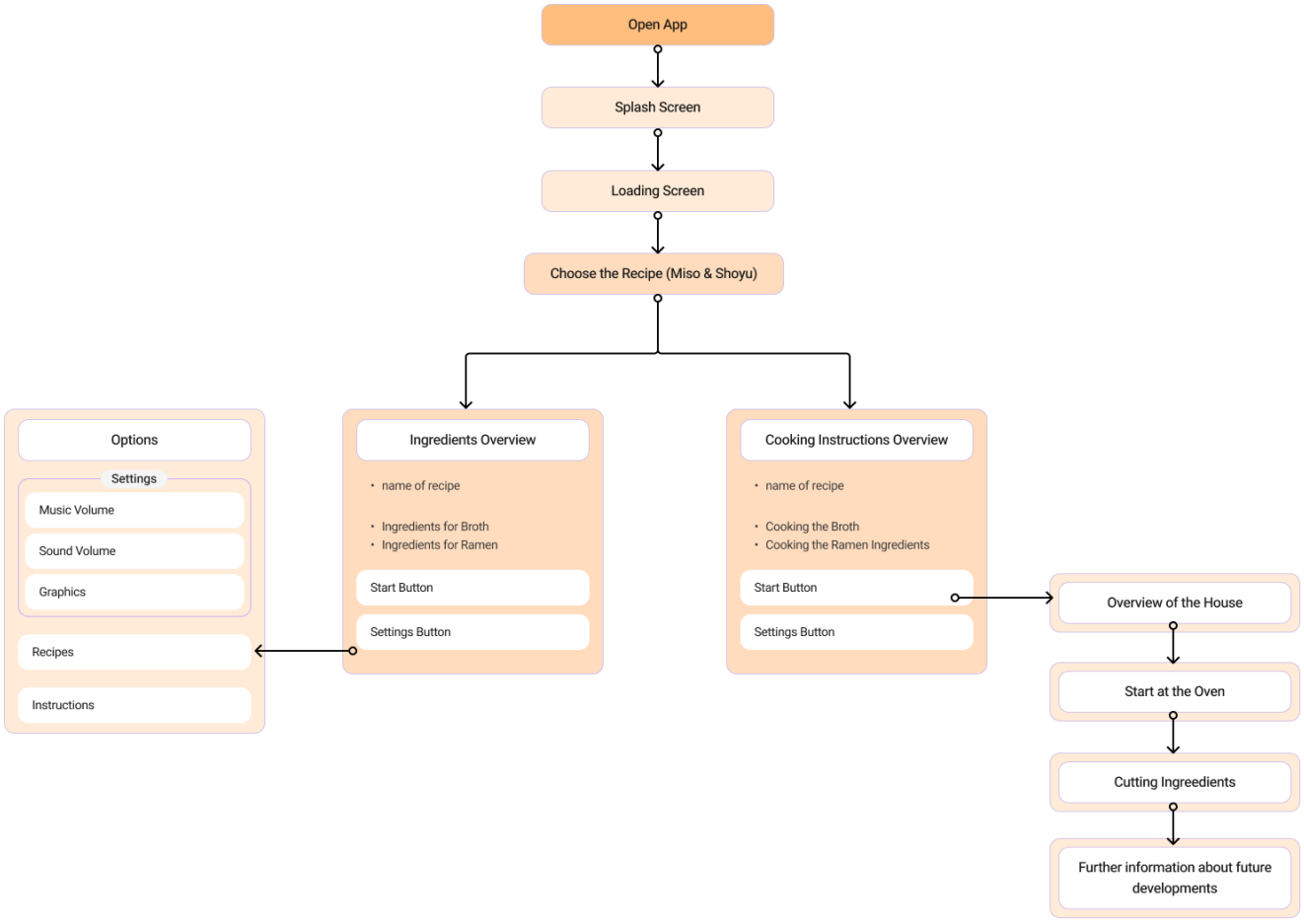

Figure 11 - Figma Information Architecture

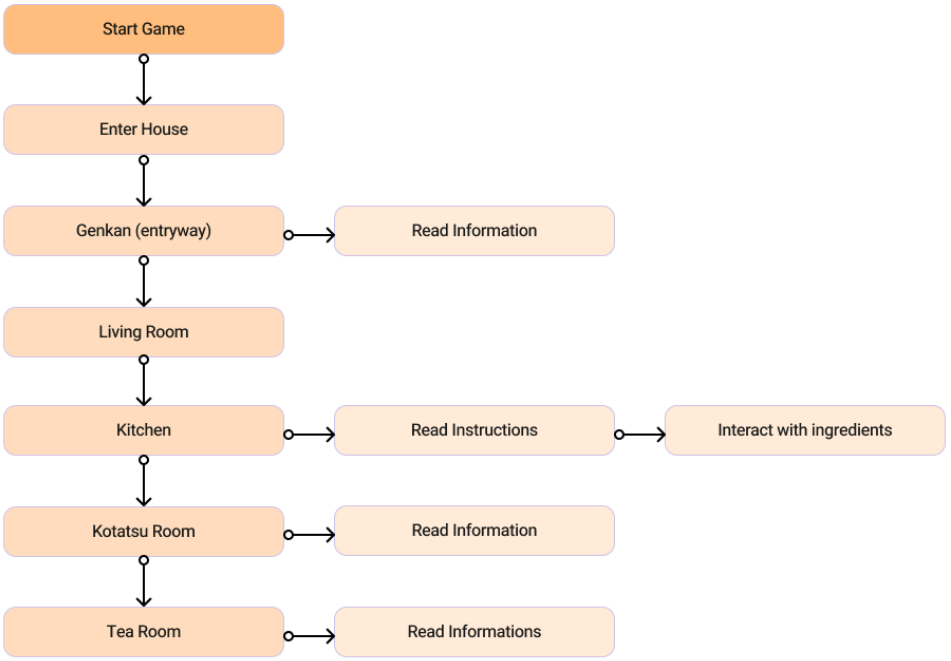

Figure 12 - Virtual Reality Information Architecture

5. 2 Prototyping

Following the synthesis of user insights and design implications, the project progressed to iterative prototyping. This process, fundamental in the UCD methodology (Norman, 2013), allowed for the continuous refinement of interaction flows and user interface.

Prototypes ranged from low-fidelity sketches to high-fidelity digital mockups in Figma and an early-stage VR implementation in UnityVR. These iterations enabled early testing of user interactions, supporting identification and resolution of usability issues and improving the final application's accessibility and intuitiveness (Guizani, 2022).

5. 3 Sketches & Wireframing

The first step in developing the final prototype was sketching and wireframing, both in traditional and digital mediums. This stage helped define the house structure, room layouts, and key interactive elements that would shape the VR experience. According to UCD principles, sketching serves as an early ideation tool, allowing for quick experimentation with different layouts and solutions (Norman, 2013).

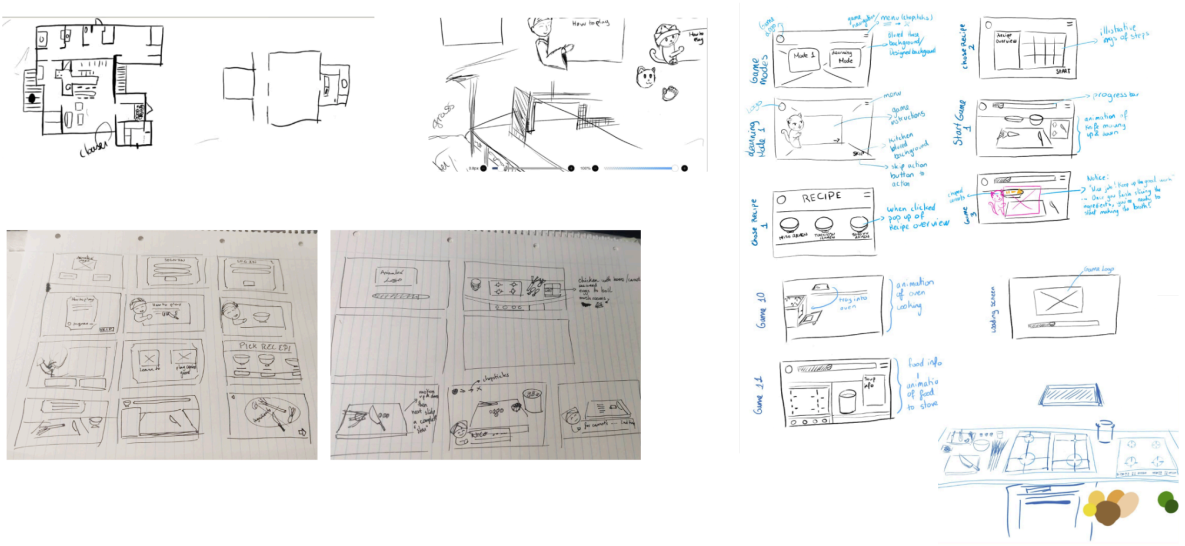

Figure 13 - Sketches

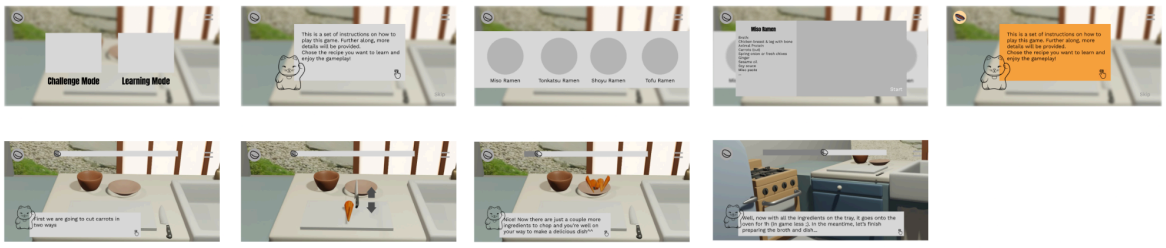

Figure 14 - Wireframing

5.4 Figma Prototype High-Fidelity

The high-fidelity Figma prototype incorporated the final design interface in UCD (Norman, 2013), the testing phase. This prototype represented the digital experience designed to mirror the intended VR interactions and aligns with the iterative approach of prototyping in interface development (Ribeiro, 2007).

While adapted for the Figma environment, the gamified prototype integrated clear navigation, step-by-step interactions, and progress tracking, features highlighted as essential in immersive learning experiences (Theodoropoulos and Antoniou, 2022).

This approach ensured the logical flow of the experience, supporting users as they navigate through each step, including functionalities, colours, shapes, interactivity, and navigation, which would be further refined in the VR prototype.

Figure 15 - Splash Screen

- **Figure 15- Splash Screen**: When opening the application, the user is greeted by the Start Game Screen. Right away, the user can find that the experience will be based on the ramen topic. Through this screen, the user can see the Start Game button, as well as the settings button.

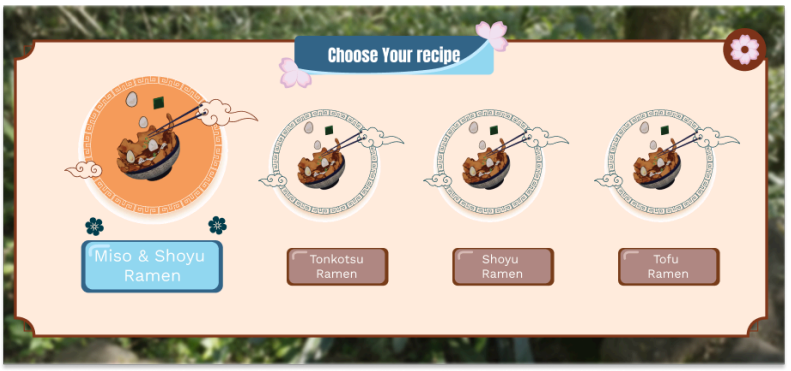

Figure 16 - Recipe choosing screen

- **Figure 16 - Choose Your Recipe**: With this screen, the user will find the different recipes that they can learn and interact with. By clicking on the chosen recipe, the user will be guided through the step-by-step process and ingredient selection.

Figure 17 - Ingredients screen

- **Figure 17 - Ingredients Screen:** On this screen, the user will see exactly which ingredients they would need and for which part they would be needed. The experience is divided into two phases, the broth phase and the Ramen phase. By clicking on the icon below the carrot, the user can view the step-by-step actions they will perform in the experience.

Figure 18 - Cooking Instructions screen

- **Figure 18 - Cooking Instructions:** Here, the user can see the step-by-step instructions that they will need to follow to make the Ramen.

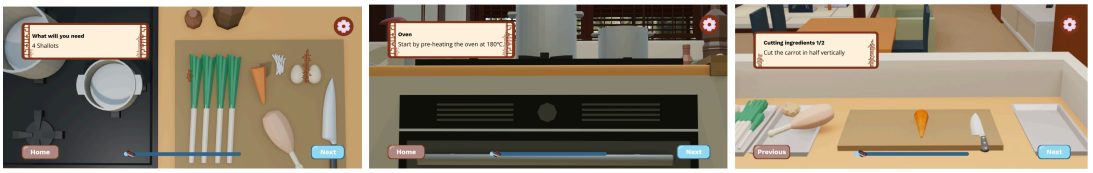

Figure 19 - Step-by-Step Screens

- **Figure 19 - Step-by-Step Screens**: With these screens, the user can click on the next or back buttons to see the step-by-step process with the instructions. The progress bar provides a sense of motivation and achievement, allowing the user to track their progress. At any point, the user can access the settings, and through there, access the full recipe again.

Figure 20 - Game Options Screens

- **Figure 20 - Settings:** To simulate that in the VR prototype, there would be music upon entry, it would be here where the user would be able to configure the sound settings, the graphic settings, and be able to go back to the recipe or the instructions page.

5.5 Virtual Reality Prototype

The VR MVP built in Unity3D extended the Figma prototype into an immersive spatial environment. The experience was accessed through the Meta Oculus Quest 2, integrating gaze and controller-based inputs with interactive object manipulation, consistent with design guidelines for VR system interaction (Jerald, 2015).

The house, modelled in Blender, included culturally relevant rooms and objects, supporting both user immersion and cultural learning. Elements such as environmental audio, physics-based feedback, and visual cues enhanced presence and reinforced the illusion of reality.

Based on Jerald's (2015) consideration for VR system design, the prototype considered:

- **Input:** User gaze and controller tracking, and inputs
- **Application:** Environment geometry, scale, user interactions, physics simulations, and instructional interfaces
- **Rendering:** Conversion of 3D assets into a VR-friendly format, ensuring smooth visual feedback
- **Output:** The HMD device and VR controllers provide real-time feedback

Interactivity is a core element of a VR experience, as such, it was supported by Unity's VR Toolkit (VRTK), which facilitated object manipulation, grabbing mechanics, and environmental interactions, critical for the tasks of ingredient selection and movement.

As Lu & Roto (2021) emphasize, experience design in VR extends beyond aesthetics, prioritizing the core functions and emotional impact of interaction in the application, ensuring that users learn through direct experience rather than passive observation.

This prototype MVP was an important step towards a fully immersive learning environment, where users can navigate, interact, and experience different parts of the Japanese Culture, especially the Japanese culinary culture, firsthand.

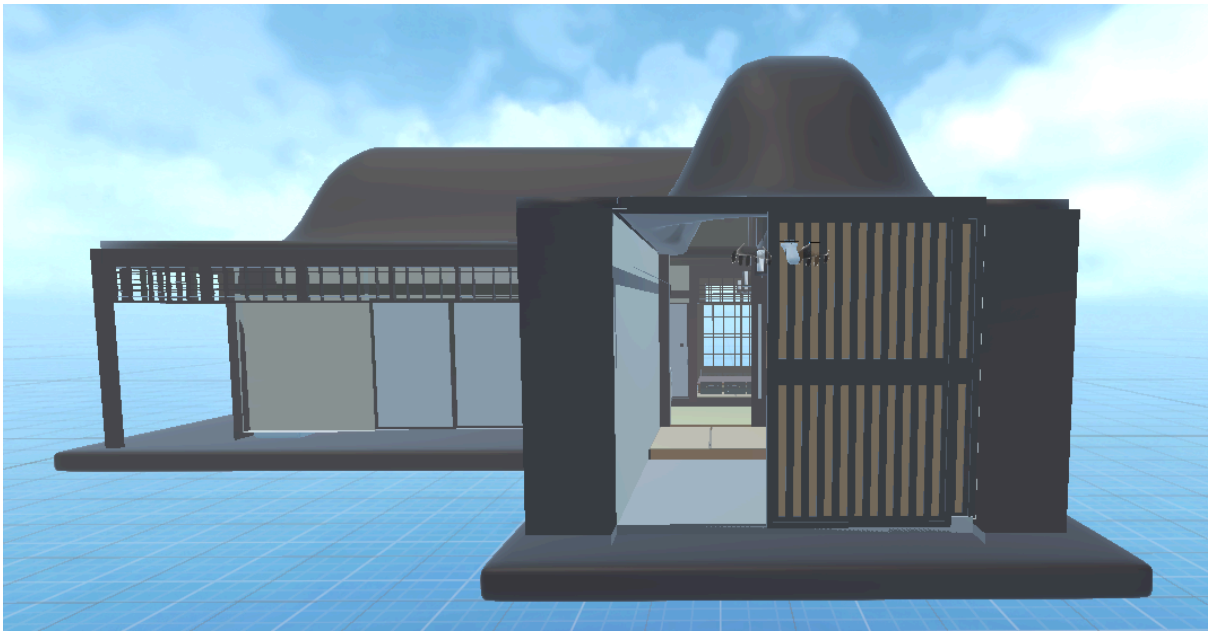

Figure 21 - VR Game Start

- **Figure 21 - VR Game Start:** Upon entering the Virtual Reality Environment (VRE), users hear traditional Japanese instrumental music, setting the immersive tone of the experience. They can see the exterior of the house, allowing them to orient themselves within the VR and adjust the headset and understand how movement and navigation mechanics work.

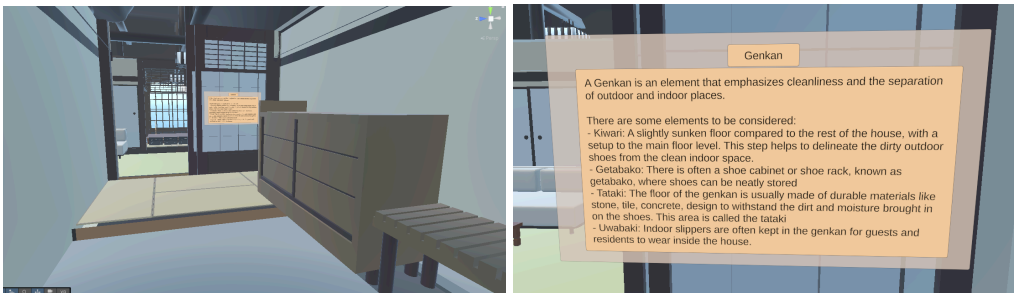

Figure 22 - Genkan

- **Figure 22 - Genkan:** As users enter the Genkan (traditional Japanese entryway), users can see the informational UI screen, explaining its cultural significance and function.

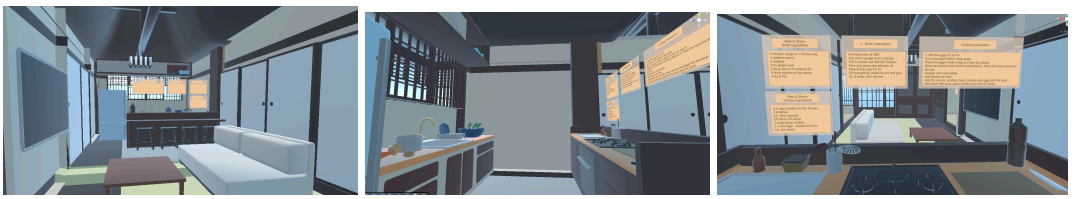

Figure 23 - Kitchen

- **Figure 23 - Kitchen:** Inside the house, users can see the kitchen space. They can approach the counter, view instructions on ingredients and preparation steps, and interact with the ingredients and kitchen tools.

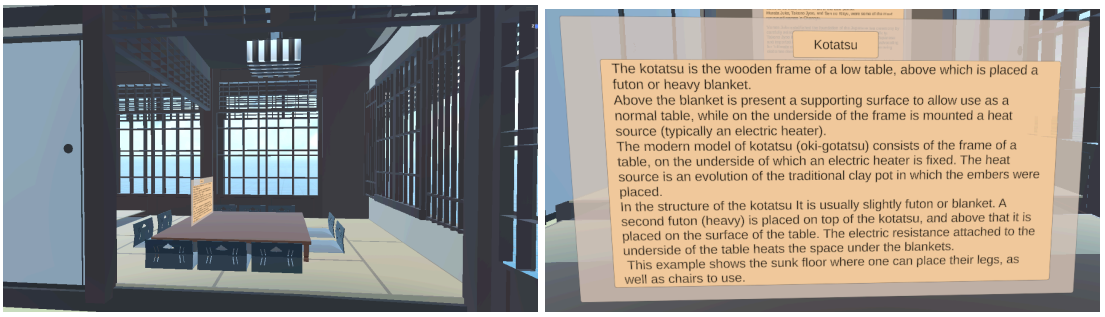

Figure 24 - Kotatsu

- **Figure 24 - Kotatsu:** Exploring the house further, users find the Kotatsu, a traditional heated table with its sunken floor setting. A detailed description is displayed, highlighting its structure and cultural relevance.

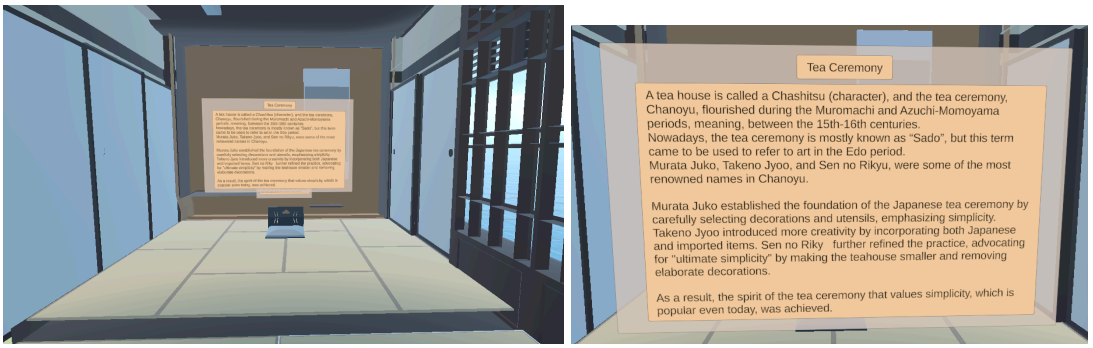

Figure 25 - Tea Ceremony

- **Figure 25 - Tea Ceremony:** In the tatami room, users encounter an example of how a Traditional Tea Ceremony room may look. It displays an information UI where the user can learn about its origins, rituals, and historical significance.

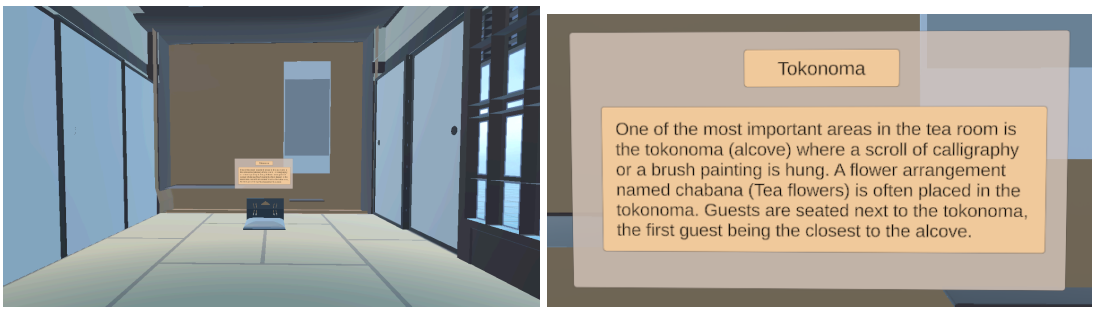

Figure 26 - Tokonoma

- **Figure 26 - Tokodoma:** A small Tokonoma alcove is present in the Tea Ceremony room, featuring a scroll, and explaining the other elements that may be present with the information UI.

5.6 Graphic Design

Although the main objective of this project was to design and prototype an application's interface and MVP, ensuring a cohesive and strong visual identity was essential. This was especially important when the final product spanned three mediums: Blender (3D Modeling), Figma (UI design), and the VR interface, as such, maintaining visual consistency across these platforms helped create a recognizable experience for the user.

5.6.1 Brand Guide

The first step was creating the visual identity of the project, namely, the application's name. Since the experience was gamified, the name needed to be straightforward, self-explanatory, and reflective of the concept and purpose. Given that the application revolves around ramen, Japanese culture, and relaxation, the chosen name was simple and direct: *Ramen Experience.*

Once the name was established, the logo design process began. Figure 27 shows early sketches in the logo brainstorm phase. After testing different directions and perspectives, the design was simplified.

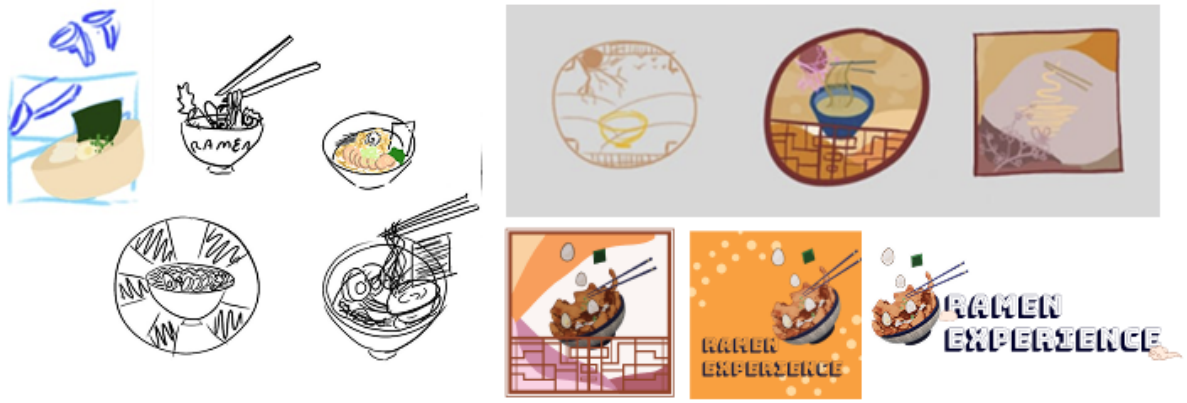

Figure 27 - Logo sketches & Iterations

The final logo combined a stylized depiction of a ramen bowl with playful typography, creating a dynamic and approachable visual identity. The use of 3D elements, such as the modeling of ingredients in Blender, was also integrated into the logo design to emphasize the experience's immersive quality

Regarding the color palette, the primary colors used in the application include a vibrant orange as the main accent, complemented by shades of dark orange/brown, light orange, and a deep blue tone used primarily for typography. These colors were selected to bring warmth, appetite, and tranquility, key feelings aligned with the purpose of this project.

Figure 28 - Final Logo Design

5.6.2 Style Guide

The definition of a style guide was an important step towards ensuring consistency and visual coherence across the interface design, aligning it with the brand's overall visual identity.

A style guide typically defines core visual elements such as the color palette, typography, buttons, and other interface components. These guidelines helped maintain a unified and recognizable aesthetic throughout the MVPs, regardless of platform or medium.

The color scheme used in the interface design reflects the same palette established for the brand identity: three shades of orange, a bright orange, a dark orange/brown, and a light orange. Additionally, two shades of blue were added as accent colours. These tones are applied complementarily to create visual contrast, support hierarchy, and draw attention to unimportant information.

In terms of typography, different environments required tailored solutions:

- **In the Figma prototypes,** Open Sans was used for body text due to its clarity and readability, while Aclonica was selected for titles, offering a playful and stylized personality that aligns with the gamified nature of the application
- **In the VR Environment**, the available font LiberationSans SDF was chosen. This font was selected for its legibility in immersive 3D contexts and its compatibility with the VR development tools used.

By defining and applying these elements across platforms, the design maintained a strong and cohesive visual language that supported usability and enhanced overall user experience.

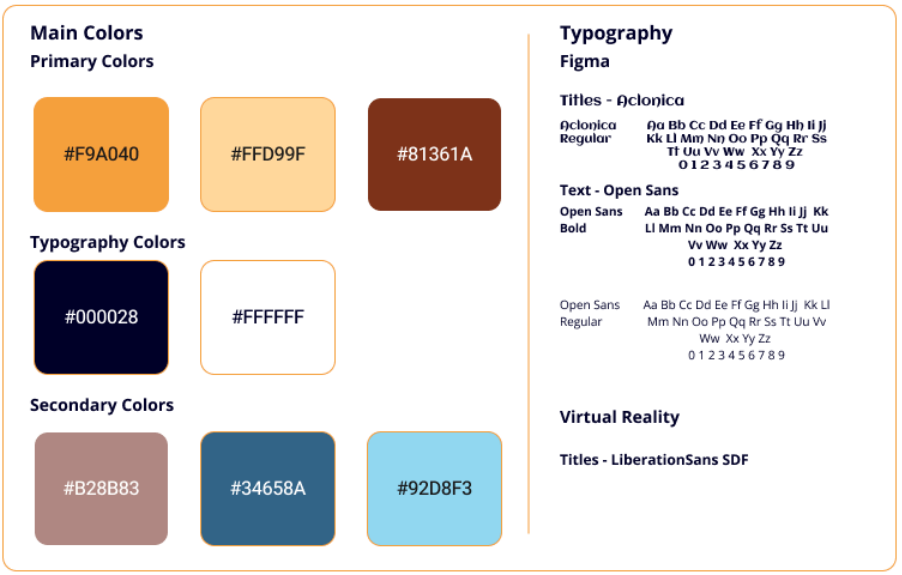

Figure 29 - Style Guide

6. Usability Tests

Following the development of the Figma and VR prototypes, usability testing was conducted to evaluate how effectively the proposed solutions addressed the needs and expectations identified throughout the research and design process. Aligned with the UCD, this testing ensured the prototypes were intuitive, engaging, and supportive of cultural learning.

This chapter presents the results of the usability testing conducted for both the Figma and VR prototypes, followed by a discussion of the insights drawn from user interactions and how these informed further improvements. The System Usability Scale (SUS) and open-ended feedback served as the primary data collection instruments.

6.1 Results

6.1.1 Figma Prototype:

Participants

Five users participated in testing the Figma Prototype:

- Participant 1 - Male, 24, Pilot Student;
- Participant 2 - Male, 23, Digital Marketing Student;
- Participant 3 - Male, 24, Gymnastics Coach;
- Participant 4 - Female, 26, Team Lead (Call Center);
- Participant 5 - Female, 24, Refund Specialist.

To carry out the usability testing, users were given a brief introduction. In this case, the prompt was: “Imagine you are opening the Ramen Experience app for the first time. You want to begin learning how to make ramen. Open the app and start the experience.”

Tasks Assigned:

- Select a type of Ramen;
- Access Cooking and Ingredient Instructions;
- Follow the step-by-step preparation process

Positive Findings

Participants responded positively to the clean interface and intuitive navigation. The blending of the 2D and 3D elements was also highlighted. All users completed the required tasks successfully, suggesting that the prototype aligned well with initial user goals.

Areas for Improvement

Some participants were unsure about how and when to interact with specific elements. Lack of interaction cues and animation feedback made progress occasionally unclear. Recommendations included improving navigation, visual prompts, and reducing unnecessary

clicks. These findings connect to previous goals of gamification, and suggest stronger feedback loops are needed for better engagement (Schöbel et al. 2022)

SUS Results

All participants completed the SUS questionnaire. Figure 30 illustrates the consolidated SUS scores for the Figma prototype.

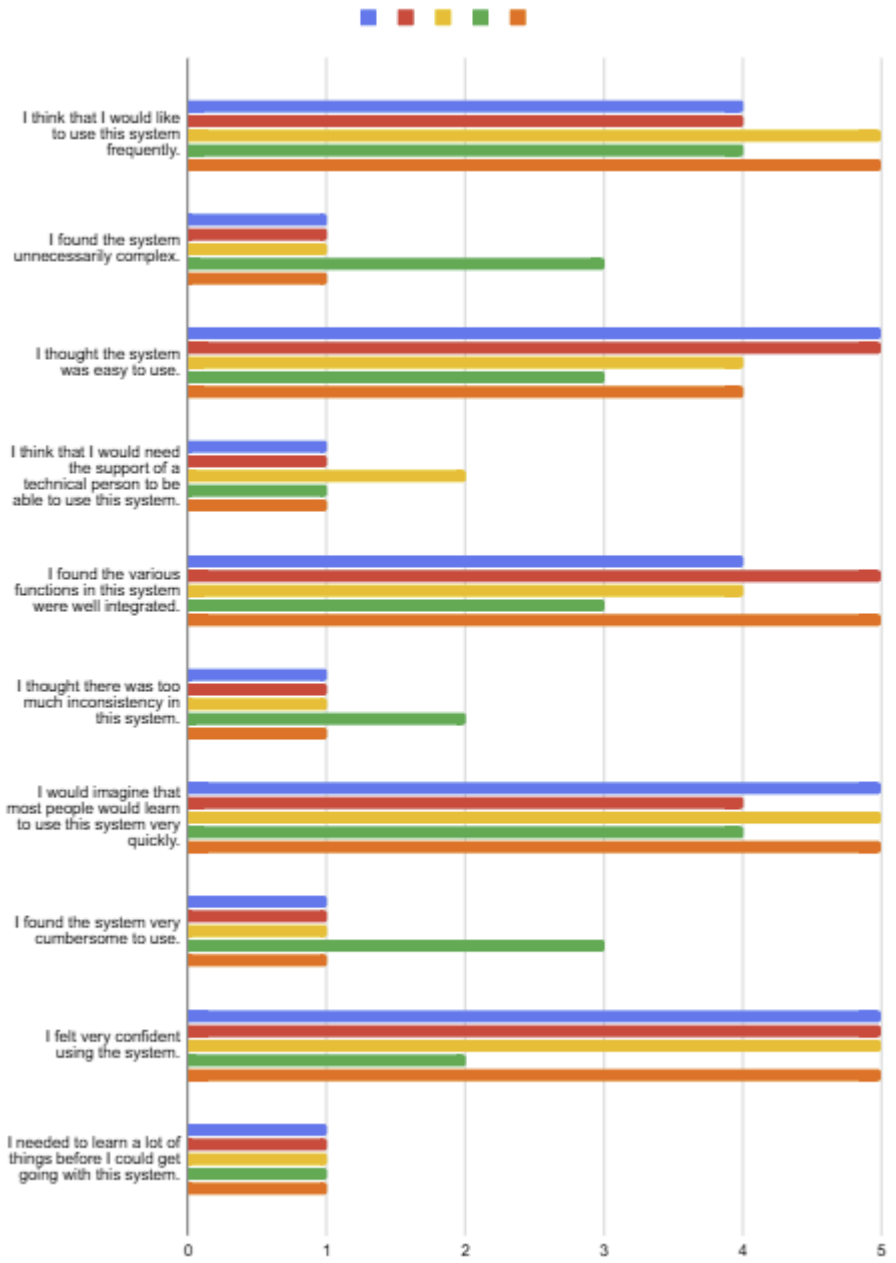

Figure 30 - Graphic of the Figma questionnaire of usability tests (SUS)

All usability testing results are available in the “Annex 6”.

Prototype Alterations Post-Testing

The prototype changes are accessible in the explanation below.

- **Step-By-Step Process:** Animations between screens. The participants noted that the "animated" steps they saw by pressing the "Next" button were not intuitive.

  Alteration: Added smoother screen transitions and reduced navigation friction.

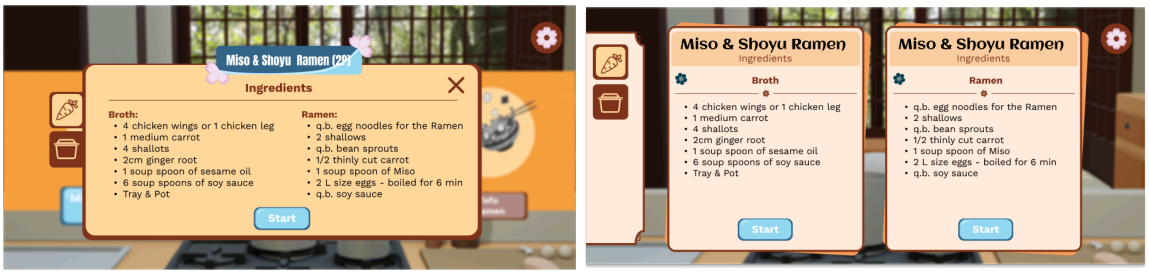

Figure 31 - Prototype screens before and after alterations in "Menu Information"

- **Menu Information:** A Participant did not understand that there was one more button

  Alteration: Simplified layout by separating closely placed buttons.

6.1.2 Virtual Reality Testing:

Participants

Three users who previously tested the Figma prototype were invited for VR testing:

- Participant 1 - Male, 24, Pilot Student;
- Participant 2 - Male, 23, Digital Marketing Student;
- Participant 3 - Male, 24, Gymnastics Coach;

To carry out the usability testing, users were given a brief introduction. In this case, the prompt was: "You have just arrived at a house with Japanese influences, ready to start your ramen-making journey. The first step is to enter the house."

Tasks Assigned:

- Navigate and enter the house, allowing the user to get used to the VR mechanics and environment
- Explore the Genkan (entryway) and learn its cultural context, allowing the user to understand how the information would be displayed throughout the experience
- Move to the kitchen and interact with the cooking ingredients, allowing the user to interact with the environment

Positive Findings

Participants appreciated the immersive sound and realistic environment, particularly the homely atmosphere, which supported the goal of cultural immersion (Theodoropoulos &

Antoniou, 2022). The absence of motion sickness, a common VR concern, was seen as a major success, especially since all participants were new to VR.

Areas for Improvement

Participants desired clearer prompts for interactable objects and were unsure which elements were usable. Some in-game physics bugs (e.g., ingredients rolling off counters or phasing through walls) initially impacted immersion. A strong suggestion for the future complete application would be to implement an in-game tutorial for better onboarding, especially in solo experiences, reinforcing the importance of clear instructional design (Érica et al., 2020)

SUS Results

Participants completed the SUS questionnaire after the VR experience. Figure 32 presents the results (All responses are included in Annex 7):

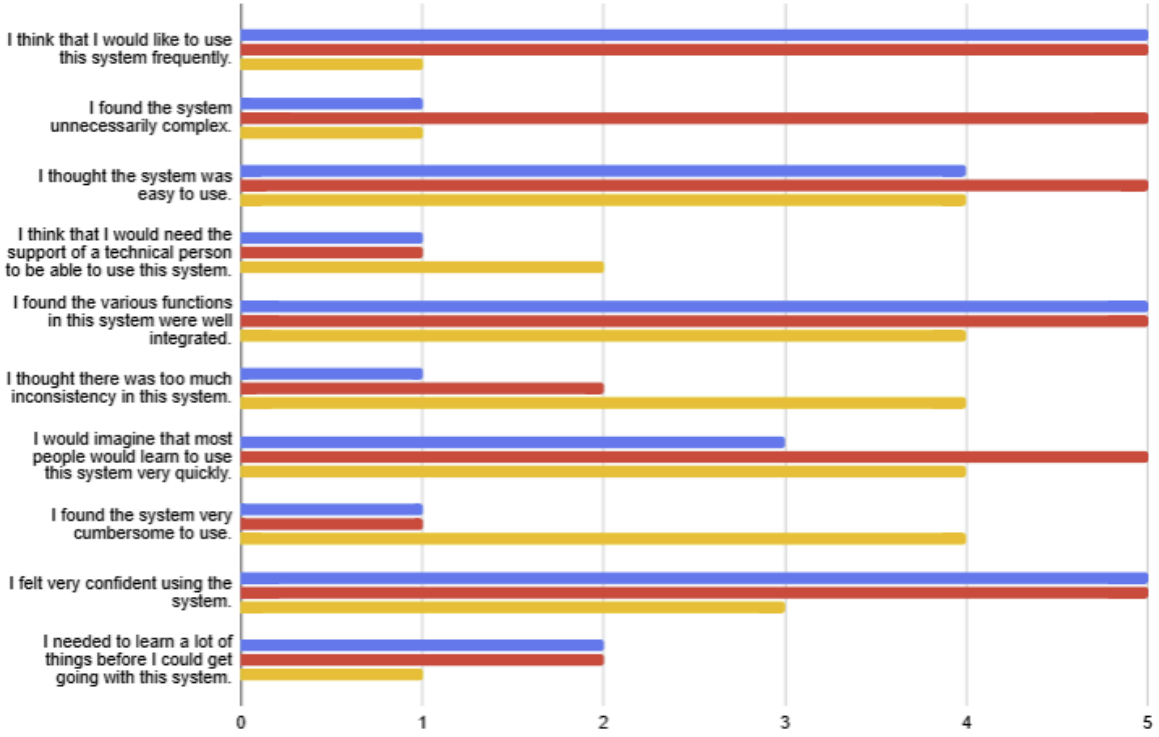

Figure 32 - Graphic of the VR questionnaire of usability tests (SUS)

Prototype Alterations

The VR prototype was refined following the observations and feedback from the usability testing. The alterations to the prototype are outlined below.

- **Onboarding Navigation Controllers:** Participants with no prior VR experience struggled to understand how to move and interact within the virtual environment

Alteration: A dedicated onboarding screen was created at the beginning of the VR experience. This screen provides clear instructions on how to use the VR controllers to navigate and interact with the virtual space.

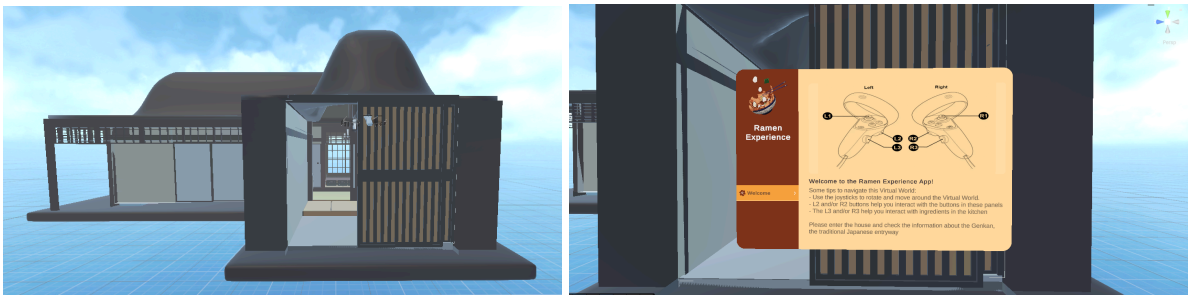

Figure 33 - Prototype screens before and after alterations in "Onboarding Controllers"

- **Kitchen Instructions:** Participants experienced confusion upon entering the kitchen area, and which elements or information to prioritize. This resulted in delays or clarifications of the task.

  Alteration: A gamified UI screen menu was implemented. This interface provided structured guidance on where to begin and what actions to perform.

Figure 34 - Prototype screens before and after alterations in "Onboarding Controllers"

- **Ingredients physics:** During longer sessions, ingredients within the VR Environment began to move unpredictably or shift from their original positions without user input, disrupting the immersive experience and/or adding stress to the user
  Alteration: The “Kinematic” property was enabled for all interactable objects. This ensured they remained stationary unless directly manipulated by the user, preventing unwanted movement or rotation caused by physics simulation over time

In addition to the major changes previously discussed, several smaller issues identified during the usability tests were also addressed. Although these minor flaws did not significantly impact the overall usability, their correction contributed to a more polished final product. These included partially incomplete animations, minor typography errors, and alignment inconsistencies.

While not substantial enough to merit a more detailed individual explanation, these adjustments enhanced the prototypes' overall quality and visual consistency.

All post-testing changes can be observed by comparing the final version of the prototypes with those used during the testing phase. For the Virtual Reality prototype, a video recording of a user session is available for the initial version, while the author recorded a separate video to showcase the improvements made in the final version.

Prototype Links:

- User Testing Prototypes:
  - Figma: https://shorturl.at/IsHKA
  - Virtual Reality (Video): https://shorturl.at/oYRKy
- Final Prototype (After Tests)
  - Figma: https://shorturl.at/7kuX5
  - Virtual Reality (Video): https://shorturl.at/K4A1X

6.2 Discussion

The usability testing revealed that both prototypes were well-received by users and generally aligned with the project’s aims: intuitive interaction, educational support, and cultural immersion. Importantly, every participant completed all core tasks without major assistance, which validates the strength of the user flows.

The SUS scores placed both prototypes within acceptable usability standards, affirming their functional robustness. However, with the open-ended feedback, several valuable insights surfaced.

- **Interaction clarity was a recurring theme**. While layouts were visually engaging, users needed more explicit cues for interaction, both in 2D and 3D environments.
- **Onboarding and instructional** design are crucial to VR, especially given the physical and cognitive novelty for many users
- **Gamification potential** was underutilized in early iterations. Participants gravitated towards elements that hinted at progression or achievement, suggesting that motivational design elements should be expanded further in future developments.

These findings reinforce the principles established by Theodoropoulos and Antoniou (2022) and Schöbel et al. (2022), confirming that successful educational interfaces, especially in gamified or immersive contexts, must continuously balance clarity with engagement.

7. Conclusions and Future Work

The elaborated project explored the design and development of a gamified, educational Virtual Reality application MVP that introduces users to ramen preparation through a culturally immersive experience and a calming experience.

Grounded in a UCD methodology, the process emphasized continuous user input, iterative prototyping, and usability testing. The ultimate goal was to create an engaging and accessible learning experience for beginner VR users.

From the initial research and analysis phase, it became evident that while there are numerous cooking-related or gamified educational applications, few combine these with immersion in a relaxed, culturally rich environment. A comparative analysis of existing applications, combined with user interviews, revealed a clear opportunity: to bridge the gap between educational cooking games and immersive cultural storytelling, particularly in VR. These insights directly informed the design and interaction decisions for both the Figma and VR MVPs.

The Figma prototype allowed for early-stage refinement of the interface design and user flow, while the Virtual Reality prototype enabled exploration of spatial interaction, immersion, and cultural storytelling.

Through usability testing, using tools such as the SUS questionnaire and observation feedback, the prototypes were iteratively improved. Although the project involved a small sample size, participants generally found the experience intuitive and enjoyable. Some challenges emerged, particularly among less experienced VR users, such as issues with navigation and understanding interaction cues, which were addressed in subsequent iterations.

Overall, users were able to follow core tasks, and results suggested high levels of engagement and comprehension. The combination of task-based learning, gamification, and aesthetic simplicity contributed to a positive user experience and supported learning outcomes.

More importantly, participants also expressed interest in expanded features, deeper interactivity, and clearer guidance, all of which offer valuable insights for guiding future developments.

7.1 Limitations

Despite the project's achievements, several limitations must be acknowledged, especially in light of the exploratory nature of this research:

- Time Constraints: Conducted alongside full-time employment, the project faced restrictions regarding time available for development, iteration, and testing. This inevitably limited the scope and polish of the final MVPs
- Technical Knowledge: As the author entered the project with limited experience in VR development, much of the process involved self-guided learning and experimentation. While this led to creative problem-solving, it also constrained the technical sophistication achievable in the MVPs.
- Budget Constraints: The project was self-funded, which influenced choices in hardware, software, and testing resources. Financial limitations also affected access to more advanced development tools or wider user testing pools.
- Team limitations: Development was conducted individually, without access to specialists in areas such as animation, sound design, or engineering. Building a full-fledged, market-ready product would require a multidisciplinary team and substantial financial investment.
- Prototype Scope: Given the constraints above, the VR application should be understood as an early-stage prototype. Its purpose was to test core usability, user comprehension, and iteration concepts, rather than to deliver a finished product.

While these limitations do not undermine the value of the project, but rather position it as a strong foundation for future research and development into immersive, culturally grounded educational experiences.

7.2 Future Work

Future development can build upon the findings and prototypes established in this project in several ways:

- **Enhanced Onboarding for New VR Users:** Streamlining tutorials and initial interactions can help reduce friction for first-time VR users and support better orientation within the environment.
- **Expanded Recipe Paths:** Including more cooking flows, branching options, or difficulty levels to make the application more dynamic and replayable.
- **Deeper Cultural Integration:** Future iterations could integrate additional storytelling elements, voiceovers, or narrative layers to deepen the sense of place and cultural immersion.
- **Technical Enhancements:** Collaborating with developers, 3D artists, and sound designers would allow for improvements in visual fidelity, interactivity, and overall performance of the VR experience.

- **Broader usability Testing:** Expanding testing to include a more diverse and larger sample of users would provide deeper insight into usability patterns, learning outcomes, and design challenges, particularly in educational VR contexts.

Though early in its development, this project validates the core concept and methodology. It provides a practical, user-centered example of how immersive technologies can be used to not only teach procedural knowledge like cooking but also offer a culturally meaningful, calming experience. The groundwork laid by this project can support more complex and scalable educational tools in future research and design work.

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Annexes

Annex 1: Usability Test Consent Form - PT

Obrigada por ter aceite participar neste estudo. A sua participação ajudará a:

- Avaliar a usabilidade, acessibilidade e a experiência geral de utilização do protótipo desenvolvido neste projeto;
- Compreender como os utilizadores percebem o protótipo em termos de aprendizagem, eficiência, memorabilidade, erros, envolvimento e satisfação;
- Identificar aspetos positivos e negativos do protótipo e do seu Produto Mínimo Viável (PMV) em Realidade Virtual (VR).

Detalhes do Estudo:

No âmbito do Mestrado em Novos Media e Práticas Web na Faculdade de Ciências Sociais e Humanas, Universidade NOVA de Lisboa, estou a desenvolver um projeto final de mestrado focado na realização de um produto mínimo viável (PMV) de uma aplicação em Realidade Virtual (VR) concebida para ensinar os utilizadores a preparar ramen em casa, enquanto fornece informações culturais sobre o prato e a cultura japonesa.

Para avaliar esta aplicação, solicito a sua participação para realizar um teste de usabilidade que consistirá numa lista de tarefas para realizar dentro do protótipo, sem qualquer assistência, simulando o seu uso como se fosse uma aplicação completamente funcional dentro de um cenário hipotético. Após completar as tarefas, será solicitado a preencher um questionário de satisfação, utilizando uma escala Likert de 1 (Discordo Totalmente) a 5 (Concordo Totalmente).

Participação e Utilização dos Dados:

- A participação nesta investigação é de carácter voluntário, pelo que poder e pode desistirar a qualquer momento, sem qualquer consequência.
- O relatório final do projeto estará disponível em acesso aberto, com acessibilidade global.
- Os dados recolhidos poderão ser utilizados em publicações científicas ou apresentações relacionadas com este projeto.
- Os seus dados pessoais, nome, imagem, morada ou qualquer informação identificável não serão partilhados. Todos os dados recolhidos serão utilizados exclusivamente para fins de investigação, sob confidencialidade e anonimato.
- O teste no Figma será gravado em áudio e o teste em Realidade Virtual será gravado o ecrã do telemóvel onde terá a visão de dentro do *headset* para análise posterior.
- As gravações serão armazenadas de forma segura, acessíveis apenas à autora, e serão apagadas após a defesa pública do projeto.

- Se tiver alguma dúvida ou preocupação, por favor entre em contacto com a autora, que será responsável pelo tratamento dos dados, através do seguinte endereço de e-mail: a2021114952@campus.fcsh.unl.pt. Pode também utilizar este contacto para retirar a sua participação a qualquer momento, sem qualquer consequência. Os dados já recolhidos não serão utilizados se decidir retirar a sua participação.

Declaração de Consentimento:

Ao assinar abaixo, confirmo que:

- Li e compreendi as informações fornecidas neste documento e tive a oportunidade de esclarecer qualquer dúvida;
- Compreendo que a minha participação é voluntária e que posso retirar-me a qualquer momento;
- Reconheço que os dados recolhidos serão utilizados exclusivamente para fins de investigação, garantindo anonimato e confidencialidade;
- Compreendo que o documento final da pesquisa e os dados recolhidos serão acessíveis publicamente online;
- Consentindo com a gravação em áudio e de ecrã da minha sessão de teste para análise de pesquisa;
- Confirmo que tenho 18 anos ou mais e aceito participar nesta investigação

Data e assinatura do entrevistado

_____

Data e assinatura do entrevistador

_____

Annex 2: Usability Tests Instructions (PT)

Olá, o meu nome é Ana e vou guiá-lo(a) através deste teste de usabilidade da aplicação Figma/VR, *Ramen Experience*. Esta aplicação tem como objetivo ensinar os utilizadores a preparar ramen em casa, ao mesmo tempo que oferece informações sobre a cultura japonesa.

Em primeiro lugar, quero agradecer-lhe pelo seu tempo e pela sua participação. O seu feedback é essencial para melhorar a experiência do utilizador e aperfeiçoar futuras iterações deste projeto.

Esta sessão não deverá durar mais de 30 minutos. Será fornecida uma série de tarefas para realizar dentro da aplicação. Depois, será solicitado a preencher um breve questionário sobre a sua experiência.

Antes de começarmos, aqui estão alguns pontos importantes a ter em mente:

- A única coisa que está a ser testada é a aplicação em si. Não existem respostas certas ou erradas.
- Não é necessário nenhum conhecimento prévio da tecnologia ou da aplicação.
- Tome o seu tempo. Não há necessidade de apressar-se nas tarefas.
- É normal encontrar dificuldades. Isto ajuda-me a identificar áreas que precisam de melhorias.
- Por favor, pense em voz alta enquanto completa as tarefas. Partilhe o que está a tentar fazer, o que espera que aconteça e como se sente durante o processo.
- Seja o mais honesto(a) possível. Quer o seu feedback seja positivo ou negativo, comentários objetivos ajudarão a aprimorar a aplicação.
- Se uma ação não produzir o resultado esperado, diga-o em voz alta.
- Avise-me quando terminar uma tarefa.

Uma vez que o teste começar, não fornecerei orientações ou assistência, pois o meu foco estará em observar e documentar as suas respostas e quaisquer dificuldades que possa encontrar.

Se tiver alguma dúvida, por favor pergunte agora. Após começarmos, só poderei responder no final do teste.

Processo de Teste:

- **Primeiro Teste:** Irá testar a aplicação utilizando o Protótipo Figma no telemóvel.
- **Segundo Teste:** Irá experimentar a versão de Realidade Virtual (VR) da aplicação utilizando o headset Oculus Quest 2.

Considerações para o Teste de Realidade Virtual (VR):

- Antes de começarmos o teste de VR, quero confirmar se se sente confortável a utilizar o headset VR durante o tempo do teste.
- Por favor, informe-me se tiver alguma condição médica que possa afetar a sua capacidade de utilizar o headset.

- Se em algum momento se sentir enjoado(a), tonto(a) ou desconfortável, avise-me imediatamente para que possamos interromper o teste.

Aqui está a lista de tarefas que terá de completar. No final, terá a liberdade de explorar a aplicação por conta própria antes de responder a um questionário de satisfação.

Tarefa 1: entrar em Casa

Acabaste de chegar a uma casa com aspetos japoneses, pronto para começar a tua jornada de preparação de ramen. O primeiro passo é entrar na casa.

- Encontra uma forma de entrar na casa e dá o primeiro passo para dentro.

Tarefa 2: Aprender Sobre o Genkan

Ao entrares, percebes que estás no genkan, a entrada tradicional japonesa onde as pessoas tiram os sapatos antes de avançar para o interior da casa. Tens curiosidade em saber mais sobre este espaço.

- Procura uma forma de descobrir mais sobre o genkan

Tarefa 3: Iniciar a Experiência de Cozinha

Agora que entraste na casa, precisas de encontrar a cozinha para começar a experiência.

- Navega até à cozinha e encontra as instruções de preparação.

Tarefa 4: Preparar os Ingredientes

O primeiro passo para cozinhar é reunir os ingredientes. Precisarás de encontrá-los e colocá-los nos locais corretos na cozinha.

- Localiza os ingredientes e move-os para ao lado do fogão

Tarefa 5: Explorar Elementos Culturais da Casa

Depois de encontrar os ingredientes e teres percebido como a experiência funcionaria, decides explorar a casa e aprender mais sobre a cultura japonesa.

- Encontra o resto das informações espalhadas pela casa, como:
    - A sala de chá
    - O kotatsu (mesa aquecida)

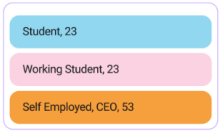
Annex 3: User Interviews

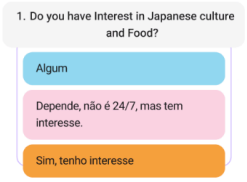
Demographic Questions:

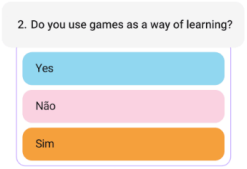
Age, Gender, Profession

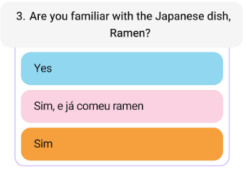
Overall questions:

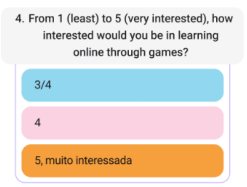
1. Do you have an interest in Japanese culture and food?
2. Do you use games as a way of learning?
3. Are you familiar with the Japanese dish, Ramen?
4. From 1 (least) to 5 (very interested), how interested would you be in learning online through games?
5. If there was a game that taught how to make ramen, what are your thoughts about this learning experience?
    1. mini info about what ramen in
6. If this game was in VR, what would you like to see?
7. If the Game was in a Home setting, what would you like to see, or what would the environment be like?
8. Regarding the house decorations, would it be interesting to have cultural aspects, and buttons to explore more?
9. In the VR game, would you prefer a more realistic kind of game or more gamified game

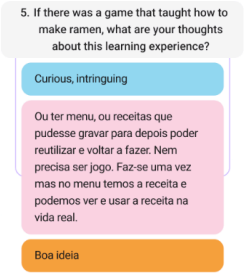


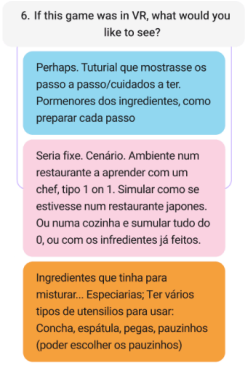


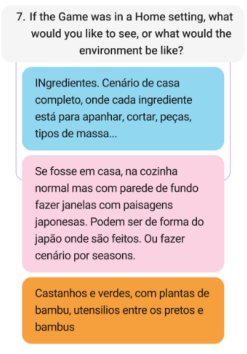


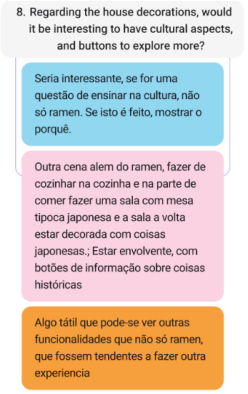


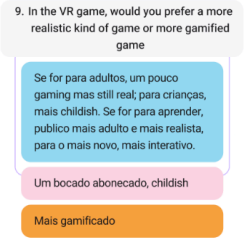












Annex 4: User Interviews Transcripts

(Interviews were translated from Portuguese to English):

Female, Accountant, 53

Q1: Yes, I am interested.

Q2: Yes.

Q3: Yes.

Q4: 5, very interested.

Q5: It would be a good idea. The ingredients are available to mix. Spices. Various types of utensils to use: ladle, spatula, oven mittens, chopsticks (having the possibility to choose the chopsticks).

Q6: Brown and green colors; bamboo plants; utensils in black and bamboo.

Q7: Something tactile where you could see other functionalities besides just making ramen; something that allows for different experiences.

Q8: More gamified.

Male, 23, Student

Q1: Somewhat.

Q2: Yes.

Q3: Yes.

Q4: 3 / 4.

Q5: Curious, intriguing.

Q6: Perhaps. Not the kind of thing I'd be looking for. A tutorial that shows step-by-step instructions and the necessary precautions. Detailed information about the ingredients and how to prepare each step.

Q7: Ingredients. The ability to set up a full home environment, locate each ingredient, and retrieve it. Cutting different types of noodles. Preparations, steps, and timing for each process. Initially, without time constraints, then progressing to a restaurant-style mode where speed is required, aligned with customer orders.

Q8: It would be interesting, especially if it's about teaching culture and not just about ramen. Explaining why a step is done in a certain way. If this is how it's done in Japanese culture, then why.

Q9: If it's for adults, a bit of gaming but still realistic; for children, more playful. It depends

on the target audience. Whether they play to experience reality or to escape from it. If it's for learning, for adults, it should be more realistic; for younger players, more interactive.

Male, 23, Airport Worker

Q1: It depends. Watches anime, likes anime; has an interest in the culture, but not 24/7. Still, he has an interest.

Q2: No.

Q3: Yes, has eaten ramen before.

Q4: 4.

Q5: Either having a menu or saving recipes to reuse later and make again. It doesn't even have to be a game. You make the dish once, but the menu keeps the recipe, so you can check it and use it in real life.

Q6: That would be cool. A setting in a restaurant, learning with a chef, like a one-on-one session. Simulating being in a Japanese restaurant with traditional bungalows, creating an authentic one-on-one experience. Or in a kitchen, simulating everything from scratch or using pre-prepared ingredients.

Q7: If it were set at home, A normal kitchen, but instead of a plain wall, there could be windows showing Japanese landscapes. The landscapes could reflect different regions of Japan where the dish originates. The environment could change according to the seasons: Spring with cherry blossoms, Winter with Mount Fuji. The kitchen background should make it feel like you are in Japan.

Q8: Beyond just ramen: In addition to cooking, there could be a traditional Japanese dining area with a typical low table. The surrounding room could be decorated with Japanese elements.

Q9: Engaging, with interactive buttons providing historical information.

Q10: More realistic or more gamified. A bit more cartoony, more childish.

Annex 5: SUS Questionnaires for Figma and VR

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

Additionally, 7 questions were added for more personalized feedback:

Figma Prototype additional questions:

1. Please rate the intuitiveness of the icons (from 1, the least intuitive, to 5, very intuitive)
2. Which issue was the biggest problem during the experience with the app? (open answer question)
3. How did you feel about the design? (open answer question)
4. How functional does the application feel to you? (open answer question)
5. What functions would you like to add? (open answer question)
6. Please rate the experience on this app (from 1, not at all, to 5 Liked very much)
7. Any last comments? (open answer question)

VR Prototype additional questions:

1. I needed to learn a lot of things before I could get going with this system.
2. Which issue was the biggest problem during the experience with the app? (open answer question)
3. How did you feel about the design? (open answer question)
4. How functional does the application feel to you? (open answer question)
5. What functions would you like to add? (open answer question)
6. Please rate the experience on this app
7. Any last comments/struggles? (open answer question)

Annex 6: SUS Questionnaires Figma Answers

Participant 1:

Q1: 4

Q2: 1

Q3: 5

Q4: 1

Q5: 4

Q6: 1

Q7: 5

Q8: 1

Q9: 5

Q10: 1

Q11: 5

Q12: The time the images took to change

Q13: Simple and effective

Q14: Very functional, but still with issues with the images changing after pressing "next"

Q15: None

Q16: 5

Q17: Very effective in teaching how to make ramen, with a clear step-by-step process, and very easy to use

Participant 2:

Q1: 4

Q2: 1

Q3: 5

Q4: 1

Q5: 5

Q6: 1

Q7: 4

Q8: 1

Q9: 5

Q10: 1

Q11: 5

Q12: The app is very appealing, it makes you wish for more interaction

Q13: The design is very appealing and intuitive

Q14: Very functional

Q15: Instead of images, a little more interaction and perhaps short videos

Q16: 4

Q17: N/A

Participant 3:

Q1: 5

Q2: 1

Q3: 4

Q4: 2

Q5: 4

Q6: 1

Q7: 5

Q8: 1

Q9: 5

Q10: 1

Q11: 4

Q12: Ver 3D

Q13: Ver 3D

Q14: Ver 3D

Q15: Ver 3D

Q16: 3

Q17: Nope

Participant 4:

Q1: 4

Q2: 3

Q3: 3

Q4: 1

Q5: 3

Q6: 2

Q7: 4

Q8: 3

Q9: 2

Q10: 1

Q11: 4

Q12: Icons that did not function as buttons, despite its appearance hinting at it having a functionality. Some steps are subdivided visually without a need, meaning there was an excessive number of clicks to progress further. The settings are also used to navigate back to the start, which isn't intuitive, and if they are opened mid-instructions they cannot be closed so progress is lost.

Q13: The design itself, except for the settings also being a menu is intuitive. Both the 2D elements and 3D elements easily identify what they represent.

Q14: Outside of the issues listed above, it is a clear step-by-step process.

Q15: During the instructions, being able to change between the broth or ramen without having to cycle through all steps may be nice.

Q16: 3

Q17: N/A

Participant 5:

Q1: 5

Q2: 1

Q3: 4

Q4: 1

Q5: 5

Q6: 1

Q7: 5

Q8: 1

Q9: 5

Q10: 1

Q11: 5

Q12: Figuring out if I had to interact with the app or just move on to the next task

Q13: Very clean and minimalistic, which makes it intuitive

Q14: Very straightforward and user-friendly.

Q15: N/A

Q16: 5

Q17: N/A

Annex 7: SUS Questionnaires VR Answers

Participant 1:

Q1: 5

Q2: 1

Q3: 4

Q4: 1

Q5: 5

Q6: 1

Q7: 3

Q8: 1

Q9: 5

Q10: 2

Q11: It wasn't a really big problem, but sometimes getting the ingredients you had to pick up closer or further away felt a bit awkward at times, but after understanding the mechanics, it became much easier

Q12: I really enjoyed the design, I felt that it was very accurate and realistic

Q13: It felt extremely functional despite the eggs sometimes rolling away. In spite of that, everything felt very fluid and thought out

Q14: I don't think it's really missing anything essential to what the experience truly is but I think it would be a fun little detail if, when reading about the Genkan, you could be able to open one drawer and see the shoes lined up

Q15: 5

Q16: It was a very clear and well-constructed experience, and I think the background music was a very nice touch that helps immerse the users further

Participant 2:

Q1: 5

Q2: 5

Q3: 5

Q4: 1

Q5: 5

Q6: 2

Q7: 5

Q8: 1

Q9: 5

Q10: 2

Q11: Movement of the Avatar doesn't need the focus (black circle) when moving

Q12: Really good experience, learnt a lot

Q13: Really smooth, no motion sickness

Q14: None

Q15: 5

Q16: N/A

Participant 3:

Q1: 1

Q2: 1

Q3: 4

Q4: 2

Q5: 4

Q6: 4

Q7: 4

Q8: 4

Q9: 3

Q10: 1

Q11: The music although immersive and interesting was too loud of me to be able to listen to the instructor clearly

Q12: Very clear and gives off the impression that we are really inside of the house

Q13: Unfortunately, I have found some bugs, but I enjoyed it very much and with some minor adjustments, I can see people wanting to use this sort of technology

Q14: Every game has its tutorial of what buttons to press and how to operate the system. Without the instructor’s guidance and/or my curiosity for pressing random buttons, I could have probably stayed in the starter point

Q15: 4

Q16: Good luck with this project! I’m sure many people would enjoy to live this experience as well.