Requirements Documentation

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Table of Contents

1. Introduction
   1.1 Purpose
   1.2 Summary
   1.3 Definitions and Abbreviations (Glossary)
   1.4 References, Standards, and Rules
   1.5 Overview
2. Product Vision and Goals
   2.1 Product Vision
   2.2 Product Goals
   2.3 Customer Requirements
3. Personas
   3.1 Noah (Preschooler)
   3.2 Ms. Aria (Preschool Teacher)
   3.3 Adam (Parent)
4. User Stories
   4.1 Preschooler User Stories
   4.2 Teacher User Stories
   4.3 Parent User Stories
5. Use Cases
   5.1 Use Case Diagram
   5.2 Tabular Form Use Cases
   5.2.1 Start Game
   5.2.2 Solve Monkey Addition Puzzle
   5.2.3 Solve Monkey Fruit Puzzle
   5.2.4 Show Monkey-Elephant Transition Scene
   5.2.5 Solve Elephant Color Matching Puzzle
   5.2.6 Solve Elephant Subtraction Puzzle
   5.2.7 Receive Feedback
   5.2.8 End Game (Restart or Quit)
6. Quantity Structure
   6.1 Scenes
   6.2 Puzzle Types

6.3 Game Assets
6.4 Game Flow Milestones
6.5 Levels (Animals)
6.6 Quantified Parameters
7. Conclusion
8. Appendices
8.1 Appendix A: Use Case Diagram

1.0 Introduction

This document details the requirements for "Safari Paths," an educational puzzle-adventure game developed by the **Blue Whales** team for the Software Engineering course, Summer 2025. It defines the product vision, identifies target users through personas and user stories, and outlines the system's functional and non-functional requirements.

1.1 Purpose

The primary purpose of this Requirements Documentation is to clearly articulate what the Safari Paths game aims to achieve and for whom. It serves as a foundational agreement between the development team and stakeholders regarding the game's scope, features, and quality attributes.

- **Who created the document and how?** This document was collaboratively created by the Blue Whales development team through an iterative process of stakeholder interviews (simulated via persona definitions), user story elicitation, and requirements analysis. It reflects the team's shared understanding of the product.
- **Who should read this document?** This document is intended for all project stakeholders, including academic evaluators, future developers, game designers, and anyone involved in the testing or maintenance of Safari Paths.
- **Who is bound by this document (scope of use)?** This document defines the mandatory features and quality standards for the Safari Paths game. All development, design, and testing activities are bound by the requirements detailed herein, serving as a baseline for acceptance.

1.2 Summary

Safari Paths is a safe, interactive 2D puzzle adventure designed for children aged 1–5. Built using the Godot engine, the game immerses players in a colorful African safari world. Through character-guided puzzles, children practice basic arithmetic (addition & subtraction), visual matching, sorting, and sequencing in a tactile, violence-free experience. Parents and educators can trust Safari Paths to be developmentally appropriate, educational, and engaging, fostering cognitive development and

problem-solving skills while providing positive audio-visual feedback.

The key customer requirements addressed by this product include providing a visually appealing, time-conscious, and highly educational gaming experience. Stakeholders include the primary users (preschoolers), as well as parents and preschool teachers.

1.3 Definitions and Abbreviations (Glossary)

- **Animal Level:** A major stage of the game, each themed around a specific African animal (like Monkey Level, Elephant Level). Each level contains two distinct tasks.
- **@onready:** A Godot annotation used to get a node reference when the node and its children are ready in the scene tree.
- **Audio Cues:** Sound effects and voice prompts used to guide players and provide feedback.
- **Autoload:** A Godot feature to load a script or scene globally at startup, making it a singleton.
- **Big Buttons:** User interface elements designed to be large and easy for young children to tap accurately.
- **Character-Guided Puzzles:** Puzzles where the animal characters provide visual or audio cues and feedback to guide the child.
- **Child-Safe Visuals:** Graphics designed to be non-threatening, clear, colorful, and age-appropriate.
- **CLS:** Cumulative Layout Shift; a web vital metric measuring unexpected layout shifts of visual page content.
- **Entry Screen:** The initial screen of the game, where players can start playing.
- **Feedback:** The system's response to player actions.
- **Feedback Animations:** Visual changes (like character expressions, animations) that indicate a correct action or success.
- **FR:** Functional Requirements.
- **GameManager:** A global script responsible for managing game state, the current player's session data (like points), and audio playback.
- **GDScript:** Godot's built-in scripting language, a Python-like language.
- **Godot:** Godot Engine, the open-source game engine used for development.
- **HUD:** Heads-Up Display; the on-screen interface that shows vital game information like coins.
- **NFR:** Non-functional Requirements.
- **Negative Visual Feedback:** Visual changes (like character expressions) that indicate an incorrect action or an area for retry.
- **Node:** The basic element in Godot's scene tree. Nodes are arranged in a tree structure and can be anything from a sprite to a script or a UI element.

- **Positive Visual Feedback:** Visual changes (like character expressions, animations) that indicate a correct action or success.
- **Puzzle:** Any interactive visual logic challenge or problem-solving activity within a task.
- **Q:** Quality (Attribute for Non-functional Requirements).
- **Reward:** Positive feedback provided to the player, including feedback animations, sound cues, coin accumulation, and marking of progress.
- **Safari Paths:** The name of the game.
- **Scene (.tscn):** A fundamental building block in Godot, representing a collection of nodes organized into a hierarchy. Scenes can be saved and reused.
- **Signal:** Godot's event system, allowing nodes to "emit" signals when something happens, and other nodes to "connect" to these signals to receive notifications.
- **T:** Technical (Attribute for Non-functional Requirements).
- **Task:** A mini-game or interactive activity within an Animal Level designed to teach a specific cognitive skill (like Addition Task, Fruit Sort Task, Match Letters Task, Subtraction Task).
- **Touch UI:** The user interface is designed for intuitive touch input, featuring big buttons and drag mechanics.
- **UX:** User Experience (Attribute for Non-functional Requirements).
- **Viewport:** The visible area of a screen or window where game content is rendered.

1.4 References, Standards, and Rules

- **Godot Engine Documentation:** Official documentation for Godot Engine 4.x (https://docs.godotengine.org/).
- **Internal Project Documentation:**
  - Architectural Documentation (Safari Paths Project, Summer 2025)
  - Test Documentation (Safari Paths Project, Summer 2025)
  - Project Documentation (Safari Paths Project, Summer 2025)
- **SWE_SoSe2025_DELIVERABLES.pdf:** Provided academic requirements and checklist for project deliverables.
- **GDScript Style Guide:** Internal team conventions for GDScript coding style, naming, and commenting, ensuring consistency and readability.
- **UI Style Guide:** (As per team action item from 1st June 2025 progress report) A set of visual standards for consistent button sizes, font sizes, layouts, and color schemes across all UI elements.

1.5 Overview

This document is structured to provide a comprehensive overview of the Safari Paths game's requirements. Following this introduction, Section 2 defines the product's vision

and overarching goals, including customer requirements. Section 3 introduces the key user personas, while Section 4 details user stories from their perspectives. Section 5 elaborates on the system's use cases, presented both diagrammatically and in tabular form. Section 6 provides a quantitative structure of game components and parameters. The document concludes with a summary, and an appendix containing the Use Case Diagram. This structure ensures clarity, completeness, and adherence to academic documentation standards.

2.0 Product Vision and Goals

2.1 Product Vision

Safari Paths is a safe, interactive 2D puzzle adventure designed for children aged 1–5. Built using the Godot engine, the game immerses players in a colorful African safari world. Through character-guided puzzles, children practice basic arithmetic (addition & subtraction), visual matching, sorting, and sequencing in a tactile, violence-free experience. Parents and educators can trust Safari Paths to be developmentally appropriate, educational, and engaging, fostering cognitive development and problem-solving skills while providing positive audio-visual feedback.

2.2 Product Goals

The overarching goals for Safari Paths are designed to ensure its effectiveness as an educational tool and its appeal to the target audience.

- **Promote Cognitive Development:**
  - Implement simple puzzle mechanics to teach matching, sorting, sequencing, and basic arithmetic (addition and subtraction of numbers 1-5).
  - Design progressively challenging gameplay across different animal levels (Monkey Level, Elephant Level) to maintain engagement and learning progression.
- **Ensure Safety & Simplicity:**
  - Ensure the game is completely violence-free and contains no intrusive ads or in-app purchases.
  - Utilize child-safe visuals and sound cues specifically designed for young players, avoiding startling noises or complex animations.
  - Develop an intuitive Touch UI with large, tactile buttons for effortless navigation, even for children with developing fine motor skills.
- **Engage & Delight Young Players:**
  - Incorporate engaging safari-themed stories and cheerful animal characters (Monkey, Elephant) to create an immersive and inviting world.
  - Feature colorful, high-contrast visuals and fun animations to capture and

maintain children's attention.
    - Provide a tactile interface designed for touch devices to allow direct and satisfying interaction.
    - Implement positive reinforcement through immediate rewards, encouraging sounds, and clear visual feedback for every correct action.
- **Support Learning Outcomes:**
    - Enable children to develop fundamental logic and visual recognition skills through interactive puzzle-solving.
    - Introduce basic vocabulary through animal-themed missions and clear on-screen text.
    - Design the game to encourage independent play, requiring minimal guidance from adults.

2.3 Customer Requirements

Based on the identified stakeholders (preschoolers, teachers, parents), the following core customer requirements are addressed by Safari Paths:

- **Visually appealing:** The game must be aesthetically pleasing and captivating for young children.
- **Time consumption:** Game levels and tasks should be short and digestible to match children's attention spans and fit into structured play times.
- **Educational:** The game must genuinely promote learning and cognitive development, aligning with early childhood education principles.

3.0 Personas

To capture the diverse needs and perspectives of our target audience, three personas have been modeled. These personas guide design decisions and ensure the game addresses real-world user requirements.

3.1 Noah (4 y/o, Preschooler)

A typical day:

Morning Attending preschool

Afternoon Watching cartoons

Evening Dinner, Playing with toys

A typical quote:

"Look! I matched the two fruits! Yay!"

My last vacation:

Went to Disneyland

These are my career plans:

Still to young for that

This is the challenge I want you to solve for me:

Identifying colors and matching them to their first letter

Reasons why I have not yet been able to solve this problem

It needs a lot of practice and doing it in class is boring

Name: Noah

Place of residence: Aschaffernburg

Profession: Prescholar

Age: 4

Marital status: Single

Hobbies: Playing with toys, drawing with crayons, watching cartoons

I play these games most often:

Matching games
Coloring games

That annoys me in everyday life:

Having to wait too long for things

That makes me happy:

->Getting a high five from his parents.
->Seeing colorful animals and being told "Good job!".

I'm afraid of:

->Loud, scary noises.
->Anything that looks mean or unfriendly.

3.2 Ms. Aria (Preschool Teacher)

A typical day:

Morning Teaching at the preschool

Afternoon Marking exercises and preparing for the next day's exercises

Evening Dinner, Yoga

A typical quote:

"Every child is a unique learner, and it's our job to find the key that unlocks their potential."

My last vacation:

Went to Italy

These are my career plans:

Head teacher of the school

This is the challenge I want you to solve for me:

How can I effectively manage classroom attention spans when integrating new, interactive digital tool

Reasons why I have not yet been able to solve this problem

It's challenging to find digital tools that genuinely balance the learning aspect and the fun part of the game for longer attention spans

Name: Ms. Aria

Place of residence: Aschaffernburg

Profession: Preschool Teacher

Age: 31

Marital status: Single

Hobbies: Reading educational psychology books and Yoga

I use these apps most often:

Educational resource apps for lesson planning

That annoys me in everyday life:

Clutter and disorganization, especially in her classroom

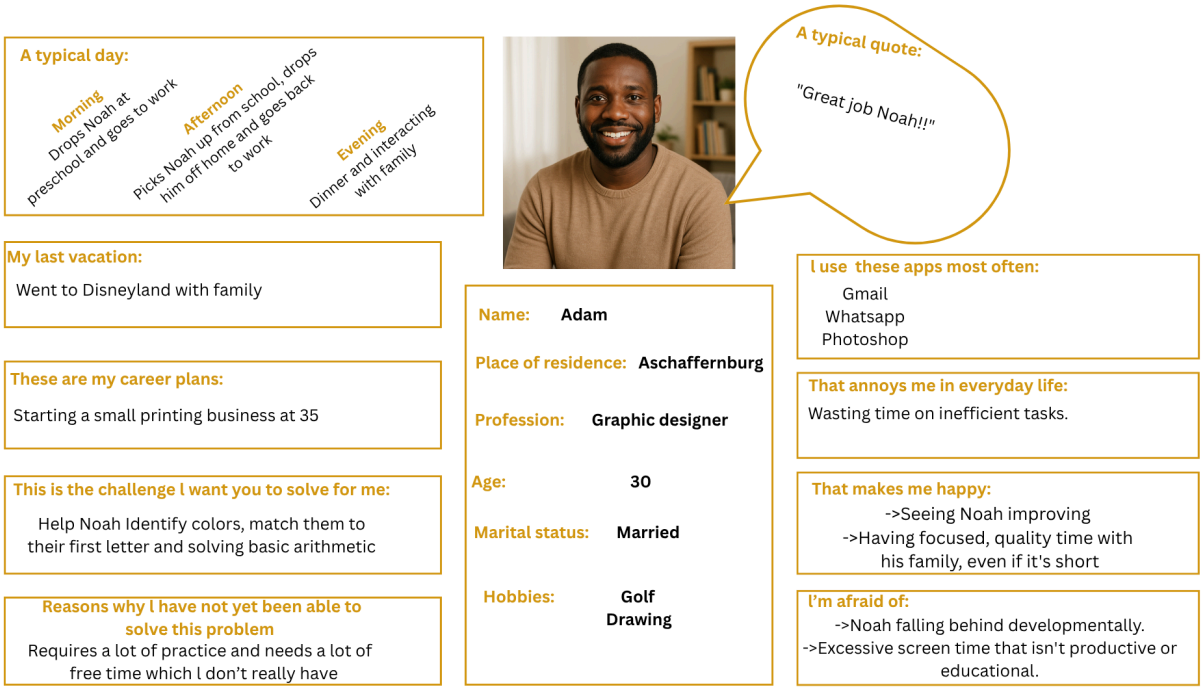
That makes me happy:

->Seeing her students developing strong friendship sand social skills.
->A beautifully organized classroom.
->Positive feedback from parents about their child's growth.

I'm afraid of:

->Not being able to reach every child's full potential
->Increasing screen addiction in children

3.3 Adam (Parent)



4.0 User Stories

User stories describe the desired functionality from the perspective of different user roles, following the "As a , I want so that " template.

4.1 Preschooler User Stories

- As a preschooler, I want to tap big buttons so I can play without reading.
- As a preschooler, I want happy sounds and feedback when I win, so I feel proud.
- As a preschooler, I want to see colorful animals and fun animations so I stay engaged.
- As a preschooler, I want to play tasks that are easy to understand so I don't get frustrated.

4.2 Teacher User Stories

- As a teacher, I want short levels so kids don't lose focus.
- As a teacher, I want the game to be free of violence or complex menus, so that young learners stay focused and safe.
- As a teacher, I want the game to reinforce basic concepts like matching and sorting found in early childhood curriculum so that they can practice the content taught at school when they are at home.

4.3 Parent User Stories

- As a parent, I want my child to develop cognitive and motor skills through puzzles,

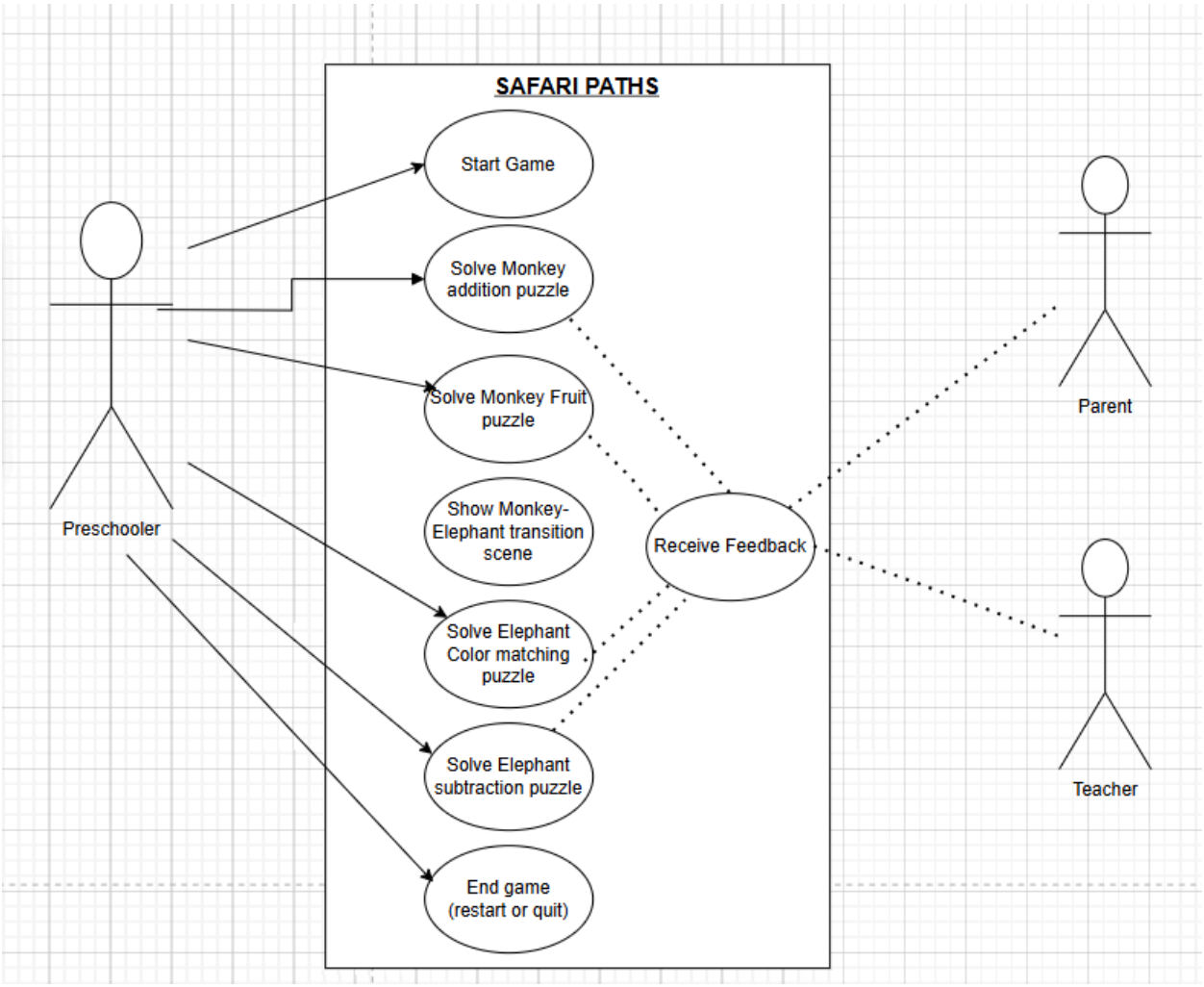
so that they gain confidence and problem-solving ability.

- As a parent, I want my child to enjoy colorful visuals, music, and kind feedback, so that they stay engaged and smile while learning.

5.0 Use Cases

This section describes the primary interactions between actors and the Safari Paths system, outlining typical scenarios and alternative flows.

5.1 Use Case Diagram



5.2 Tabular Form Use Cases:

5.2.1 Start Game

Actor	Preschooler/Teacher/Parent
Goal	Begin game from title screen
Pre-condition	Game is launched
Post-condition	Monkey Addition Puzzle is loaded
Main Flow	1. Entry screen loads 2. Tap Start 3. Transition to Monkey Addition Puzzle
Alternative Scenario	None

5.2.2 Solve Monkey Addition Puzzle

Actor	Preschooler/Teacher/Parent
Goal	Solve 3 correct addition questions
Pre-condition	Monkey Addition puzzle is active
Post-condition	Transitions to Monkey Fruit Puzzle
Main Flow	1. Display question 2. Child taps answer 3. System evaluates 4. If correct: +1 5. If total correct == 3 → next puzzle
Alternative Scenario	Incorrect → new question generated
Includes	Receive Feedback

5.2.3 Solve Monkey Fruit Puzzle

Actor	Preschooler/Teacher/Parent
Goal	Pick 3 good fruits
Pre-condition	Entered after Monkey Addition Puzzle

Actor	Preschooler/Teacher/Parent
Post-condition	Fruit Level complete → Transition to Elephant scene
Main Flow	1. Display fruit set 2. Child taps fruit 3. System evaluates 4. Good → +1 5. If 3 good fruits → level complete
Alternative Scenario	Bad fruit → set refreshes
Includes	Receive Feedback

5.2.4 Show Monkey-Elephant Transition Scene

Actor	Preschooler/Teacher/Parent
Goal	Tap “Continue” after finishing Monkey puzzles
Pre-condition	Monkey Fruit Puzzle completed
Post-condition	Elephant Matching Puzzle begins
Main Flow	1. Show congratulations scene 2. Show “Continue” button 3. Tap → transition to next puzzle
Alternative Scenario	None (game waits for input)

5.2.5 Solve Elephant Color Matching Puzzle

Actor	Preschooler/Teacher/Parent
Goal	Match 5 colors to first letters
Pre-condition	Elephant level starts
Post-condition	Transition to Elephant Subtraction
Main Flow	1. Display color and letter cards 2. Child selects two

Actor	Preschooler/Teacher/Parent
	3. System evaluates 4. If match: disable cards 5. All 5 matched → next puzzle
Alternative Scenario	Incorrect match: cards stay active
Includes	Receive Feedback

5.2.6 Solve Elephant Subtraction Puzzle

Actor	Preschooler/Teacher/Parent
Goal	Solve 3 subtraction questions
Pre-condition	After Elephant Matching Puzzle
Post-condition	Game ends → Final scene
Main Flow	1. Display subtraction 2. Child answers 3. System evaluates 4. If correct: +1 5. On 3 correct → final scene
Alternative Scenario	Incorrect → new question generated
Includes	Receive Feedback

5.2.7 Receive Feedback

Actor	System (responding to input)
Goal	Encourage learning through responses
Pre-condition	Player makes a selection
Post-condition	Audio and visual feedback given
Main Flow	Correct → sound (“Excellent!”), amount of coins increases and happy face remains

Actor	System (responding to input)
	Incorrect → sound (“Let’s try again”), sad face

5.2.8 End Game (Restart or Quit)

Actor	Preschooler/Teacher/Parent
Goal	Conclude play session
Pre-condition	Final puzzle completed
Post-condition	Game quits or restarts
Main Flow	1. Final scene shows 2. Tap “Restart” → return to title 3. Tap “Quit” → close game

6.0 Quantity Structure

This section provides a quantitative overview of the game's components and parameters, essential for understanding the project's scale and scope.

6.1 Scenes

Scene Type	Quantity	File Names / Purpose
Title / Entry Screen	1	_WelcomePage.tscn
Monkey Addition Puzzle Scene	1	AdditionTask.tscn (instantiated in MonkeyLevel)
Monkey Fruit Picking Puzzle Scene	1	FruitSortTask.tscn (instantiated in MonkeyLevel)
Monkey Level Completion / Transition Scene	1	LevelTransition.tscn
Elephant Color-Letter Matching Scene	1	MatchLettersTask.tscn (instantiated in ElephantLevel)
Elephant Subtraction Puzzle	1	SubtractionTask.tscn

Scene		(instantiated in ElephantLevel)
Final (Game Completion / Restart/Quit)	1	EndScene.tscn
Total Main Game Scenes	**7**	

6.2 Puzzle Types

Puzzle Category	**Puzzle Type**	**Tasks / Interactions**
Arithmetic	Addition, Subtraction	3 correct answers each puzzle
Visual Discrimination	Pick Good Fruit	3 correct picks (from a set of 6)
Visual Matching	Color to First Letter	5 correct matches (from 5 pairs)
Total Puzzle Types	**4**	**Total of 14 core correct interactions required**

6.3 Game Assets

Asset Type	**Count / Description**	**Folder Location (Example)**
Animal Characters	2 (Monkey, Elephant) with neutral, happy, and sad expressions	assets/characters/
Feedback Animations	4 (happy/sad faces, success popups, button visual feedback)	assets/characters/, scene components
Audio Files	5+ (background music, correct feedback, incorrect feedback, button click, level complete)	assets/audio/
Scene Backgrounds	3+ (for Welcome, Monkey, Elephant, End scenes)	assets/backgrounds/
UI Elements (per scene)	~7–15 for Puzzle Scenes	assets/items/, scene

	(buttons, labels, grids)	components
UI Elements (menu/completion)	~3–8 for Menu / Completion Scenes (buttons, labels, panels)	assets/items/, scene components
Puzzle-specific elements	Fruits (good/bad variants), letters, colors, coins icon (coins.png)	assets/fruits/, assets/items/

6.4 Game Flow Milestones

Milestone	**Trigger**
Start Game	Tapping "Play" on the Entry screen
Complete Monkey Level	Finishing both Monkey Addition and Monkey Fruit puzzles (3 correct each)
Unlock Elephant Level	Tapping "Continue" after Monkey Level Completion
End Game	Finishing Elephant Subtraction puzzle (3 correct)
Restart or Quit	Interaction on the Final scene screen

6.5 Levels (Animals)

Animal Level	**Task 1 (Path)**	**Task 2 (Path)**	**Completion Criteria**
Monkey	Addition (AdditionTask.tscn)	Fruit Sort (FruitSortTask.tscn)	3 correct additions, 3 correct fruits
Elephant	Match Letters (MatchLettersTask.tscn)	Subtraction (SubtractionTask.tscn)	5 correct matches, 3 correct subtractions

6.6 Quantified Parameters

- **Game Duration:** Aim for short, digestible play sessions, approximately 1-3 minutes per Animal Level for a typical user. The entire game completion is expected to be

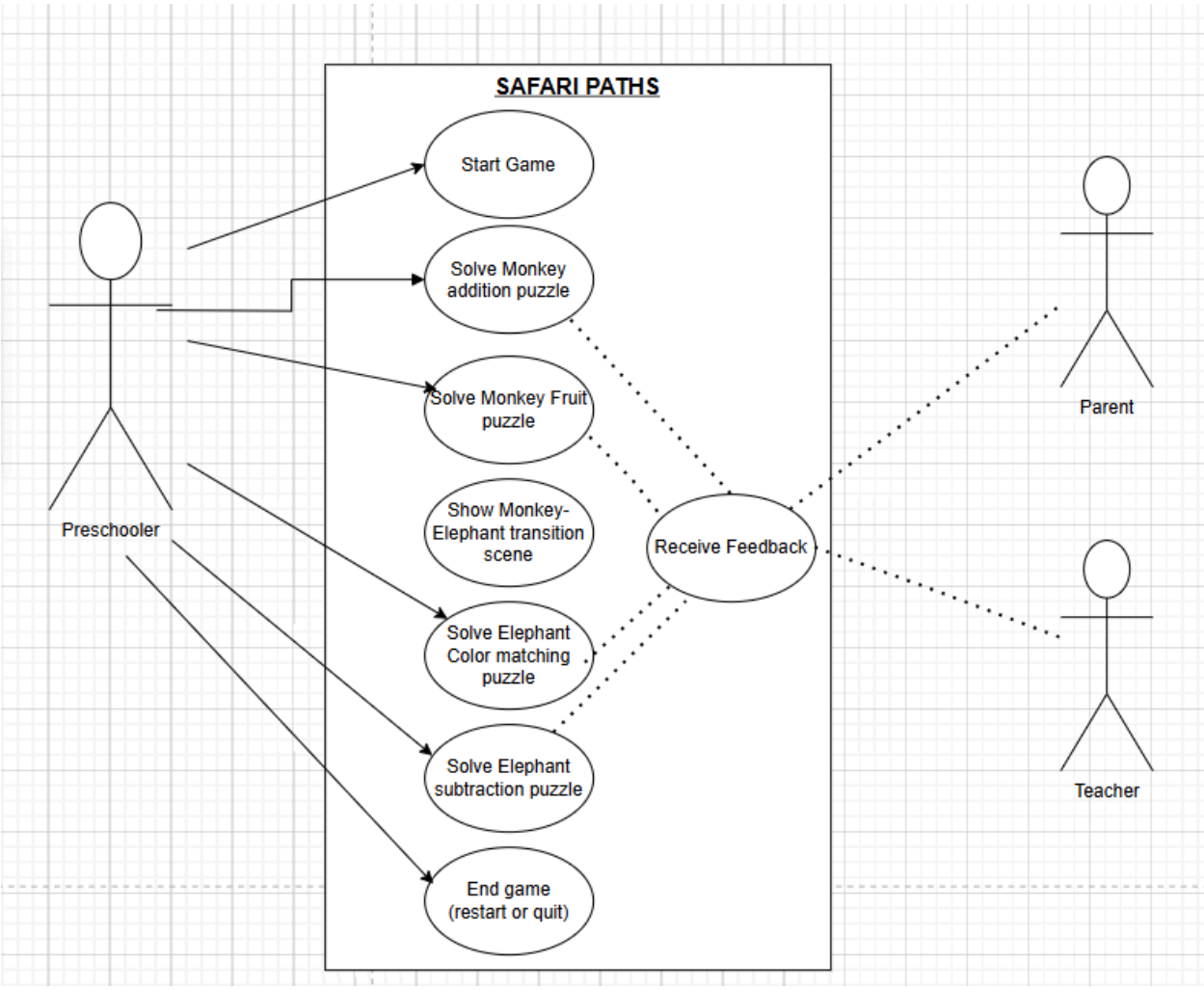
under 5-10 minutes.

- **Number of Correct Answers per Task (to complete the task):**
  - Addition Task: 3 correct answers.
  - Fruit Sort Task: 3 correct fruits.
  - Match Letters Task: 5 correct pairs.
  - Subtraction Task: 3 correct answers.
- **Points per Correct Action:** 100 points (represented as coins) awarded for each correct action within a task.
- **Number of Task Variations:** Each arithmetic task (Addition, Subtraction) will generate random questions within defined parameters (numbers 1-5, ensuring non-negative subtraction results) to ensure replayability within a session. Fruit Sort and Match Letters tasks also feature dynamic arrangements.
- **Audio Files:** Minimum of 5 distinct audio cues: background music (Ghana_to_Mississippi.mp3, Kalahari_Dreaming.mp3), button click (button-click.mp3), correct answer (Girl Saying Excellent.mp3), incorrect answer (Boy Saying Awesome.mp3), and level complete (Girl Saying Let's Do It Again.mp3).
- **Visual Assets:** Dedicated animal characters (Monkey, Elephant) with at least happy and sad expressions. Various puzzle elements (fruits, letters, colors, numerical buttons), and UI elements (buttons like yellowContinuebutton.png, RestartButton.png, Quitbtn.png, coins.png).
- **Target Age Group:** Children aged 1–5 years.

7.0 Conclusion

This Requirements Documentation provides a comprehensive and formally structured overview of the Safari Paths game. It defines the product vision, specific goals, and the customer requirements that drive the game's development. By detailing personas, user stories, and use cases in both diagrammatic and tabular forms, we have captured the functional expectations from various stakeholder perspectives. Furthermore, the quantitative structure provides clear metrics and parameters for the game's components and content.

This document serves as the primary reference for all subsequent development phases, including architectural design, implementation, and rigorous testing. It ensures that the final product will deliver an engaging, educational, and safe interactive experience for its target audience, aligning with the core objectives of the Blue Whales team and the academic deliverables. The clarity and detail provided herein are crucial for successful project execution and evaluation.

8.0 Appendices

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