



## Requirement Documentation

Project: Garbage Collector

Authors:

Hayyan Serwer  
Farees Farooq Ismail  
Sahil Hardasani  
Hussain Ahmed  
Mohsin Siddiqui

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<b>Garbage Collector - Requirements Documentation.....</b>	<b>3</b>
Authors.....	3
Table of Contents.....	3
1. Introduction.....	3
2. Product Vision and Goals.....	4
Product Vision.....	4
Product Goals.....	4
Customer Value Proposition.....	4
3. Personas.....	4
Persona 1: "Curious Clara".....	5
Persona 2: "Energetic Emil".....	5
Persona 3: "Shy Sofia".....	5
4. User Stories.....	5
Host Player Stories.....	5
Joining Player Stories.....	6
General Player Stories.....	6
5. Use Case Diagram and Use Cases.....	6
System Boundary.....	6
Actors.....	6
Use Cases.....	6
UC-01: Host Game.....	7
UC-02: Join Game.....	7
UC-03: Move Character.....	7
UC-04: Collect Trash.....	8
UC-05: Sort Trash.....	8
UC-06: Win Game.....	8
6. Quantity Structure.....	9
Game Session Parameters.....	9
Technical Specifications.....	9
Educational Content.....	9
7. Dictionary of Terms.....	9
8. Summary.....	10
9. References.....	11

# 1. Introduction

*This document presents the requirements for "Garbage Collector," an educational multiplayer game designed for children aged 5-10. The game teaches environmental responsibility through interactive waste management and recycling activities. This requirements document reflects the final implemented system specifications as validated through acceptance testing.*

*The game operates as a local area network (LAN) multiplayer experience for exactly two players, implemented using the Godot engine . Players cooperatively collect and sort different types of waste into appropriate bins while learning about environmental stewardship.*

*This document serves as the definitive specification for the Garbage Collector game, incorporating lessons learned during development and final system capabilities.*

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## 2. Product Vision and Goals

### Product Vision

*Create a fun and cooperative educational game for children between 5 to 10 that teaches environmental responsibilities by letting players sort different types of trash into the correct bins, promoting awareness of waste management and recycling through local multiplayer collaboration.*

*Vision Development Method: User-Centered Design approach with persona-driven requirements gathering and iterative testing.*

### Product Goals

- 1. Develop a local network multiplayer game where exactly 2 players can join on separate computers*
- 2. Implement 4 types of bins: Restmüll (Black), Bio (Brown), Plastic (Yellow), and Paper (Blue)*
- 3. Continuously generate trash items that players must cooperatively sort into correct bins*
- 4. Track player scores with victory condition of first player to reach 20 points*
- 5. Provide simple, colorful, and child-friendly graphics appropriate for children aged 5–10*
- 6. Ensure basic educational messages about waste types and recycling rules*
- 7. Enable cooperative gameplay where players help each other learn proper sorting*
- 8. Ensure the game is simple enough to learn in under 2 minutes*

## 9. Support Windows platform with Godot engine implementation

### Customer Value Proposition

*The game addresses the need for engaging environmental education by combining learning with cooperative play, allowing children to practice waste sorting skills in a safe, fun digital environment while building teamwork abilities.*

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## 3. Personas

### Persona 1: "Curious Clara"



**Age:** 5

**Background:** Lives in a suburban German household with eco-conscious parents

**Personality:** Inquisitive, eager to explore, asks a lot of questions

**Goals:** Wants to "do things like Mama and Papa" and help around the house

**Tech Skills:** Can use a tablet with supervision, familiar with basic touch controls

**Game Motivation:** Loves colors, matching games, and earning cute rewards like stickers

**Multiplayer Role:** Likes playing up against a sibling or friend to "beat the mess".



### Persona 2: "Energetic Emil"

**Age:** 6

**Background:** Goes to a bilingual kindergarten in Berlin, loves playing outside

**Personality:** Active, social, loves challenges and competition

**Goals:** Wants to win, be fast, and collect points—loves being the leader

**Tech Skills:** Regularly uses a kid-friendly gaming console; familiar with simple games

**Game Motivation:** Engaged by fast-paced games, bright visuals, and leaderboards

**Multiplayer Role:** Naturally takes charge; tries to direct others on which bin to use

## Persona 3: "Shy Sofia"



**Age:** 7

**Background:** Recently started grade 1; has a quieter personality

**Personality:** Observant, shy around others but warms up with encouragement

**Goals:** Wants to feel included and praised for doing things right

**Tech Skills:** Rarely uses devices, but responds well to interactive storybooks

**Game Motivation:** Prefers games that involve story or gentle guidance; enjoys characters talking to her

**Multiplayer Role:** Follows others' lead but learns by observing; excels with cooperative modes

## 4. User Stories

### Host Player Stories

- **US-01:** As a host player, I want to create a new game room in order to enable local multiplayer gameplay with my friend
- **US-02:** As a host player, I want to start the game when my friend has joined in order to begin cooperative waste sorting together
- **US-03:** As a host player, I want to use WASD controls for movement in order to navigate around the game environment efficiently

### Joining Player Stories

- **US-04:** As a joining player, I want to connect to a hosted game on the local network in order to participate in cooperative gameplay
- **US-05:** As a joining player, I want to use WASD controls for movement in order to avoid control conflicts with the host player
- **US-06:** As a joining player, I want to see when my connection is successful in order to know I can start playing

### General Player Stories

- **US-07:** *As a player, I want to pick up trash items using the “E” button in order to collect waste for sorting*
  - **US-08:** *As a player, I want to sort trash into the correct colored bins in order to earn points and learn proper waste management*
  - **US-09:** *As a player, I want to see my score increase when I sort items correctly in order to track my progress toward victory*
  - **US-10:** *As a player, I want to reach 20 points to win the game in order to have a clear victory condition*
  - **US-11:** *As a player, I want simple, colorful icons for each bin type in order to easily identify where to sort different waste items*
  - **US-12:** *As a player, I want continuous trash spawning in order to maintain engaging cooperative gameplay throughout the session*
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## **5. Use Case Diagram and Use Cases**

### **System Boundary**

**System:** *Garbage Collector Game*

**Environment:** *Local Area Network ,Godot Engine*

### **Actors**

- **Host Player:** *Player who creates and hosts the game session*
- **Joining Player:** *Player who connects to an existing hosted game*

### **Use Cases**

**UC-01:** *Host Game*

**Actor:** *Host Player*

**Pre-conditions:** *Game application is launched, local network is available*

**Post-conditions:** *Game room is created and waiting for joining player*

**Main Scenario:**

1. *Host player selects "Host" option*
2. *System creates local network game session*
3. *System waits for joining player to connect*

**Alternative Scenario:**

- *If the network setup fails, the system displays an error message and the game doesn't work.*

#### **UC-02: Join Game**

**Actor:** *Joining Player*

**Pre-conditions:** *Host has created game room, joining player is on same local network*

**Post-conditions:** *Both players are connected and ready to play*

**Main Scenario:**

1. *Joining player selects "Join" option*
2. *System searches for available games on local network*
3. *System connects to host's game session*
4. *System confirms successful connection to both players*

**Alternative Scenario:**

- *If the connection fails, the system displays an error and the game does not work.*

#### **UC-03: Move Character**

**Actor:** *Host Player, Joining Player*

**Pre-conditions:** *Player is connected to active game session*

**Post-conditions:** *Player character position is updated*

**Main Flow:**

1. *Player presses movement key (WASD for host, WASD for joining player)*
2. *System updates character position*
3. *System synchronizes position with other player*
4. *System renders updated game state*

#### **UC-04: Collect Trash**

**Actor:** *Host Player, Joining Player*

**Pre-conditions:** *Player character is near trash item*

**Post-conditions:** *Trash item is collected by player*

**Main Scenario:**

1. *Player moves character near trash item*
2. *Player presses E and picks the trash.*
3. *System attaches trash item to player character*
4. *System updates game state for both players*

#### **UC-05: Sort Trash**

**Actor:** Host Player, Joining Player

**Pre-conditions:** Player is carrying trash item, player is near appropriate bin

**Post-conditions:** Trash is sorted, points awarded if correct

**Main Scenario:**

1. Player carrying trash approaches bin
2. Player presses F near bin
3. System checks if trash type matches bin type
4. If correct: System awards point, updates score display
5. If incorrect: System removes trash without points
6. System spawns new trash item

**Alternative Flow:**

- If player reaches 20 points, system triggers victory condition

**UC-06: Win Game**

**Actor:** Host Player, Joining Player

**Pre-conditions:** Player has reached 20 points through correct sorting

**Post-conditions:** Game session ends with victory declaration

**Main Scenario:**

1. Player's score reaches 20 points
2. System declares player as winner
3. System displays victory screen
4. System ends game session

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## 6. Quantity Structure

### Game Session Parameters

- Players per session: Exactly 2
- Maximum score to win: 20 points
- Bin types: 4 (Restmüll, Bio, Plastic, Paper)
- Continuous trash spawning: Limited to 10 items
- Network type: Local Area Network (LAN)

### Technical Specifications



- **Game engine:** Godot
- **Network architecture:** Host-client model
- **Control schemes:** Single control set (WASD )
- **Points per correct sort:** 1 point
- **Victory condition:** First to 20 points

## **Educational Content**

- **Waste categories taught:** 4 types
  - **Learning objective:** Environmental awareness through waste sorting
  - **Target age range:** 5-10 years
  - **Session duration:** Variable (until victory condition met)
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## **7. Dictionary of Terms**

### **Bin**

**Colored containers representing different waste categories: Black(Restmüll), Green (Bio), Yellow (Plastic), Blue (Paper). Players must sort trash items into matching bins to earn points.**

### **Cooperative Gameplay**

**Game mode where two players work together on the same task of collecting and sorting waste, sharing the same game environment while using different controls.**

### **Garbage Item**

**Objects that spawn continuously in the game environment and must be collected and sorted by players. Examples include organic waste, plastic containers, paper items, and general waste.**

### **Host Player**

**The player who creates and manages the local network game session. Uses WASD keys for character movement and hosts the game on their computer.**

### **Joining Player**

**The second player who connects to a hosted game session over the local network. Uses WASD for character movement.**

### **Local Area Network (LAN)**

**The network connection type used for multiplayer functionality, allowing two players on separate computers within the same local network to play together.**

**Points**

*Numeric score awarded to players for correctly sorting waste items into appropriate bins. First player to reach 20 points wins the game.*

**Restmüll**

*German term for "residual waste" or general waste that cannot be recycled. Represented by black bins in the game.*

**Sorting**

*The core gameplay mechanic where players place collected trash items into the correct waste bins based on material type.*

**Victory Condition**

*The game ending trigger occurs when any player reaches exactly 20 points through correct waste sorting.*

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## **8. Summary**

*The Garbage Collector requirements document defines a cooperative educational game that successfully combines environmental learning with engaging multiplayer gameplay. The final system specification reflects a focused, achievable scope with local network multiplayer for exactly two players using distinct control schemes.*

*Key achievements of the requirements include clear persona definition targeting children aged 5-10, comprehensive user stories following proper formatting, detailed use cases with pre/post conditions, and quantified parameters that guided successful implementation. The game's educational value is delivered through hands-on waste sorting mechanics that teach children about environmental responsibility.*

*The requirements successfully guided development of a Windows-based Godot game that passed all acceptance criteria, demonstrating effective requirements engineering practices and stakeholder collaboration.*

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## **9. References**

- 1. Acceptance Documentation - Garbage Collector Project (June 25, 2025)*
  - 2. User-Centered Design Methodology for Educational Games*
  - 3. German Waste Management Categories (Restmüll, Bio, Plastic, Paper)*
  - 4. Godot Engine Documentation and Best Practices*
  - 5. Local Area Network Gaming Implementation Standards*
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