Technical Specifications and Game Design Framework

This document provides the granular technical and procedural details for game-based mechanics for each game.

1. INFINITY Specifications

Game Type: Competitive/Collaborative Board Game for Game-Based Assessment.

Physical Components: 1x Game Board (Monopoly-style path), 4x Player Tokens, 1x Six-sided Die.

Card Inventory: Skill Cards (60 total), categorized by DigComp Area (Safety, Literacy, Problem Solving); Action Cards (20 total): Game-logic modifiers (e.g., "Skip a turn," "Move forward 2 spaces").

Mechanics: Players roll the die to move along the path. Landing on a "Task Tile" requires drawing a Skill Card. The Game Master (Trainer) reads the prompt.

Scoring: A correct answer allows the player to remain on the tile. An incorrect answer requires the player to move back one space, followed by a "Learning Moment" where the trainer explains the correct digital practice.

Board Architecture

The board follows a continuous infinity-loop topology, ensuring that players cycle through all three DigComp competence areas multiple times.

Total Fields: 42 active tiles.

Specific Field Types:

- **Conquer Fields (32):** Standard assessment points. Landing requires a "Foundation" (Level 1) or "Intermediate" (Level 2) card.
- **Debug Zones (4):** High-difficulty penalty areas. Players cannot leave the zone until an "Advanced" (Level 3) Problem-Solving task is correctly resolved.

Wi-Fi Hubs (2): Strategic "safe zones" where players can choose to "Update" their knowledge (read a learning card) without a formal assessment check.

The "Attack" Dynamic

If Player A lands on a field already "Conquered" by Player B, an **Attack Challenge** is triggered.

1. Player A draws an **Attack Card** (randomly selected from Level 2 or 3 tasks).
2. If Player A is correct, they "Reclaim" the field.
3. If Player A is incorrect, they move back 3 spaces, and Player B retains the field.

This mechanic was designed to measure "Resilience" and "Digital Confidence" in a competitive but safe environment.

The INFINITY Gameplay

INFINITY (shown in **Error! Reference source not found.** of the manuscript) begins with each player selecting a game totem, choosing one of the offered colors (red, blue, green, or yellow) to represent their identity on the board. Players then place their totems at the center of the game board, which is marked by a joker hat symbol that denotes the starting point. The objective is to conquer eight fields on the board by answering questions that test digital competencies. The game unfolds by

players taking turns in rolling the die, which allows them to advance their totems along the infinity-shaped path.

As players move through the fields, they face with various scenarios that shape the dynamics of their game-play and lead to opening card from various card decks (**Error! Reference source not found.** of the main text). When a player lands on an empty white field, they have the opportunity to conquer it. To do that, they draw a card from the Conquer card deck containing questions related to digital skills. If they answer correctly, they claim the field and mark it with their chosen color to signal ownership. If the answer is incorrect, the field remains unclaimed, and the player continues their journey until the next opportunity for conquering.

The game becomes dynamic and interactive when a player lands on a field that has already been conquered by someone. In this case, they can choose to attack the field, which leads to drawing a more challenging question from the Attack card deck. If they answer correctly, they reclaim the field, replacing the previous owner's colour with their own. If the answer is incorrect, the field remains under its current owner, and the attacker continues with their next turn.

The board is punctuated with special fields that add complexity and strategy to the gameplay. Landing on a Debug Zone field imposes a penalty, requiring the player to answer from the game's most difficult questions from the Debug Zone deck. A correct answer allows the player to continue playing, while an incorrect response results in a temporary setback, forcing the player to skip a turn before attempting another question. Alternatively, the Wi-Fi Free Zones offer respite, allowing players to conquer or reclaim fields without the need to answer a question. This introduces a layer of luck and strategic positioning.

Other fields offer unique advantages. The Teletransport field enables players to move their totems freely across the board, creating opportunities to bypass difficult fields or strategically position themselves for conquest. Landing on a Joker field rewards the player with a Joker card, which can be used to skip answering a question, providing advantage in critical moments.

Throughout the game, players keep track of their progress by collecting the cards associated with each question they attempted to answer. Correct answers are placed in the "Right" - ✔ field and incorrect answers in the "Wrong" - ✗ field, displayed at their respective corners of the board. This visual record of their performance serves as both a scoring mechanism and a reflection of their digital competencies.

The game results in a Win when one player successfully conquers eight fields. However, the final victor is determined not only by the number of conquered fields but also by the number of correctly answered questions. Players count their correct cards, and the one with the most correct answers earns additional points, ultimately deciding the winner.

2. DiGiUP Specifications

Game Type: Scenario-based Digital Simulation for Game-Based Learning.

Platform: Hybrid - board play with web-based, tablet-optimized access to learning modules and materials.

Structure: 5 Narrative Chapters (e.g., "Setting up a Home Office," "Safe Online Shopping").

Mechanics: Players navigate a "Choose Your Own Adventure" interface. Each decision point represents a DigComp competence task.

Dynamics: Branching logic. If a player chooses a "High Risk" security option, the game simulates a consequence (e.g., a "Pop-up Alert") and offers a pedagogical hint to retry.

Game Architecture

The Room Tasks: Each room contains 4 hidden tasks. Participants must "uncover" at least 2 tasks to qualify for the "Elevator Challenge."

QR-Triggered Simulations: The "Elevator" is a physical tile on the board with a static QR code.

- **Action:** The participant scans the code with a project-provided tablet.
- **Interaction:** The tablet launches a sandbox environment (e.g., a simulated "Inbox" or "Banking App").
- **Assessment:** The trainer observes the participant's touch-gestures and navigation logic, scoring based on a standardized 3-point rubric (Independent, Prompted, Assisted).

At the start of DiGiUP, each participant receives 3 physical "Help Tiles."

- **Peer-Assistance:** A participant can "spend" a tile to ask another player for the answer.
- **Trainer-Assistance:** A tile can be spent to receive a "Conceptual Hint" from the facilitator.
- **Coding Rationale:** Use of Help Tiles is recorded as an indicator of **Relatedness** (SDT) and **Information-Seeking Behavior** (DigComp Problem Solving).

The DiGiUP Gameplay

In DiGiUP, players take on the role of trusted community members participating in a digital discovery challenge: "*The local community centre has launched a month-long initiative to promote smart, safe, and confident use of digital tools for everyday tasks, from staying connected with loved ones to managing appointments, online shopping, and ensuring digital safety.*" As participants, players move through familiar settings like the kitchen, living room, and study, solving practical digital challenges tailored to real-life situations. Their mission is to complete tasks, gain confidence, and unlock digital milestones that support independence and lifelong learning.

The game then unfolds in a house represented on the game-board, featuring six distinct rooms, as shown in **Error! Reference source not found.** of the manuscript: the Kitchen, Bathroom, Dining Room, Living Room, Bedroom, and Study Room. Each room corresponds to a specific set of digital competencies from the DigComp 2.2 framework. For instance, the Kitchen and Living Room focus on information and data literacy, and the Bathroom and Bedroom emphasize safety skills. The narrative progresses as players move from room to room, starting at the bottom of the house and advancing upwards toward the top floor.

To begin, each player selects a totem to represent their progress. Players take turns entering each room and tackling its challenges, which consist of four quiz-style questions (the "traditional steps") and a final digital task (the "digital step"). The direction of the gameplay goes from the bottom to the

top of the house. The questions vary in difficulty from basic, through intermediate, to advanced level. They are presented by the game master, who uses a booklet containing quizzes tailored to each room's topic. Players must choose the difficulty level of each question based on their confidence and strategy. As players encounter questions, they have the option to answer independently or rely on some game resources for assistance:

- If a player answers a question correctly without aid, they progress to the next question field and retain any unused help tiles.
- If they struggle, players can use a help tile to request assistance from another player or exchange it for a bridging card. These bridging cards (see **Fig. 1**) act as powerful learning tools, offering access to relevant learning modules via QR codes. By scanning the code, players are directed to an online resource that helps them build the knowledge needed to answer the question.
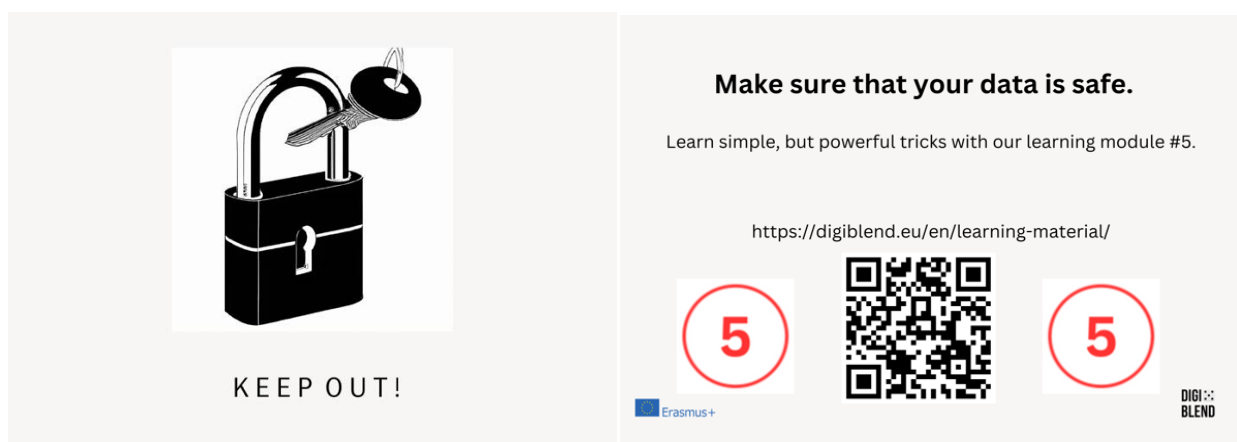

Fig. 1*: The Bridging card no.5: The front and the back side*

Each room culminates in a mandatory digital task at the elevator (represented by a QR field). Only after successfully completing this task can players proceed to the next room. These digital tasks test practical skills aligned with the room's theme, reinforcing learning through application. Players who answer all questions and complete the digital task advance, continuing their journey toward the top of the house.

The game's competitive edge comes to life as players strive to reach the final room. The first player to complete all six rooms and solve the last digital task wins. In the case of a tie, the winner is determined by the number of unused bridging cards – rewarding efficient problem-solving and self-reliance. If still tied, a dice roll will ultimate resolve the competition.

DiGiUP combines storytelling, strategic decision-making, and collaborative learning, creating an engaging experience that not only evaluates but actively enhances digital skills. Through the use of bridging cards, customizable question difficulties, and interactive digital tasks, the game ensures meaningful learning outcomes while fostering a sense of challenge, collaboration, and achievement.