

The Location-Based *AR Design* Playbook

Four evidence-based principles for augmented reality that connects people across distance — from three user studies with 128 participants.



Most AR is decoration.

Most location-based AR games treat AR as an optional visual layer — players can switch it off and the game barely changes. That's fine for collecting creatures on a street corner. It falls apart when the whole point is to connect people who are physically apart: a family across two countries, a distributed team, visitors to a heritage site and the expert guiding them from elsewhere.

The principles in this playbook come from research-through-design at HIT Lab NZ, University of Canterbury, with Sony Interactive Entertainment as industry partner: build a game, test it with players, learn, and build the next one. Three studies with 128 participants in total asked how to represent a remote space, how players make decisions and coordinate inside it, and which AR mechanics make distributed play meaningful.

Each principle names the study it comes from, so you can check the evidence yourself — full sources are on the last page.

THE FOUR PRINCIPLES

- **01** — Make the place feel present
- **02** — Lightweight presence beats fidelity
- **03** — Make AR a core mechanic
- **04** — Guide without removing the challenge

HOW TO USE IT

- Read the principles at concept stage
- Run the checklist before your first playtest
- Share the do/avoid lists with designers and developers

Make the place feel present

When people share a game across distance, the remote place is the game board. How you show it decides whether players feel they are in it, or looking at a picture of it.

We compared three techniques. Showing the remote room as a real-world-scale **Overlay** around the player produced the strongest sense of “being there” and of knowing where you are in the space. A **Window** portal felt like the remote place extending into your own, which makes it a natural doorway between locations. A **Tabletop** miniature gave a useful strategic overview — but a detached one.

Evidence: Study 1 · 30 participants · Entertainment Computing (Elsevier), 2025

DO

- Use a real-world-scale Overlay when you want presence and self-location
- Use Window “portals” as the interface for passing resources between locations
- Ground the remote space in high-fidelity 3D scans of the real environment

AVOID

- Reaching for a tabletop miniature when players need to feel present — it gives overview, not immersion
- Treating the remote place as a backdrop rather than the space players act in

Lightweight presence beats fidelity

It's tempting to spend the budget on realistic avatars. In a remote multiplayer AR hide-and-seek game, a minimal cue — a **view frustum** showing where the remote player was looking — strengthened social connection and coordinated players as effectively as far heavier embodiment, without avatars or video.

AR shifted how people played, too: players made use of mid-air and vertical space. Design for it, because they will find it.

Evidence: Study 2 · 60 participants · IEEE VR 2025 and Multimodal Technologies and Interaction (MDPI), 2025

DO

- Show the remote player's viewpoint in real time
- Pair visual cues with voice
- Test minimal orientation cues, like a view frustum, before investing in avatars
- Design play spaces with vertical and mid-air positions in mind

AVOID

- Spending on high-fidelity avatars or video before simple cues have been tested
- Designing only at ground level

Make AR a core mechanic

If players can switch AR off without changing the game, AR is decoration. When AR was built into the gameplay loop — several remotely anchored objects, real-time manipulation, and time pressure — strategic search behaviour and engagement deepened.

The condition is **clear feedback and well-calibrated constraints**. Time pressure that stretches players works; time pressure that overwhelms them doesn't.

Evidence: Study 3 · 38 participants · OzCHI 2025 (ACM)

DO

- Embed AR in the gameplay loop, so the game changes if AR is removed
- Anchor several objects remotely and let players manipulate them in real time
- Calibrate time pressure in playtests until it stretches without overwhelming

AVOID

- AR as an optional visual layer
- Constraints tuned on paper rather than with real players

Guide without removing the challenge

Players new to shared AR get disoriented early. Subtle feedback — such as **particle trails** marking where objects were swapped — helped them stay oriented while leaving the discovery to them.

Good onboarding reduces that early confusion. And because players move through physical space, their safety is part of the design, not an afterthought.

Evidence: Studies 2 and 3 · synthesised in the PhD thesis, University of Canterbury, 2025

DO

- Use subtle feedback, like particle trails, to support orientation
- Invest in onboarding for the first minutes of play
- Design for safe physical movement: space, pace and awareness of surroundings

AVOID

- Guidance so strong it solves the puzzle for players
- Leaving safety to a warning screen

A twelve-question checklist

Run through it at concept stage, and again before your first playtest. Every “no” is a design decision worth making on purpose.

- | | | |
|----|---|--------------------------|
| 01 | Would the game change if AR were switched off? (It should.) | ☐ |
| 02 | Where presence matters, is the remote place shown at real-world scale? | ☐ |
| 03 | Is there a clear, intuitive way to pass things between locations? | ☐ |
| 04 | Is the remote space built from real scans rather than generic stand-ins? | ☐ |
| 05 | Can players see, in real time, where remote teammates are looking? | ☐ |
| 06 | Can players talk to each other? | ☐ |
| 07 | Have simple presence cues been tested before investing in avatars? | ☐ |
| 08 | Do levels use vertical and mid-air space? | ☐ |
| 09 | Are there several remotely anchored objects players can manipulate live? | ☐ |
| 10 | Has time pressure been calibrated with real players? | ☐ |
| 11 | Does feedback support orientation without giving answers away? | ☐ |
| 12 | Is there onboarding for the first minutes — and a plan for safe movement? | ☐ |

SOURCES

Check the evidence

Representing Remote Locations with Location-Based Augmented Reality Game Design

Entertainment Computing 53 (2025), Elsevier · Study 1

<https://doi.org/10.1016/j.entcom.2025.100932>

Augmented Hide-And-Seek: Evaluating Spatial Decision-Making and Player Experience in a Multiplayer Location-Based Game

IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR), 2025 · Study 2

<https://ieeexplore.ieee.org/document/10973019>

Evaluating Spatial Decision-Making and Player Experience in a Remote Multiplayer Augmented Reality Hide-and-Seek Game

Multimodal Technologies and Interaction 9(8):79 (2025), MDPI · Study 2

<https://doi.org/10.3390/mti9080079>

On the Impact of Augmented Reality Game Mechanics on the Player Experience in Remote Multiplayer Gameplay

OzCHI '25, ACM · Study 3

<https://doi.org/10.1145/3764687.3764699>

Designing Multiplayer Location-Based Augmented Reality Games that Connect Remote Players and Places

PhD thesis, University of Canterbury, 2025 · All studies

<https://ir.canterbury.ac.nz/items/6df971c0-1314-4863-8156-304c838686d0>

Want these principles applied to your project?

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