Evaluation 2

Objective and Validation Metrics

Key objectives from the XR block assembly testing plan:

1. Whether users can intuitively assemble blocks to replicate a pictured table in XR.
2. How validation feedback impacts accuracy and user strategy.
3. If users engage playfully and curiously with the novel interlocking material.

Note – I have combined the fourth objective with the third, as both focus on differentiating user experience and performance based on visual cues.

Based on these objectives, the following metrics were used for evaluation:

Objective 1: Whether users can intuitively assemble blocks to replicate a pictured table in XR.

Metric:

- Users can pick up, move, and accurately place blocks onto target positions, benefiting from guiding cues and without extensive external assistance.

Objective 2: How validation feedback impacts accuracy and user strategy.

Metric:

- Participants correctly interpret blue hologram cues/shadows for block placement.
- Users distinguish colour coding for blocks, understanding the role of blue (placement), yellow/red (block type/orientation), and their effect on task performance.

Objective 3: If users engage playfully and curiously with the novel interlocking material

Metric:

- Participants report ease of reaching, grabbing, and manipulating all blocks.
- Boundary and workspace issues (like out-of-reach or floating blocks) are recorded and user feedback on physical comfort is collected.

Results

This table shows a concise overview of participant experiences aligned to each evaluation objective, facilitating quick pattern recognition for further iteration and reporting

Participant	Accurate Block Manipulation (Pickup, Place, Snap)	Interprets Blue (Placement) Cues	Interprets Colour Coding	Ergonomic/Workspace Comfort	Requests for Feedback Improvement	Requests for Guidance/Visual Reference
Ben	Yes, but wanted rotation prompts, some blocks hard to reach	Yes, found blue cues very helpful	No, found colours not meaningful	No, hard-to-reach blocks, physical constraints	Yes, wanted positive and negative cues	Yes, suggested whole structure guide/hologram
Lilly	Yes, smooth and intuitive	Yes, blue cues "most helpful"	No, colour not functionally clear	No, some floating/out-of-reach blocks	No specific feedback mention	Yes, wanted a sheet near plate to show target
Ella	Yes, but some awkward placing	Yes, blue shadow guides helpful	No, blue cues more meaningful than colour	No, boundary issues and low reach	No specific feedback mention	Yes, recommended nearby visual guide
Rithisha	Yes, but lost tracking/reach issues	Yes, cues helpful even with setup issues	No, cues prioritized over colour	No, hand went out of play boundary, frustrating	No specific feedback mention	No direct mention (focused on setup/boundary)
Prisha & Cimi	Yes, intuitive and "like Lego"	Yes, blue cues critical for guidance	No, colour secondary to cues	No, some blocks out of reach, preferred flexible movement	No, but wanted easier distance grabbing	Yes, visual reference or overview requested

Participant	Assembly Success	Most Challenging Task & Why	Helpfulness of Cues	Validation Feedback	Intuitive Controls	Curiosity/Experimentation	Suggested Improvements	Mental Demand	Physical Demand	Temporal Demand	Performance (1=best)	Effort	Frustration
Ben	Yes	Hard-to-reach blocks due to workspace	Blue cues very helpful; colours not meaningful	Wanted both positive and negative cues	Grabbing/snapping intuitive, rotation suggestions	Structure clearer, reduced guesswork	Improve cue clarity, workspace, automatic snapping	10	8	9	4	11	8
Lilly	Yes	Floating blocks; out-of-reach	Blue cues helpful, colours not clear	No validation issues	Smooth, like Lego	Playful building	Add target sheet, fix floating blocks	10	7	7	3	9	7
Ella	Yes	Boundaries restrictive; chair interference	Blue shadow guides helpful	Boundaries affected feedback	Intuitive; boundaries awkward	Experimentation possible	Improve boundary and movement	14	12	8	5	12	10
Rithisha	Yes	Lost tracking, low boundary	Blue shadow cues helpful	Needed better boundary/feedback	Smooth, but setup issues	Playful interaction despite difficulties	Adjust virtual boundaries, tracking	15	11	12	6	13	12
Prisha	Yes	Out-of-reach blocks, preferred walking	Blue cues crucial, colour secondary	Wanted easier distance feedback	Intuitive, fun	Creativity encouraged	Overview of full structure, walking	11	6	8	3	10	6

The above table and analysis provide a comprehensive view of participant experiences, strengths, and opportunities for further design iteration. Here is a synthesized and analysed table based on the user testing transcripts for the Post-Task Questions and NASA TLX Questionnaire:

Analysis

- Accurate block manipulation was mostly successful but limited by ergonomic or boundary setups for several users.
- Blue placement cues were consistently reported as the most helpful guidance tool, crucial for task clarity.
- Colour coding (yellow/red) was widely seen as secondary and not well-understood without deeper explanation or functional linkage.
- Workspace and ergonomic comfort were flagged as issues by nearly all users, emphasizing a recurring barrier that affected overall ease of interaction.
- Several recommendations focused on adding negative/positive feedback and structured in-scene guidance to improve confidence and reduce ambiguity.

Evaluation of Aims

Objective 1: Whether users can intuitively assemble blocks to replicate a pictured table in XR.

- **Partially Validated**: While most participants successfully grabbed and placed blocks, ergonomic challenges (especially unreachable or floating blocks) indicate room for improvement to ensure consistent success for all users.

Objective 2: How validation feedback impacts accuracy and user strategy

- **Validated**: Blue cues and placement shadows were clearly understood and appreciated, greatly aiding task completion. Other colours required further explanation to gain significance.

Objective 3: If users engage playfully and curiously with the novel interlocking material

- **Partially Validated**: Participants highlighted boundary and comfort issues as recurring challenges. Rectifying physical setup and expanding interaction flexibility is necessary.

Concept Iteration

Based on this evaluation, design updates for the next iteration will include:

1. Introducing both positive and negative feedback cues to confirm or correct user actions.
2. Adding in-environment visual references (e.g., hologram or instruction sheet showing desired final structure).

3. Improving boundary calibration, allowing users to reposition themselves or the workspace for better physical comfort.
4. Considering haptic feedback for weight/texture simulation and making block supplies more flexible (e.g., infinite mode).
5. Clarifying the purpose of colour coding or reducing colour reliance in Favor of spatial and visual guides.

Reflection

What Worked Well:

- Focused visual guidance like blue shadows significantly supported user learning and precision.
- Intuitive, real-world-inspired grabbing mechanics enabled rapid onboarding for most participants.

What Did Not Work as Well:

- Ergonomic limitations and insufficient negative feedback created occasional frustration.
- Some supporting cues (colour coding, task overview) lacked clarity or relevance and should be made more explicit.

Lessons Learned and Next Steps:

- Prioritize corrections to physical workspace design and cue feedback mechanisms.
- Implement more explicit onboarding and reference aids.
- Iterative testing cycles focused on comfort, guidance, and feedback clarity will ensure broader usability and satisfaction.

References

In-text reference (citation)	When prompted with “Improve grammar and spellings for the draft and give me relevant feedback on structure?” the perplexity-generated text (OpenAI, 2025).