XR Kindle Redesign: Prototype 3 Testing Plan - Advanced VR Interactions

Project Pitch

This project is Amazon Kindle but using XR for leveraging VR's boundless spatial capabilities to create portable pocket libraries where users can manipulate miniaturized book collections, dynamically scale reading materials to preferred sizes, and teleport between immersive reading environments through portal-based scene transitions that transcend physical world limitations.

Research Summary

Recent research demonstrates that VR's spatial manipulation capabilities significantly enhance user engagement with digital content through embodied interactions. Zhang et al. (2022) demonstrated that spatial scale manipulation in VR enhances perception and empathy in design-related tasks, showing that dynamic scaling of virtual objects creates stronger cognitive engagement and improved task performance compared to fixed-scale interfaces. Portal-based navigation systems have been validated by Bowman and McMahan (2007) as effective locomotion methods that reduce motion sickness while maintaining spatial presence, particularly when combined with clear visual affordances. Furthermore, Dourish (2001) established that tangible interactions with physical manipulation of digital objects create stronger mental models than abstract UI controls, a principle that applies to VR's ability to simulate real-world object manipulation at impossible scales. These findings support the design decision to implement miniaturized libraries with scalable books and portal-based environment switching, as they exploit VR's unique affordances while maintaining intuitive interaction paradigms grounded in physical world understanding.

References:

- D. A. Bowman and R. P. McMahan, "Virtual Reality: How Much Immersion Is Enough?" in *Computer*, vol. 40, no. 7, pp. 36-43, July 2007, doi: 10.1109/MC.2007.257.
- Dourish, P. (2001). *Where the action is: the foundations of embodied interaction*. MIT Press.
- Zhang, J., Dong, Z., Bai, X., Lindeman, R., He, W., & Piumsomboon, T. (2022). Augmented perception through spatial scale manipulation in virtual reality for enhanced empathy in design-related tasks. *Frontiers in Virtual Reality*, 3, 672537. https://doi.org/10.3389/frvir.2022.672537

Testing Objective

From my above concept, I have identified **the intuitiveness and effectiveness of VR-native spatial manipulation (miniaturization, scaling) and portal-based scene transitions** that needs testing. This test aims to discover **whether users can understand and successfully interact with non-realistic VR affordances (pocket library, scalable books, portal teleportation) and whether these interactions enhance the perceived value of immersive reading preparation compared to real-world simulation approaches**.

Testing Methodologies

This testing plan uses controlled task-based usability testing with side-by-side think-aloud protocol, immediate post-task interview questions, and follow-up digital survey to evaluate a functional VR prototype made in Unity with Meta SDK integration running on Meta Quest headsets.

Prototype Description/Requirements

The prototype was designed to **test VR-specific spatial interactions that exploit impossible physics unavailable in real-world contexts**. It **features a study space library environment with a miniaturized book collection on a desk that users can grab and scale to readable sizes, a PortalCore (interactive cube) and PortalDock (teleportation pad) system that enables scene transitions by placing the cube on the dock, and a forest reading environment with ambient scenery and furniture for immersive reading preparation**. Text labels identify key interactive elements (Mini Library, PortalDock, PortalCore) to support first-time user comprehension.

Data Collection Method

During the testing process, I will be conducting concurrent think-aloud observations with verbal prompts, logging task completion success/failure and time using stopwatch, documenting interaction attempts and confusion points in observation notebook, conducting brief 2-question post-test interviews immediately after VR session, and distributing QR-coded Google Form survey for extended feedback collection to document comprehensive quantitative and qualitative results within time constraints.

Testing Setup

- Meta Quest 2/3 headset fully charged with prototype pre-loaded
- Stopwatch/timer for task duration tracking
- Observation form with task checklist prepared
- Audio recording device for think-aloud capture
- QR code for post-test survey distribution
- Backup headset with identical build deployed

Testing Process (Schedule/Time: 5 minutes per participant)

Pre-Test Briefing (30 seconds)

1. **VR Safety & Consent** - Fit headset, confirm comfort, explain think-aloud expectations
2. **Concept Introduction** - "You'll explore a VR library with miniature books and portals to different reading environments"

Task Execution Phase (3 minutes)

Task 1: Mini Library Discovery & Book Scaling (75 seconds)

Instructions: "Explore this study space. Find the Mini Library and try to prepare a book for reading."

Success Criteria:

- User locates miniaturized book collection on desk
- Successfully grabs a mini book
- Scales book to larger readable size
- Demonstrates understanding of scale manipulation gesture

Metrics: Discovery time, grab success, scaling completion, number of attempts

Think-Aloud Prompts:

- "What do you notice about the books?"
- "How would you make this book readable?"

Task 2: Portal Navigation System (105 seconds)

Instructions: "Find the PortalCore and use it with the PortalDock to travel to a different reading environment."

Success Criteria:

- User locates PortalCore (cube)
- Successfully grabs and transports cube to PortalDock
- Places cube on dock to trigger teleportation
- Experiences scene transition to forest environment
- Understands return mechanism

Metrics: Portal system discovery time, placement accuracy, teleportation success, bidirectional navigation comprehension

Think-Aloud Prompts:

- "What do you think this cube does?"
- "How would you use these elements together?"
- "How would you return to the library?"

Post-Test Interview (60 seconds)

Q1: "On a scale of 1-10, how intuitive was interacting with the miniature library and scaling books? What felt natural or confusing?"

Q2: "Did the portal system make sense to you? How clear was the connection between the cube and the teleportation pad?"

Q3: "Compared to the realistic book-grabbing from a shelf, did this 'VR-only' approach feel more engaging or just different? Why?"

Survey Distribution (10 seconds)

- **Provide QR code** for extended feedback survey
- "Please scan this QR code when you have time to share additional thoughts"

Success Metrics & Evaluation Criteria

Quantitative Benchmarks

- **Task 1 (Book Scaling)**: >70% success rate, <60 seconds completion
- **Task 2 (Portal Navigation)**: >60% successful teleportation, <90 seconds completion
- **User Preference**: >50% favor VR-native approach over realistic simulation
- **Intuitiveness Ratings**: Average >6/10 for mini library and portal systems

Qualitative Indicators

- **Conceptual Understanding**: Users can articulate why mini library is useful in VR
- **Comparative Value**: Users identify specific advantages/disadvantages vs. Prototype 2 approach
- **Engagement**: Positive verbal feedback during exploration
- **Discoverability**: Users locate interactive elements within timeframes without excessive guidance

Critical Assumptions to Validate

1. Scale manipulation feels natural despite lacking real-world equivalent
2. Portal metaphor communicates teleportation purpose without extensive explanation
3. Text labels provide sufficient affordance for first-time users
4. VR-native interactions provide value beyond novelty compared to realistic simulations

APPENDIX

Google Form Survey Questions

Section 1: Interaction Effectiveness

How successful were you in completing the following tasks? (Scale: Very Easy / Easy / Neutral / Difficult / Very Difficult)

- Finding and grabbing mini books
- Scaling books to readable size
- Locating PortalCore and PortalDock
- Using the portal system to teleport

Rate the intuitiveness of each interaction (1-10 scale)

- Mini Library concept
- Book scaling gesture
- Portal teleportation system

Section 2: Comparative Assessment

Which interaction style do you prefer for VR reading preparation? (Select one)

- Realistic approach (grabbing full-size books from shelves)
- VR-native approach (miniature portable library with scaling)
- Both have value for different contexts
- Neither - suggest alternative: _____

What made the VR-native interactions (mini library, portals) valuable or problematic? (Open text)

Section 3: Design Feedback

Were the text labels (Mini Library, PortalDock, PortalCore) helpful for understanding the system?

- Very helpful
- Somewhat helpful
- Not helpful - I figured it out without them
- Confusing - they didn't match my expectations

What would you change to improve these interactions? (Open text)

If you could add one feature to this VR reading preparation experience, what would it be? (Open text)

VR Kindle Redesign - User Testing Transcripts