

DEPI Graduation Project Proposal

Project Title:

Virtual Reality Educational Experience for Children with ADHD

Team Members:

Raghad Ayman Saber

Salma Saad Mohamed

Shrouk Saad Mohamed

Rodina Aatef Mohamed

Hana Ehab Abdstaar

Annan Khaled Rakem

1. Executive Summary

This project proposes the design and development of an immersive Virtual Reality (VR) application aimed at enhancing sustained attention, working memory, and cognitive focus in children aged 10-15 years diagnosed with ADHD. Leveraging the interactive capabilities of VR, the application will provide a distraction-minimized, engaging environment where complex cognitive skills are reinforced through gamified activities. The primary focus of this thesis is the creation of the complete VR environment, interactive menus, and the full suite of 3D assets and animations for three specific cognitive games (Connect4, Difference Between Two Images, and a Puzzle). The final prototype will demonstrate one fully designed and integrated game, showcasing a high-fidelity design solution built in Unity and Blender, without requiring full system programming.

2. Problem Definition and Educational Rationale

Children with ADHD commonly struggle with executive functions, often manifesting as:

- **Deficit in Sustained Attention:** Difficulty maintaining focus on tasks, particularly in environments with competing stimuli.
- **Impaired Working Memory:** Challenges with the recollection and application of recently learned information or skills.
- **Motivation and Engagement Gaps:** Reduced enthusiasm for traditional, non-personalized learning or repetition exercises.

The project addresses these deficits by using VR to create a highly controlled and motivating learning space, minimizing real-world distractions and maximizing active cognitive participation.

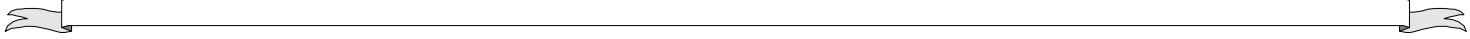
3. Proposed VR Solution:

. Cognitive Gamification Module

The solution is an educational VR application structured around an Interactive Cognitive Gamification Module that supports skill reinforcement through repetition and enjoyable challenge.

Immersive Environment: Aesthetically engaging, low-clutter 3D environment designed to be calming yet stimulating.

1. **Activity Selection Menu (VR UI):** Intuitive, gaze- or controller-driven interface for selecting the desired cognitive activity.
2. **Adaptive Gamified Sessions:** Short, intensive 5- to 10-minute sessions to align with the target audience's attention span and adhere to safety guidelines.

- 
3. Customization Interface: Design provision for trainers/parents to manage session availability and adjust initial complexity parameters.

. Cognitive Game Selection

The project will develop the complete 3D models and animations for the following three distinct cognitive games. One of these three will be selected for full prototype implementation and demonstration:

- Connect4 (Strategy Game)
 - Cognitive Target: Planning & Strategic Focus
 - Design Rationale in VR: Translating a 2D grid into a compelling 3D vertical drop mechanism, requiring continuous visual tracking and foresight.
- Difference Between Two Images (Visual Search)
 - Cognitive Target: Sustained & Selective Attention
 - Design Rationale in VR: Presenting two distinct, large-scale 3D virtual screens or environments where the user must visually scan and isolate minor discrepancies.
- Puzzle Game (Spatial Reasoning)
 - Cognitive Target: Problem-Solving & Spatial Memory
 - Design Rationale in VR: Implementing a spatial manipulation task, potentially using large 3D interlocking pieces to enhance haptic feedback and coordination.

4. Technical Methodology and Deliverables (Tools and Technologies)

- VR Engine / Integration (Unity)
 - Role in Project: Primary platform for scene assembly, VR development, interactive scripting, and animation integration.
- 3D Modelling & Assets (Blender)
 - Role in Project: Creation of all high-fidelity 3D environments, characters, game pieces, and custom objects.
- Animation (Unity / Blender)
 - Role in Project: Rigging and creation of engaging, simple animations for game mechanics and UI feedback.

4.2. Expected Deliverables

- VR Prototype
 - Description: A functional Unity-based VR application with an interactive

menu and one fully integrated cognitive game (chosen from the three candidates).

- Status: Complete Design & Integration
- 3D Asset Library
 - Description: Comprehensive set of optimized 3D models for all three proposed games and the main VR environment.
 - Status: Modeled and Textured
- Animation Package
 - Description: A collection of key animations for game interactions and visual feedback loops.
 - Status: Animated and Rigged
- Technical Documentation
 - Description: Detailed report on 3D/VR design methodology, usability considerations, and asset optimization for VR performance.
 - Status: Comprehensive Report

5. Safety and Ethical Considerations

To ensure the safety and well-being of the target audience, sessions will be strictly limited to 5-10 minutes. The design will adhere to VR best practices, utilizing comfort settings (e.g., teleportation, minimal motion), and highly simplified, low-latency UI to prevent motion sickness and visual fatigue.

6. Conclusion and Future Scope

This project offers a robust, design-centric approach to address critical educational needs for children with ADHD. By providing a professional, engaging VR environment and a selection of cognitively targeted games, the thesis demonstrates a strong capability in advanced VR design, 3D modelling, and Unity integration. The successful delivery of the prototype and asset suite will lay a solid foundation for future development, including full system programming and clinical trials.