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# \*\*3D Environment Design Report\*\*

\*\*Module: Principles of 3D Environments\*\*

\*\*GitHub Repository:\*\* [https://github.com/UWEGames-P3DE/principles-of-3d-environments-unity-t2-khatri.git](https://github.com/UWEGames-P3DE/principles-of-3d-environments-unity-t2-khatri.git)

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## \*\*1. Introduction\*\*

This report documents the design and development of a 3D environment in Unity, focusing on key principles such as \*\*level design, lighting, texturing, and optimization\*\*. The project demonstrates an understanding of 3D space composition, asset integration, and environmental storytelling.

### \*\*Project Overview\*\*

- \*\*Engine:\*\* Unity (URP/HDRP)

- \*\*Theme:\*\* [Specify theme, e.g., Sci-Fi Lab, Fantasy Dungeon, Urban Cityscape]

- \*\*Key Features:\*\*

- Modular asset usage

- Dynamic lighting & shadows

- Post-processing effects

- Optimized performance

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## \*\*2. Design Process\*\*

### \*\*2.1 Concept & Planning\*\*

- \*\*Inspiration:\*\* [Mention references from games/films, e.g., \*Half-Life Alyx, The Last of Us Part II\*]

- \*\*Mood Board:\*\* [Include sketches/color palettes]

- \*\*Level Blockout:\*\* Greyboxing in Unity to establish scale and flow.

### \*\*2.2 Asset Creation & Integration\*\*

- \*\*Modular Design:\*\* Used prefabs for reusable structures (walls, floors, props).

- \*\*Texturing:\*\* Applied PBR materials (Albedo, Normal, Metallic/Roughness maps).

- \*\*Custom Models:\*\* Created in \*\*Blender/Maya\*\* (if applicable).

- \*\*Asset Sources:\*\*

- \*\*Free Assets:\*\* [List sources, e.g., Unity Asset Store, Quixel Megascans]

- \*\*Original Models:\*\* [Describe custom-made assets]

### \*\*2.3 Lighting & Atmosphere\*\*

- \*\*Lighting Techniques:\*\*

- \*\*Directional Light\*\* (Sun/Moon simulation)

- \*\*Point/Spot Lights\*\* (Artificial lighting)

- \*\*Emissive Materials\*\* (Glowing objects)

- \*\*Post-Processing:\*\*

- \*\*Bloom, AO, Color Grading\*\* for realism.

- \*\*Fog\*\* for depth perception.

### \*\*2.4 Optimization\*\*

- \*\*Occlusion Culling:\*\* Improved rendering performance.

- \*\*LOD (Level of Detail):\*\* Reduced polygon count for distant objects.

- \*\*Light Baking:\*\* Precomputed lighting for static objects.

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## \*\*3. Technical Implementation\*\*

### \*\*3.1 Unity Setup\*\*

- \*\*Render Pipeline:\*\* URP (Universal Render Pipeline) for optimized graphics.

- \*\*Physics:\*\* Colliders & rigidbodies for interactivity.

- \*\*Scripting:\*\* C# for dynamic elements (e.g., doors, moving platforms).

### \*\*3.2 Challenges & Solutions\*\*

| \*\*Challenge\*\* | \*\*Solution\*\* |

|--------------|-------------|

| Poor lighting realism | Adjusted light probes & baked lighting |

| Performance drops | Implemented LOD & occlusion culling |

| Texture stretching | UV unwrapping fixes in Blender |

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## \*\*4. Final Outcome\*\*

### \*\*4.1 Screenshots & Annotations\*\*

\*(Include 3-5 annotated screenshots highlighting key design choices, e.g., lighting, composition, and interactivity.)\*

### \*\*4.2 Interactive Elements\*\*

- \*\*Player Movement:\*\* First-person controller.

- \*\*Physics-Based Interactions:\*\* Pickup objects, doors, switches.

### \*\*4.3 Performance Metrics\*\*

| \*\*Metric\*\* | \*\*Value\*\* |

|-----------|----------|

| Avg. FPS | 60+ (target) |

| Draw Calls | Optimized via batching |

| Memory Usage | <1GB (estimated) |

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## \*\*5. Conclusion & Future Improvements\*\*

### \*\*5.1 Key Learnings\*\*

- Importance of \*\*modular design\*\* for scalability.

- \*\*Lighting\*\* drastically impacts immersion.

- \*\*Optimization\*\* is crucial for real-time performance.

### \*\*5.2 Potential Enhancements\*\*

- \*\*Dynamic Weather System\*\* (Rain, day/night cycle).

- \*\*AI NPCs\*\* for environmental storytelling.

- \*\*VR Support\*\* for immersive exploration.

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## \*\*6. References\*\*

1. Unity Technologies (2024) \*Unity Manual\*. Available at: [https://docs.unity3d.com/Manual/index.html](https://docs.unity3d.com/Manual/index.html)

2. Quixel (2024) \*Megascans Library\*. Available at: [https://quixel.com/megascans](https://quixel.com/megascans)

3. Blender Foundation (2024) \*Blender 3D Modeling Guide\*. Available at: [https://www.blender.org/](https://www.blender.org/)

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This report provides a structured breakdown of your 3D environment project, suitable for academic submission. Let me know if you'd like adjustments!