

1. Executive Summary and Overview of the General Game Idea

1.1 Project Concept: CAVERN

CAVERN is a first-person, session-based co-op multiplayer game built around exploring dark caves, scary gameplay moments, and managing your resources under pressure. Developed as part of a university team project, this game fits right into the popular co-op extraction horror genre that players often call "friendslop." In CAVERN, up to four players drop into a randomly generated mix of caves and old mining areas. The main goal of each run is to go deep into the tunnels, grab valuable scrap, and make it back to the extraction pod before the environment or the monsters kill the whole team.

1.2 The Core Mechanic: Oxygen and Resource Management

Most extraction games use inventory space or basic combat to slow players down, but CAVERN forces players to hurry up by using a personal oxygen tank that constantly runs out. Regular actions like sprinting, jumping, carrying heavy scrap back to base, or panicking in dark areas make your oxygen drop much faster.

To survive this, players have to use oxygen pockets scattered around the map. These pockets are small rooms or old setups where air scrubbers still work. Inside these zones, players can refill their air tanks and find medkits to heal up after taking damage from falling or getting hit by monsters. This creates a risk-versus-reward system where players have to constantly choose between pushing deeper for better loot or heading back before their air completely runs out [1].

2. Market Segmentation and Target

Audience Analysis

2.1 The "Friendslop" Genre and the Player Base

The main target audience for CAVERN is PC gamers aged between 16 and 35 who love playing funny, unpredictable multiplayer games with their friends. In game design right now, "friendslop" is a popular term for low-graphic, proxy-chat games that rely on funny physics, unexpected chaos, and sudden team wipes to create memorable moments.

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[Lots of Player Freedom] + [Proximity Voice Chat] ==> [Funny Moments with Friends]
                                                                    |
                                                                    (Clips / Virality /
Streams)
                                                                    v
[Hard Systems] + [Sudden Team Wipes] =====> [High Replayability]
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This player base does not care about perfect graphics or smooth triple-A gameplay loops. Instead, they want gameplay friction, meaning features that split up the team, use physics to mess with players, and lead to hilarious or terrifying moments. CAVERN targets these players by combining real survival stakes, like running out of air or getting jumped by monsters, with total player freedom [2].

2.2 Streaming and Content Creation

A massive secondary audience for the game is content creators on Twitch and YouTube. Games in this genre are great to watch because proximity voice chat creates an instant story for viewers. When a player wanders away from the group in CAVERN and their voice starts fading out into an echo, right before they get cut off by a choke sound because their air died, it makes perfect clip material. By building mechanics that naturally create these scary and funny moments, CAVERN appeals to both the people playing the game and the viewers watching online.

3. Design and Theming Decisions:

Aesthetic Justification

3.1 Low-Poly Graphics and Creating Tone

The art style of CAVERN uses low-poly models, retro textures, and a pixelated look inspired by old 90s console games, mixed with modern lighting. This was not chosen just to save time on asset creation, it was a deliberate design choice to make the game scarier. High-end graphics can make a game less scary by showing every detail clearly. By using rough shapes, low-resolution textures, and pixelation, CAVERN makes players use their imagination to fill in the blanks.

A weird shadow on a cave wall could just be a rock, or it could be a monster waiting to jump out. This visual confusion keeps players paranoid and on edge the entire time they are underground.

3.2 Real-World UI and Lighting Design

To keep the game as immersive and claustrophobic as possible, CAVERN does not use a normal HUD screen. All the info about your survival has to be read directly from objects in the game world. Your oxygen levels are shown on a wrist monitor on your suit or a physical gauge on your teammate's back. Medkits have glowing screens that show how many uses are left, meaning you have to look down and check them manually.

Lighting is a major gameplay mechanic instead of just a visual effect. The caves are completely pitch black. Players have to use flashlights or drop flares that throw harsh shadows around the rooms. Since flares burn out and flashlights need battery power, light is just another resource you have to manage. The contrast between a bright flashlight beam and the deep shadows of the cave reinforces the feeling of being trapped and alone.

4. Game Design Theory and Principles

4.1 Interacting Systems and Unscripted Gameplay

CAVERN is built around systemic game design, which means the rules and mechanics interact with each other automatically instead of following a set script. According to game design theory, the most fun parts of a game happen when simple rules crash into each other to create unpredictable situations [2].

The main rules in CAVERN are simple. First, your air runs down faster if you move fast or panic. Second, the map is dark and needs lights. Third, monsters hear your noise and see your lights. When these rules mix together, you get great unscripted moments. A player low on air might sprint toward an oxygen station, but the noise wakes up a monster. To survive, they have to turn off their flashlight and hide in the dark. This saves them from the monster but wastes valuable seconds of air while they sit still. The game does not force this to happen, it just happens naturally because of how the mechanics work together [3].

4.2 Managing Player Attention and Stress

From a psychological perspective, CAVERN works by overloading the player's brain with too many tasks at once. In normal shooters, you just look at where you are going and aim your gun. In CAVERN, your focus is split between several survival problems at the exact same time, as shown in Table I.

Game Mechanic	Direct Danger	How to Fix It	What the Player Focuses On
Oxygen Loss	Suffocation and Death	Find Oxygen Pockets	Checking air tanks and mapping routes
Pitch Darkness	Blindness and Hidden Traps	Use Batteries and Flares	Watching the floor and managing tools
Monster Placement	Getting Hurt or Killed	Sneaking or Running Away	Listening for footsteps and tracking threats
Carrying Loot	Failing the Mission	Managing Inventory Space	Choosing what scrap to keep or drop

By forcing players to manage all four of these things at once, the game creates a sense of controlled panic. This panic makes the horror work much better. If a player is distracted checking their oxygen gauge, they are way more likely to miss the quiet sound of a monster

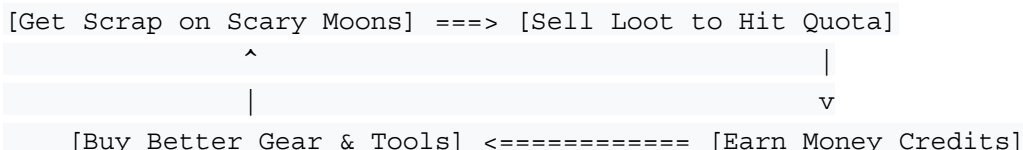
creeping up behind them, leading to a jump scare that feels fair but terrifying.

5. Comparative Case Studies: Market Precedents

To show how CAVERN works in the real game market, we need to look at the main indie hits that inspired this project.

5.1 Lethal Company: The Foundation of Co-op Extraction Horror

Lethal Company is the game that started the modern wave of co-op extraction horror [4]. The gameplay loop is built around a corporate quota where players land on industrial moons to collect scrap metal. If you do not make enough money by the deadline, the game ends and you get thrown into space.



Lethal Company works so well because it cuts players off from each other and uses highly dangerous monsters. It mixes low-fi graphics with great spatial audio. CAVERN uses a similar style of high lethality and loose physics-based movement, but it changes the main threat from an outside clock to an internal survival problem with your personal air supply.

5.2 PEAK: Movement, Heights, and Team Exhaustion

Released as a big co-op indie hit, PEAK changed the extraction style by making players deal with extreme vertical heights instead of flat hallways [5]. In PEAK, four players try to climb up a randomly generated mountain after a crash. The main danger is a stamina bar that shrinks because of cold weather, hunger, and injuries. Players have to set up campfires, share food, and use climbing gear like ropes and pitons to get up cliffs together.

PEAK's best feature is how it punishes teams for splitting up. If a player climbs too fast and leaves their friends behind, they can get stuck or attacked with no one around to save them. CAVERN takes this idea and flips it upside down. Instead of climbing a mountain, you are going down into the dirt, trading open spaces for tight cave walls. The oxygen pockets in CAVERN work just like the campfires in PEAK, serving as safe spots where the team can group up and recover.

5.3 R.E.P.O.: Physics-Based Loot and Heavy Moving

The game R.E.P.O. added a lot of friction to the genre by making all the loot use physics [6]. Players have to find heavy, fragile items and carry them back to a drop-off ship. The items have actual weight, mass, and momentum. If you run too fast with a fragile object or drop it down a hole, it breaks completely, losing its value and setting off alarms that attract robots.

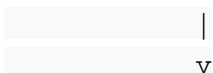
The clever thing about R.E.P.O. is that the items you want to steal become your biggest weakness because they slow you down and make you clumsy. CAVERN uses this exact concept. Carrying big oxygen tanks, large medkits, or heavy industrial metal scrap changes your weight, slows your speed, and makes you burn through your air supply much faster. Trying to carry too much loot is exactly what ends up killing you.

6. Self-Directed Learning and Technical Implementation Report

6.1 Audio Engineering: Spatial Sound and Cave Echoes

A huge part of my job on the development team was building the game's audio framework. In horror games, sound is a major gameplay mechanic, not just background noise. To make the caves feel real, I spent time teaching myself how to use advanced 3D audio pipelines and sound filtering based on game geometry.

[Voice Chat / Monster Sound]



```
[Wall Check] =====> (Solid Rock Wall) =====> [Muffle Filter On (Sounds  
Blocked)]  
|  
+=====> (Open Tunnels) =====> [Add Delay & Reverb (Echo  
Effect)]  
|  
v  
[Player Hears Sound]
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To make the caves feel tight and closed-in, I set up dynamic audio blocking. When a teammate talks across a large open cave room, their voice has a long echo that matches the size of the room. But if that player walks around a corner or stands behind a thick rock wall, the engine checks the line of sight and instantly applies a muffle filter to the audio. This means players have to listen carefully to the actual direction of sounds to find their friends or hear monsters coming.

6.2 Making the Suffocation Audio Effects

I also programmed the audio changes for when a player runs out of air. When your tank drops below 15%, the entire game audio shifts to show physical panic. Outside environment sounds get cut off, simulating what happens when your brain loses oxygen. At the same time, the sound of your own heavy breathing and loud heartbeat gets mixed right to the front of the audio channels, drowning out everything else.

This creates a dangerous gameplay situation. The closer you are to dying of suffocation, the harder it is to hear a monster creeping up on you, linking technical audio programming directly with horror gameplay tension.

7. Reflective Analysis on Research Methodologies and Team Dynamics

7.1 Looking at Player Habits and Performance

Benchmarks

While working on CAVERN, our team used a mix of two research styles: watching community habits and testing technical game performance.

For the community side, we spent time watching live streams and reading player forums for games like Lethal Company, PEAK, and R.E.P.O. We kept track of what features players complained about, what clips got shared the most, and what mods people made. We learned that players love moments where everything goes wrong because of chain reactions in the game's physics systems, rather than just bad bugs.

On the technical side, my research focused on optimizing multiplayer performance and lighting budgets. Making massive cave systems with real-time dynamic flashlights takes a lot of processing power. I ran performance profiling tests to see how much multiple flashlights dropped the frame rate on low-poly models.

By pooling our light components, turning off lighting for rooms players cannot see, and setting hard distance limits on shadows, I kept the game running at a smooth 60 frames per second on normal gaming PCs. This stops the game from stuttering during chaotic moments when players are fighting for survival.

7.2 Critical Reflection on Team Roles and Project Management

Working in a university development team showed me how important communication is when making a horror game. Mechanics cannot just exist on their own. Level designers, programmers, and sound designers have to work together perfectly. For example, when the level designers made tight crawlspaces, I had to immediately change the sound settings so the echo did not sound weird inside a small gap.

The hardest part of the project was balancing difficulty so the game stays fun without getting annoying. It is easy to make a game that kills the player instantly, but it is hard to make a game where dying feels fair and makes you want to try again. Through internal testing, we got rid of cheap, instant deaths. Instead, we made dangers obvious ahead of time.

When you die in CAVERN, you know exactly what mistakes you made: you stayed too long looking for scrap, you ran out of flares, and you ignored your character's heavy breathing. This turns dying from a frustrating fail state into a funny story that makes you want to click restart and

try another run with your team.

8. Conclusion and Future Development Roadmap

8.1 Summary of Project Outcomes

CAVERN successfully blends the social fun of modern co-op horror games with a tight personal resource mechanic that gives it its own style. By taking design lessons from the chaos of Lethal Company, the team climbing mechanics of PEAK, and the heavy physics of R.E.P.O., we built a highly replayable, atmospheric multiplayer game. The technical systems I worked on, like the muffled audio walls and real-world UI design, directly support the core themes of isolation, panic, and underground claustrophobia.

8.2 Next Steps: Balancing the Gameplay Loop

As we move the game into wider playtesting, our next step is balancing our random generation systems to make sure oxygen pockets spawn fairly. If the air stations are too far apart, the game gets too frustrating and players just suffocate without a chance. If they spawn too much, the game loses all its tension and stops being scary.

By building tracking tools that show us where players die, what their average oxygen levels are, and how much scrap they extract, our team can keep adjusting the variables. This will let us turn CAVERN into a polished, genuinely scary, and highly shareable indie horror game.

9. References

- [1] K. Salen and E. Zimmerman, *Rules of Play: Game Design Fundamentals*. Cambridge, MA, USA: MIT Press, 2004.
- [2] J. Juul, *Half-Real: Video Games between Real Rules and Fictional Worlds*. Cambridge, MA, USA: MIT Press, 2005.

- [3] E. Adams, *Fundamentals of Game Design*, 3rd ed. Berkeley, CA, USA: New Riders, 2014.
- [4] Zeekerss, *Lethal Company*. PC video game, Windows via Steam, 2023.
- [5] Aggro Crab and Landfall Games, *PEAK*. PC video game, Windows via Steam, 2025.
- [6] semiwork, *R.E.P.O.*. PC video game, Windows via Steam, 2025.