

The White Rabbit: Studying Player Guidance in Non-Linear Level Design



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ABSTRACT

With the outcry against obvious, immersion breaking guidance in modern level design, a hypothesis emerged that if players recognise guidance methods they are no longer fit for their intended purpose, that being to guide players subtly and subconsciously. This report tests this hypothesis.

The method of study utilised was the thorough research of a number of established guidance methods into three versions of the same non-linear level, one with a complete set of methods spanning the entire play space and UI, one sans UI, and another presenting a seemingly linear path through guidance.

Playtesting of each version was then conducted with a 'Heat-Trail' recorded during gameplay to visualise player decision making, followed by short interviews to gather personal, candid responses to play.

Through this methodology a number of trends were discovered proving that some players either ignored guidance entirely, or purposefully went against it in favour of exploration and following their own path.

While the overall results do not categorically prove the hypothesis to be correct, they do supply enough of an indication to warrant further study which could possibly lead to changes to level design methodology in modern video games.

ACKNOWLEDGEMENTS

This project would not have been possible without the guidance of my supervisor Dr Ian Sturrock, whose expert input and recommendations were absolutely essential to my research methodology and the quality of my research. Also, for his continued support of me and the project.

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Special appreciation goes to my friends and fellow course mates/alumni Jay Narin, Niall Curren, Matthew Pyrah and Alice Halley, the teams at Dink and Northrak, and to my partner Joy and my family for their everlasting support throughout my extended studies. I wouldn't be here without them.

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INTRODUCTION

“Alice... had never before seen a rabbit with either a waistcoat-pocket, or a watch to take out of it, and burning with curiosity, she ran across the field after it”

– Alice in Wonderland, Lewis Carroll. 1865

In his 2000 GDC presentation ‘The Art and Science of Level Design’, Cliff Bleszinski stated “The LD is the one who is taking everyone else’s hard work and tying it together into a cohesive package”. With this responsibility, level design became a specialised profession during the golden age of video games (1993 to 2002), led by high profile level design ‘rockstars’ such as DOOMs John Romero (id Software. 1993). Compounded by the popularisation of 3D technologies during the same period (Shahrani, S. 2006), the role flourished and developed its own deeply set rules of creation and psychological and scientific foundation.

These rules include comprehensive methods of player guidance, which can now be found in any popular release. Using light and colour to draw the eye, placing points of interest to aid navigation of complex outdoor spaces, or setting up lines of coins to pull the player down a certain path are as synonymous with video games as high scores.

Non-linearity is currently a popular avenue for complex play and level design. Previously enjoyed by a niche subset of users in now revered titles like Deus Ex (Ion Storm. 2000) and Thief: The Dark Project (Looking Glass Studios. 1998), non-linear games are now a growing market with player choice and exploration at the forefront of modern gaming trends.

Through this lens, this study catalogues how modern players interact with and react to guidances in the context of a “radically non-linear single player level” (Serr, A. 2021).

Could this oft-utilised level design ruleset have become too identifiable to players that repeatedly encounter its methods, and is it still fit for purpose?

This is what this thesis studies.

AIMS

This thesis will investigate:

- Established level design methods of player guidance and existing uses of those methods.
- How players notice, react to, and interact with guidance methods via gameplay decisions.

By:

- Creating and playtesting a non-linear level with two (Later three) variations of guidance.
- Creation of a 'Heat-Trail System' which visually records details of player movement.
- Recording and analysing spontaneous responses to player guidance during play.

LITERATURE REVIEW

METHODS OF GUIDANCE

Guidance, defined by the Cambridge Dictionary as “help and advice about how to do something...” (Cambridge Dictionary. ND), is an essential part of our lives. Shopping for example guides us daily, “Traders have always been the first innovators in displaying products and attracting the attention of consumers” (Walsh, S. 2018).

Guidance in video games is universal, and is, as such, thoroughly documented. ‘Game Level Design: 35 Ways to Guide the Player’ (Wheeler, J.R. 2021), offers a comprehensive list (Figure 1).



Figure 1: List of guidance methods (Wheeler, J.S. 2021) with unused methods removed

Research was undertaken to explore these methods individually (Appendix B). Reputable articles and GDC talks were primary sources, for example, David Shaver’s 2018 talk ‘Level Design Workshop: Blockmesh and Lighting Tips’, which describes “how to guide players naturally with your level layout...” (Shaver, D. 2018).

‘Landmarks in Level Design’ (Piaskiewicz, M. 2015) offered specialised information into the Landmarks and Weenies method. “Directional landmarks can help players determine their position in regard to the rest of the scene or game world” (Piaskiewicz, M. 2015).

Research was also conducted into other areas, for example, architecture. The book ‘101 Things I Learned in Architecture School’ (Frederick, M. 2007) can be applied to spatial design in video games. The quote, “Frame a view, don’t merely exhibit it” (Frederick, M. 2007) (Figure 2) heavily informed my use of the Framing method.

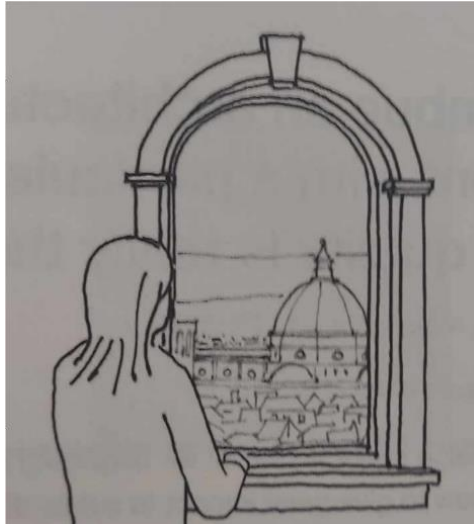


Figure 2: Example of 'Framing' from '101 things I Learned in Architecture School' (Frederick, M. 2007)

In his book 'The Design of Everyday Things', Donald A. Norman coined two important terms with a strong relation to user guidance: affordances, and signifiers.

Affordances are the designed elements that "afford" how an object is used, while signifiers are the visual indicators of affordance.

The most common examples of this are door handles (Figure 3). This figure evidences how confusion could be caused by weak affordances (Handle) and signifiers (Push/Pull Sign).



Figure 3: Example of poor affordance and signifiers (Lee, S. 2017)

Level designer Steve Lee discusses affordance in video games in his 2017 GDC talk 'An Approach to Holistic Level Design', saying "The most obvious affordances in first person level design in particular are visual... all relative to the player view" and "At Arkane it is forbidden to use the same meshes for a noninteractive door as an interactive one" (Lee, S. 2017). These quotes informed the use of affordance throughout the product I created, both as a direct method of guidance, and as subconscious implications of object and environmental usability.

Denial of affordance is also an important aspect of level design. When discussing a house with one open window and a number of boarded ones, David Shaver says "The intended way forward is open, while the rest of the entrance affordances are denied" (Shaver, D. 2021).

GUIDANCE WITHIN NON-LINEARITY

Self-paced and guided gameplay goes directly against guidance by offering players broad and unique options that they discover through their own exploration.

The immersive sim genre is synonymous with non-linearity, following classics like Deus Ex (Ion Storm, 2000). Modern interpretations are growing in popularity, a great example being Gloomwood (Rogers, D. & Szymanski, D, 2022) with its clearly well considered level design central to the gameplay experience. An analysis of its starting area 'Croup's Fishery' was conducted (Figure 4) to study the developers use of guidance within an expansive and densely non-linear space.

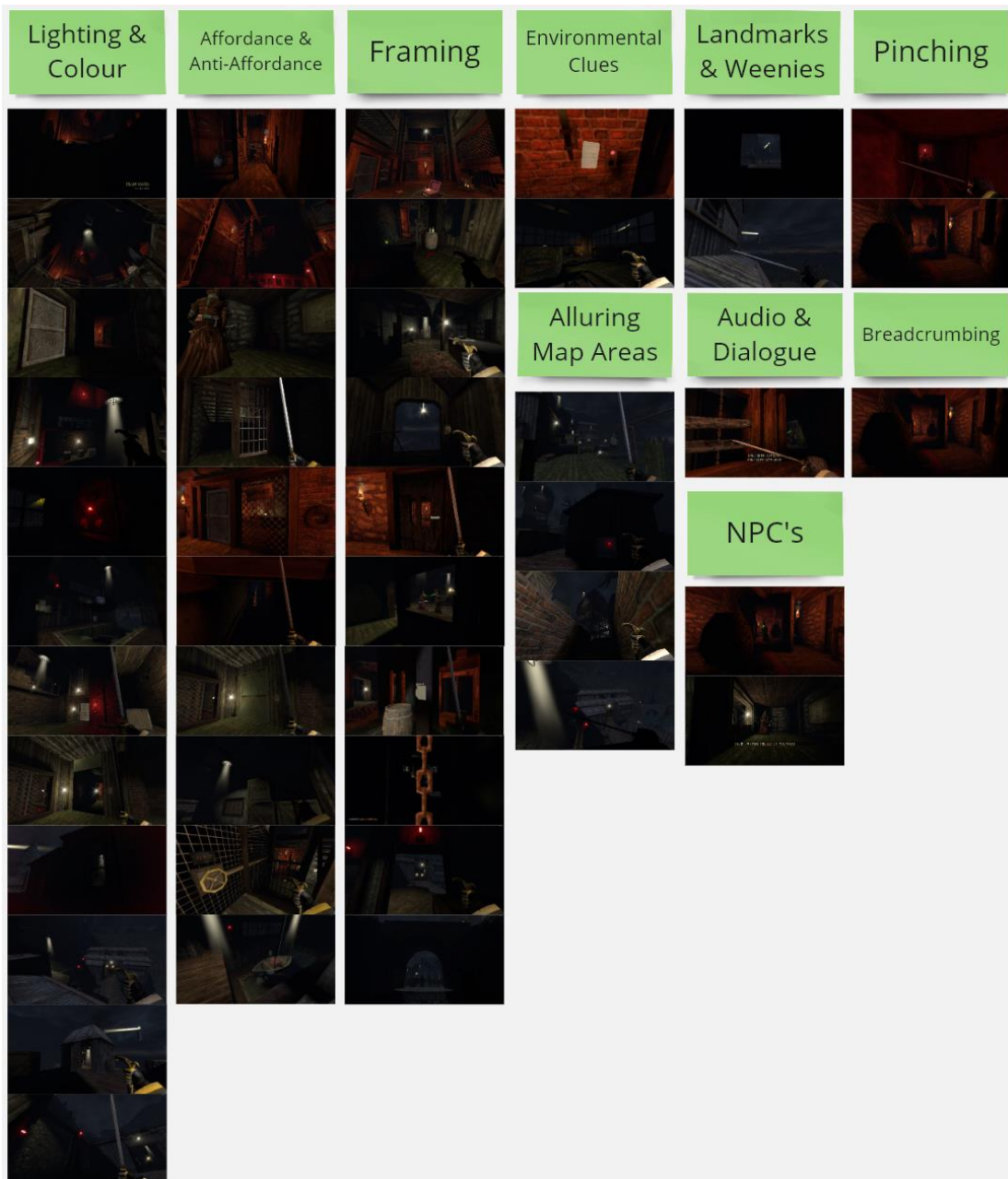


Figure 4: Deep dive into Gloomwood's Croup's Fishery

COUNTER POINTS TO GUIDANCE METHODS

‘The Level Design Book’, an online level design bible, challenges these rules however, by stating, “Decades of industry level designer orthodoxy have claimed that the goal of level design is to manipulate / trick the player into "feeling smart" while "subconsciously" following the critical path... and to this, we say: no, stop! Can we quit thinking like this?” (Yang, R. & Yoder, A. ND). Instead, they offer “Wayfinding” with “aids” as opposed to something as stringent as guidance, though with some overlap in methodology. They use percentages as a means of measuring the effectiveness of each aid (Figure 5) and say, “Subtle wayfinding aids are best when overlaid as extra detail / polish with another more reliable wayfinding aid” (Yang, R. & Yoder, A. ND).

Method	Example	%	Method	Example	%
allegory	recreation or homage to an existing place, game, or level (e.g. <i>the intro to The Beginner's Guide is an homage to de_dust</i>)	1%	scripted sequence	friendly NPC directly leading the player (Half-Life 2), voiceover audio with directions, sudden explosion, etc.	70%
worldbuilding, architectural patterns	e.g. castles have dungeons at the bottom, and rich powerful people live deep in the middle / toward the back / at top... modern houses often have bedrooms with nearby en-suite bathrooms	4%	resources, items, breadcrumb trails	lines of collectible items or powerups (Donkey Kong Country), collectibles or powerups visible in the distance ("weenies"), a treasure chest, etc.	80%
following NPCs	destination implied by following humanoid NPCs or ambient wildlife (e.g. birds in Half-Life 2, mote particles in Proteus, foxes in Skyrim)	7%	cutscene	scripted cutaway camera shot that shows a newly unlocked door (Zelda)... assuming player is actually watching, and not just checking their phone or skipping through the cutscene	90%
unusual detail	subtle crack in ground or wall (Zelda), conspicuous use of game elements with unclear purpose (e.g. explosive barrel with nothing to affect)	10%	dynamic world UI / HUD	glowing GPS route (Grand Theft Auto 5), dynamic road signs (Mafia 3), pings (Apex Legends), alternate vision ("detective mode" in Batman Arkham games)	92%
sound design	ambient sound (e.g. hearing the sound of flowing water in the distance), dynamic use of music (e.g. hearing tense music upon entering a dangerous area)	15%	active threats	enemy NPCs actively attacking the player, aggro'd NPCs with audio barks that draw dangerous attention to themselves	93%
typology	e.g. shooter levels with large rooms full of cover but no enemies yet, or when a room feels structured like a boss battle arena	20%	static deep wide barriers	deep pits, canyons, lava, rivers, etc. that physically block movement without blocking line of sight, cannot be destroyed or bridged	95%
Method	Example	%	Method	Example	%
composition, sightlines	dense clusters of details to inspect up close, sparse skybox geometry to avoid, tall landmark in distance with wide sightline, window framing a specific view	35%	always-on global UI / HUD	objective marker (Call of Duty), objective arrow (BioShock), on-screen objective text, minimap with icons... <i>sometimes it's OK to "give up"</i>	97%
lighting, color	path implied by light placement (Left 4 Dead), visibly lit entrances and exits, color contrasts (e.g. bright blue door in a dark orange landscape)	40%	static hard barriers	walls, fences, fortifications that physically block movement and block line of sight, cannot be destroyed	98%
in-world signage	in-world signs and placards; <i>easily mistaken for irrelevant set dressing</i>	40%			
gamer tropes	e.g. waterfalls hide treasure, or climb a tower for a reward	45%			
environmental storytelling	trail of blood on floor (Doom), trail of destruction (BioShock)... clear authored path formed by a character or event	50%			
ground composition	planks that extend off the ledge (Uncharted), train tracks (Team Fortress 2), scratchy ledge markers (Tomb Raider)... clear gameplay function	55%			
repetition	repeated use of prior elements in a similar situation, directly evoking the player's memory and pattern recognition	60%			

Figure 5: Wayfinding aids (The Level Design Book, ND)

This source goes even further against some methods, stating “Leading lines (are bullshit)” (Figure 6). Further, they posit “Players often avoid the perceived critical path on purpose, to explore side areas and progress through the game at their own pace” and “Let’s move away from the weird (and creepy) prescriptive designer fantasy about secretly mind-controlling players into playing the way we want” (Yang, R. & Yoder, A. ND).

This stark counter opinion shows that my hypothesis is shared by other developers, suggesting that further study and evolution in the field of level design may well be necessary.

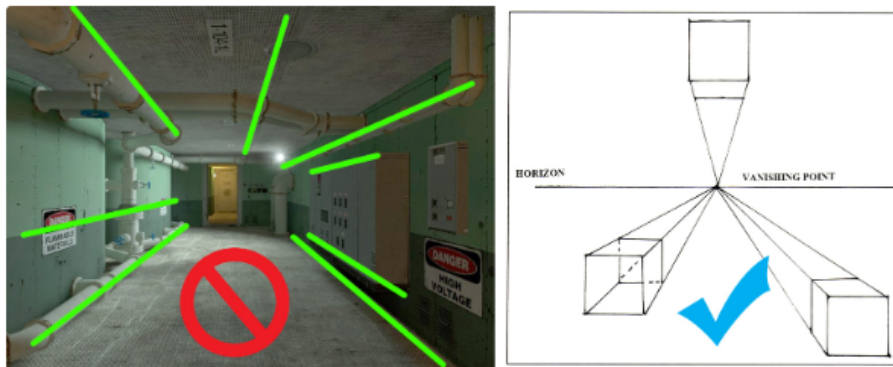
Leading lines (are bullshit)

There's currently a trend in level design to analyze screenshots by drawing "leading lines" that seem to point / guide the player's eyes toward a landmark in the distance.

However we argue that **leading lines aren't actually effective**, and furthermore, leading lines don't even make sense within their own logic.

Leading lines misunderstand human gaze, perception, and information processing. Retina scans and gaze tracking tech show how leading lines and other traditional tenets of 2D visual composition don't "lead the eye" in the ways we think they do. Even if they did, there's no guarantee the player actually processed the visual information.

Literally every hallway you build will seem to converge in the distance. This phenomenon is called *foreshortening*, creating an illusion of depth in an otherwise flat 2D image. Games with isometric or parallel projection make leading lines impossible. The art history of perspective drawing is interesting, but it's not level design.



"leading lines" always exist in any screenshot with linear perspective; you can't-not make leading lines

Ironically, leading lines mislead level designers into believing that shot composition, environment art, and set dressing are central level design problems instead of metrics, encounter design, or playtesting. Even if leading lines worked (which they don't), you would do it near the end of the level design process. Focus on the fundamental foundation of the level first.

Leading lines routinely fail if you actually bother to playtest. You'll find that there is a 99% chance the player will look somewhere else, and a 1% chance they will look in the intended direction for 0.5 seconds. A screenshot is not a level, no one ever plays a screenshot.

Leading lines are a self-fulfilling prophecy when you move the game camera into a specific place to frame a specific view. *Of course the screenshot will follow rules of composition! That's because you composed it like that! And then you drew lines on it!* This is photography, not level design. Consult the "Golden Ratio" meme about the absurdity of self-fulfilling composition patterns.

Figure 6: Leading lines (are bullshit), (The Level Design Book, ND)

DEVELOPMENT

PRE-PRODUCTION

Thesis concept and product ideation:

Originally, this project intended to explore balancing guidance in non-linear levels, how one could effectively lead players when there is no main path. However, as the project developed, I witnessed a twitter storm of players opposed to the use of “yellow paint” in the Resident Evil 4 Remake (Capcom, 2023), saying, “using yellow paint to highlight stuff is “unnecessary,” an insult to the player's intelligence, gaudy, immersion-breaking, inelegant” (Wood, A. 2023), even leading to the creation of a mod, “No Ugly Yellow paint Everywhere” (BonusJZ, 2023). This led me to explore this reaction and to alter the thesis’s goal to study guidance methods and their effectiveness with modern players.

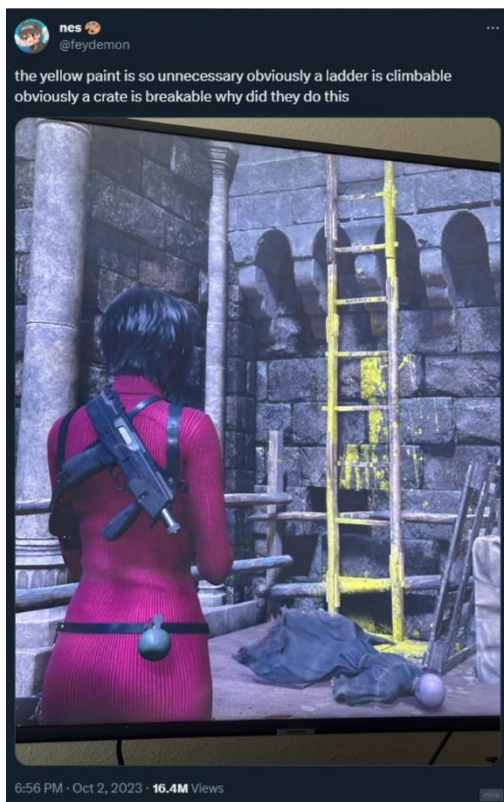


Figure 7: @feydemon's original post complaining about excessive guidance



Figure 8: Keano Raubun (@xArcky) mocking excessive guidance

The product with which to study this thesis would be a non-linear level built in Unreal Engine 5 (Epic Games, 2022). This would utilise various methods of interaction and traversal, scripted objectives, multiple endings and incorporate an easily graspable suite of mechanics (jumping, crouching, doors, windows, vents, and keys) based on games like Dishonoured (Arkane Studios, 2012) and Gloomwood (Dillon Rogers & David Szymanski, 2022).

This level would have two versions, one with general guidance throughout, another with linear guidance, focussing one path but retaining access to others. The results from each version would be collated independently and compared.

A mood board was compiled (Figure 9) of images on a Miro board (Miro, N/A) (Figure 10) which became my design bible. I decided a coastal prison would be the ideal setting as it would facilitate the use of traversal mechanics and of unique, varied spaces such as cells, offices, and a dock.

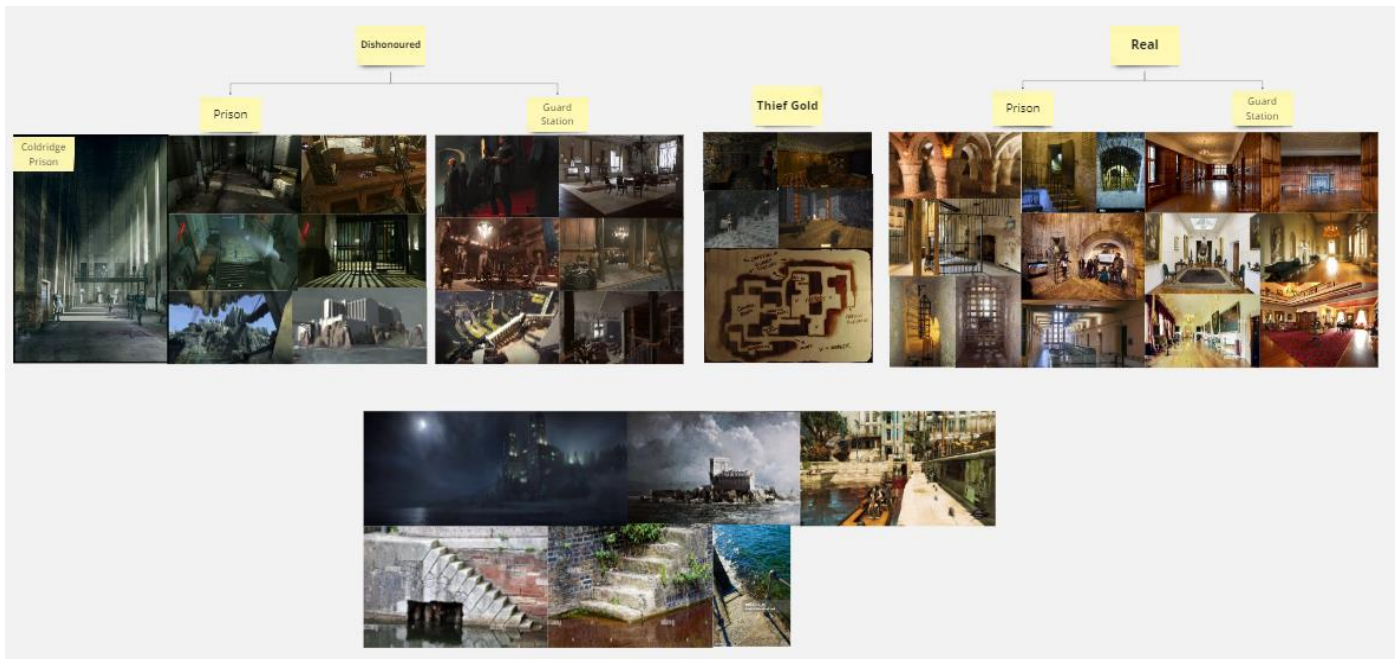


Figure 9: Level setting and theming mood board



Figure 10: Miro board
(Access the Miro board at: <https://shorturl.at/ginC8>)

Level flow and layout design:

I designed level flow (Figure 11) and layout (Figure 12 & 13) to establish a backbone for development before in engine implementation.

Both were developed in tandem which allowed a more streamlined and consistently informed process for design ideation and decision making.

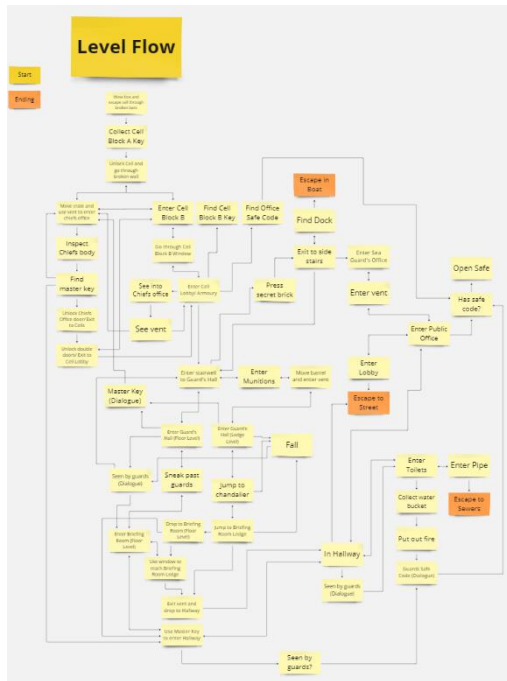


Figure 11: Level flow diagram

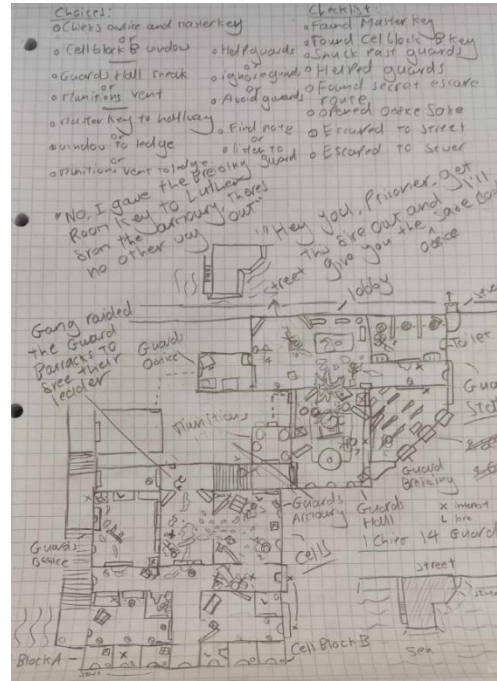


Figure 12: Initial level layout sketch and notes

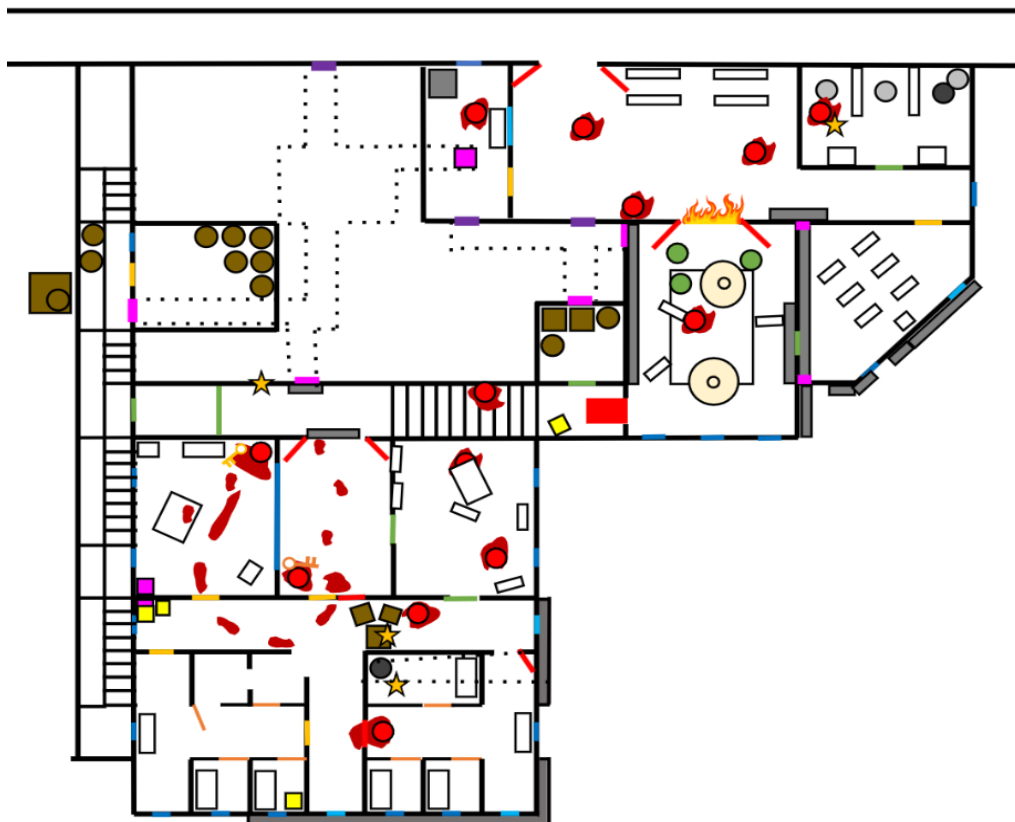


Figure 13: Digital level layout sketch

PRODUCTION

Whiteboxing and Detailing:

The whiteboxing process started with the creation of re-usable assets such as bookcases, vents, doors, grates, chairs, and tables that I could use as metric markers to maintain scale throughout the environment, as well as to decorate the space with believable purposeful details. I also created a grid material that helped maintain scale consistency.

Creation of the whitebox was completed with additive and subtractive box brushes, and detailed prior to implementing lighting and guidances (Figure 14).



Figure 14: Sequences of whitebox to detailing throughout the level

Implementation of guidance:

Backed by extensive research I made informed design decisions to implement guidances throughout the level (Appendix D) in the most effective manner.

Pinching:

This linear path (Figure 15) naturally funnels the player through pinching.



Figure 15: Example of Pinching

Landmarks and Weenies:

In a mostly interior space, landmarks and weenies aren't as usable. However, the bridge (Figure 16) is visible from numerous areas along the east side of the level, continuously reinforcing it as an important landmark to players who take those paths.

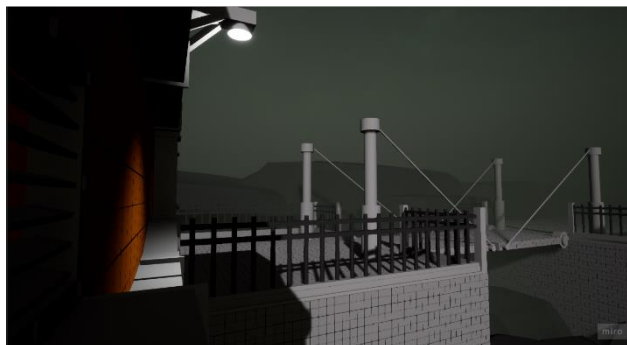


Figure 16: Example of a Landmark/ Weenie

Framing:

These examples (Figure 17) display damaged bars framing the broken wall, the vent above the door, and the key behind the bookcase. From this one point the player can see each exit opportunity.

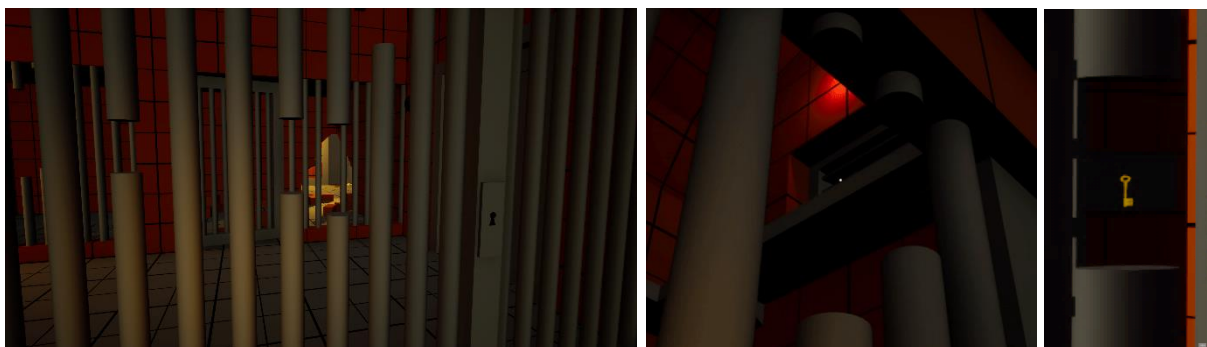


Figure 17: Examples of Framing

Colour and Lighting:

Light in some cases (Figure 18) was intentionally accentuated to stand out. Vents were indicated with a red light (Figure 19) to draw the eye.

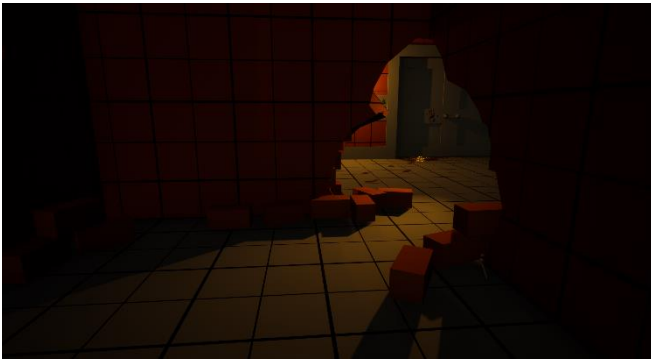


Figure 18: Example of Guiding Light



Figure 19: Example of Coloured Light

Leading Lines:

Purposefully placed or angled leading lines (Figure 20) (Figure 21) subtly or directly point the player in the intended direction.



Figure 20: Example of Leading Lines

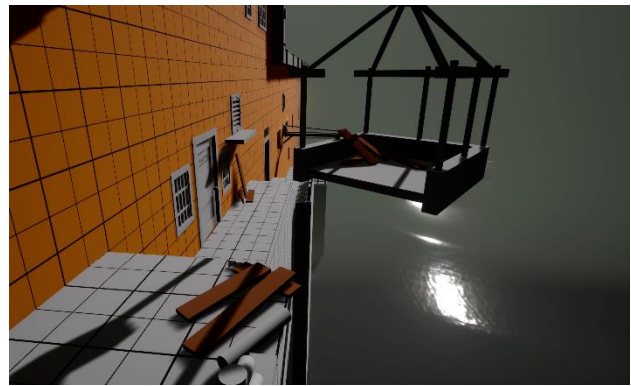


Figure 21: Example of Leading Lines

Signs and Arrows:

Diegetic signs use clear words and icons (Figure 22) to inform the player of where they are and where they are going.



Figure 22: Example of Signs & Arrows

Environmental Clues:

A series of notes, blood splatters, corpses (Figure 23) and other clues litter the level, unfurling narrative, but also indicating movement in a positive direction.



Figure 23: Example of Environmental Clues

On-Screen Objectives:

While not technically an element of level design, UI objectives (Figure 24) were used for further insight into how players interact with guidance.

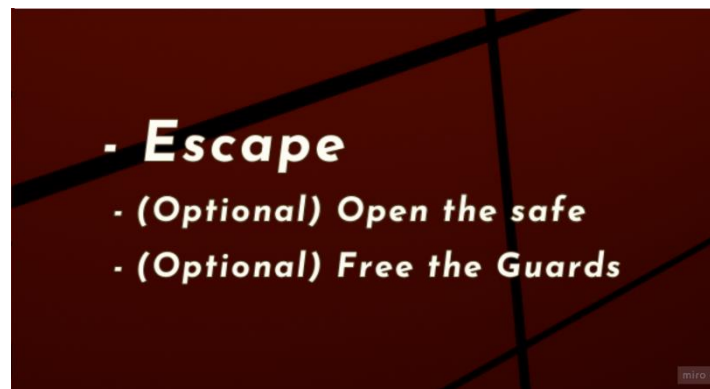


Figure 24: Example of On-Screen Objectives

Affordances and Anti-Affordances:

Windows came in two variations, one with bars (Anti-Affordance) (Figure 25), and another without (Affordance) (Figure 26). This visual difference affords their functionality.



Figure 25: Example of Anti-Affordance



Figure 26: Example of Affordance

Breadcrumbs:

Trails of blood and footprints lead to the 'Captain's Office' (Figure 27), directly guiding the player through intrigue.



Figure 27: Example of Breadcrumbs

Alluring Map Areas:

'The Office' stands out as a map area with its bright white light, blood and shadows (Figure 28). This view isn't welcoming but indicates there is more to explore.



Figure 28: Example of Alluring Map Areas

Dialogue Instructions, Hints and Background Chatter:

This example of dialogue (Figure 29) can be heard from outside the room and in the vents, giving the player consistent context to their whereabouts and whether to avoid or confront the source.

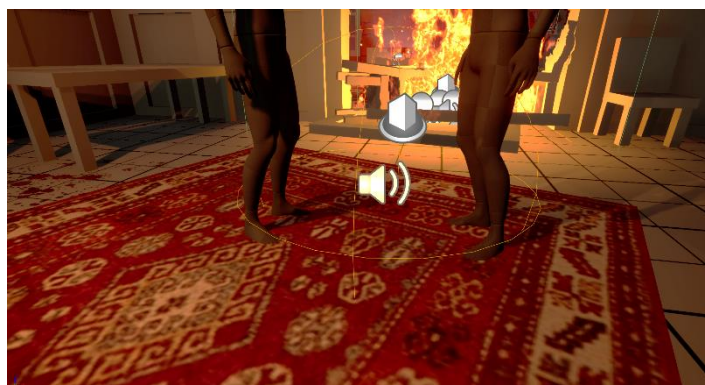


Figure 29: Example of Dialogue

3D Audio:

The player can hear water and the lighthouse bell (Figure 30) from the windows. This adds to ambiance, but also indicates to the player where they are in the environment relative to key landmarks.

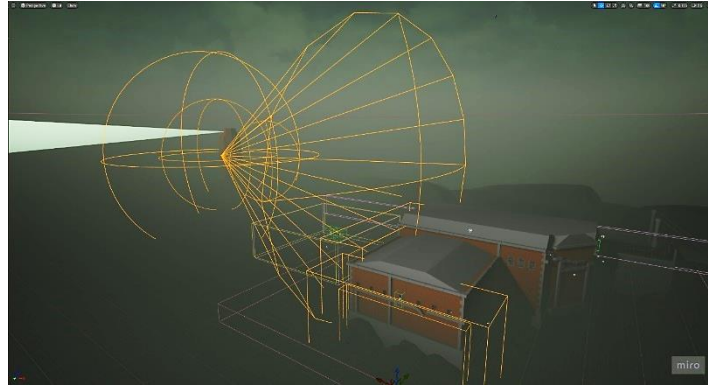


Figure 30: Example of 3D Audio

Linear version changes:

A linear build of the level was edited in order to further test my hypothesis. This build removed much of the lighting and tweaked the guidances into a more straightforward path (Figure 31). It was important to maintain accessibility to the existing alternate paths, only limiting guidance methods and obfuscating affordances for exploration.

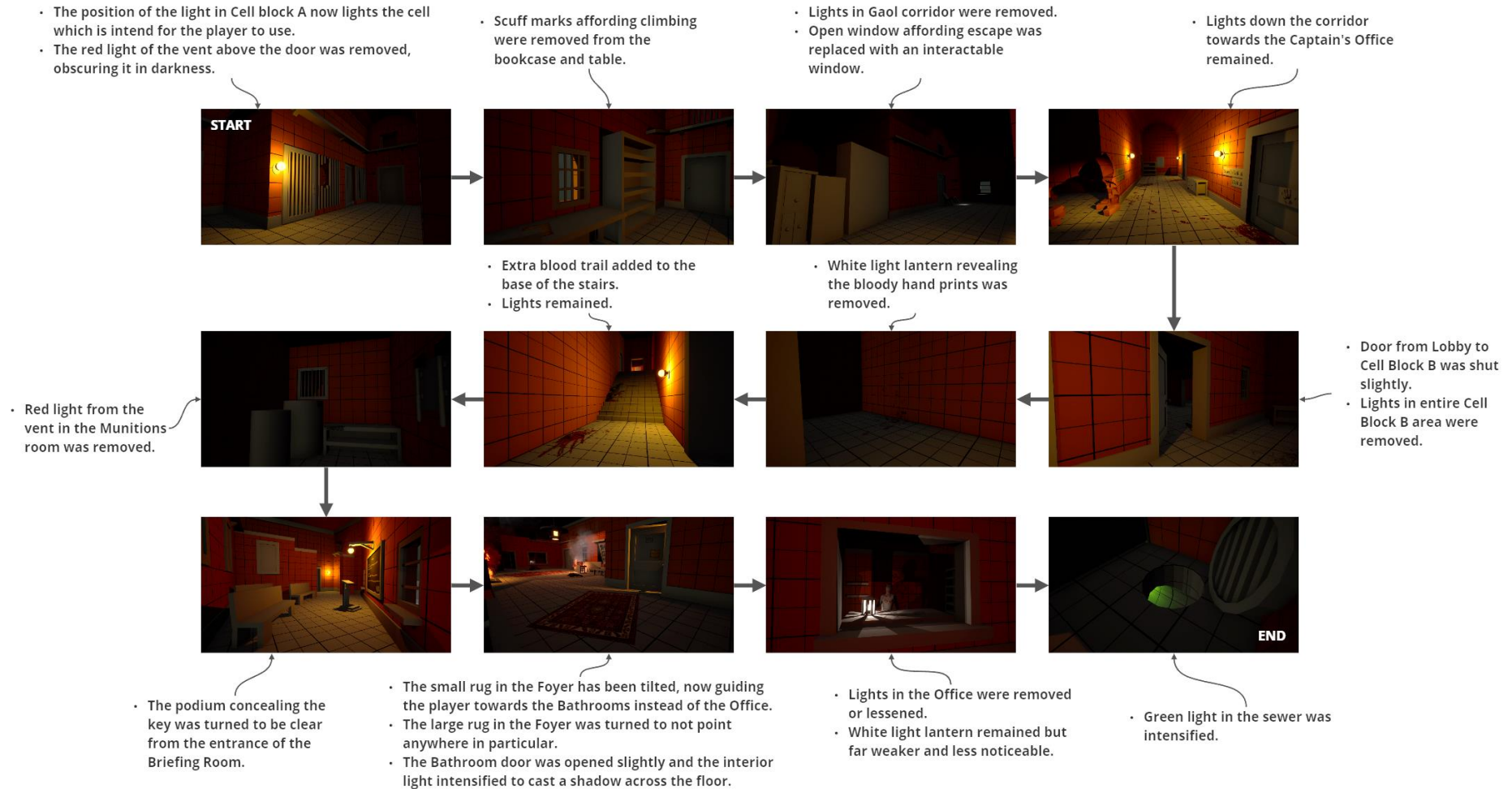


Figure 31: Linear level sequence and detail of changes

Heat-Trail System:

Though a non-technical project aside from level scripting (See Appendix A), to accurately record and view data I needed to design a bespoke system with Blueprints.

My initial concept was a standard heatmap, recording how players move through the environment. However, upon implementation, the system lacked the detail that I was looking for, primarily due to its lack of differentiation of verticality.

To accommodate these requirements, I redesigned the system to use debug lines with a colour range attached to the players Z-Axis. This method drew a debug line and changed colour (Figure 32), providing visible three-dimensional data.

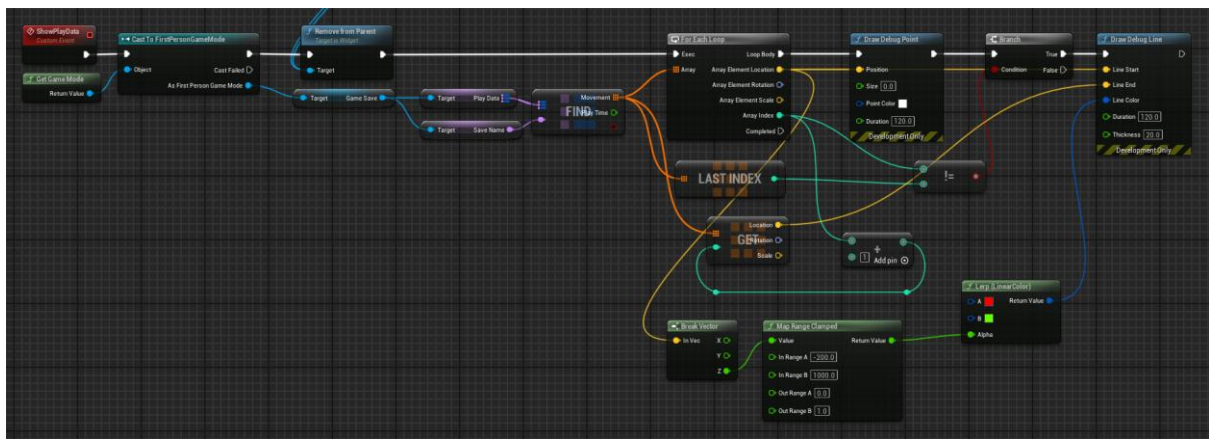


Figure 32: Show play data event functionality.

The system also needed to save and display data, so, next came setup of a save game function which recorded and stored player movements. I added the save game event to the level end triggers (Figure 33) and used editable save names to store the data in an array (Figure 34), so, after numerous play sessions, I could go through the list and view data independently.

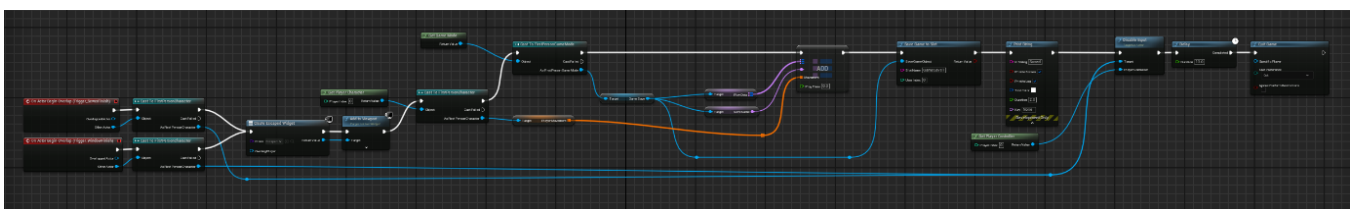


Figure 33: End game save functionality.

VARIABLES		Default	
PlayData	Name	Play Data	0 Map elements
SaveName	Name	Save Name	Save1

Figure 34: Save data variables.

Finally, I used the “Show Play Data” event as a button within the player character (Figure 35) to display recorded data. Then I was able to place the character in a blank level and press the button to view and screenshot the data (Figure 36).

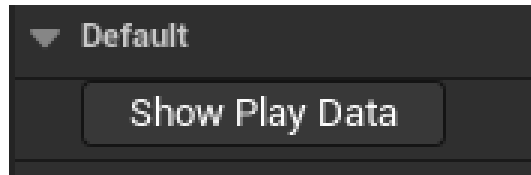


Figure 35: "Show Play Data" Button

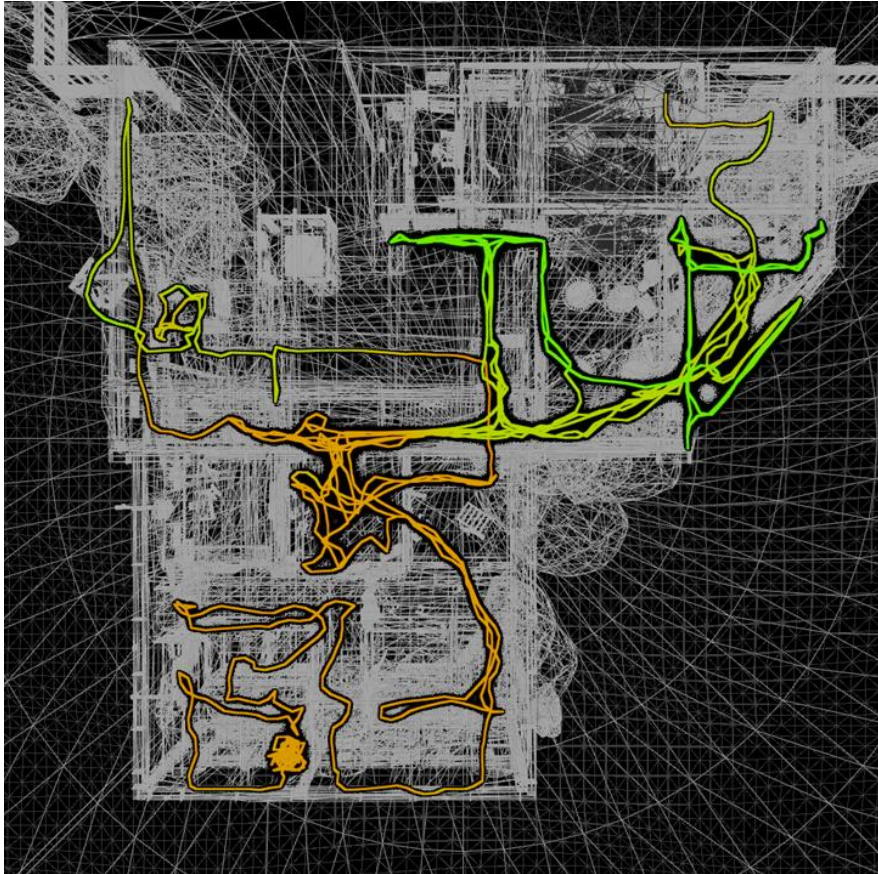


Figure 36: Example of visualised play data overlaid onto a wireframe of the level

RESULTS

METHOD

The aim was to reach 10 unique players for each version of the product, focussing on game development students and recent graduates to maintain consistency. All testers played the level while explaining their thoughts to the developer, as well as conversing subsequently.

The first session revealed a problem with 'On Screen Objectives' (Figure 24), one user stating, "Knowing there was a safe made me want to find it". This led to a third 10 player test session with lessened objectives that appear, when necessary, instead of being visible by default. Each version was labelled a 'Set':

- Set 1 – Complete guidance with 'On-Screen Objectives'.
- Set 2 – Complete guidance with lessened 'On-Screen Objectives'.
- Set 3 – Linear guidance with lessened 'On-Screen Objectives'.

Upon completion, all 30 results were analysed to identify data points. These results were then collated into 23 charts (See Appendix F) to better display findings.

GUIDANCE BEING INEFFECTIVE

Exploring despite guidance:

One trend in the data was players exploring despite guidance, "I don't pay attention to guidance; I just explore at my own pace" (Appendix B).

'Actions Taken' (Figure 37), which recorded the total number of actions taken by each set of players, evidences this. 'Set 1' displayed objectives which warranted exploration and led to the highest number of actions. However, removing objectives and cutting out guidance in 'Set 3', led to only slightly fewer actions, with noticeably fewer actions taken by 'Set 2'. This implies that denying guidance to players could lead to more enticing exploration, or, that players, despite guidance, choose to explore.

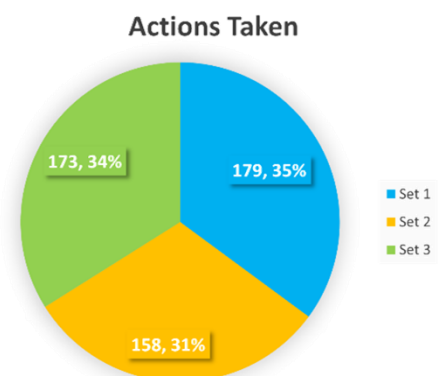


Figure 37: Actions Taken Chart

Though guidance was greatly restricted in 'Set 3', the number of players entering the 'Docks' (Figure 38) and 'Office' (Figure 39), which are only accessible through thorough exploration, was similar. Five players accessed the doors of the 'Office' in 'Set 1' and 'Set 3', and only one less player discovered the 'Docks' in 'Set 3' with zero guidance to do so.

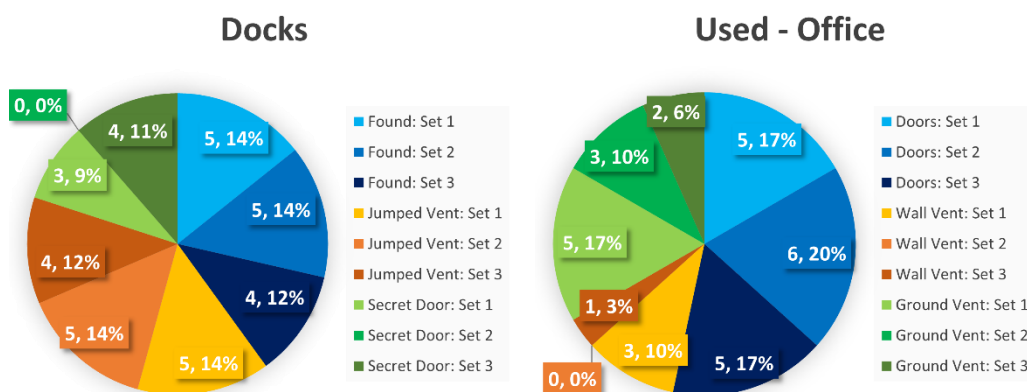


Figure 38: Docks Chart

Figure 39: Used - Office Chart

Purposefully avoiding guidance:

Another trend was players recognising and purposefully avoiding guidance, “Sometimes if I see the way to go, I’ll go the other way” (Appendix B).

‘Set 3’ saw 45% of all entries into the vent in ‘Munitions’ (Figure 40) and 50% of all platforming across the chandeliers (Figure 41). This could mean that making the vent clearer with the red light in ‘Set 1’ and ‘Set 2’ made it less alluring.

This could also mean that ‘Set 3’ players were more averse to the guards and dialogue from the ‘Guard’s Hall’. However, ‘Guards’ (Figure 44) proves that the same number of players (7) interacted with the guards as did in ‘Set 2’ and two more than ‘Set 1’.

‘Explored Captain’s Corridor’ (Figure 42) shows fewer players in ‘Set 3’ (7 of 10) opted to even walk down the corridor towards the ‘Captain’s Office’ (Figure 43) than in the other sets. This implies that players purposefully avoided the clearer guidance. One player said, “I was looking for the main path so I could avoid it and find secrets”.

Entered Munitions Vent

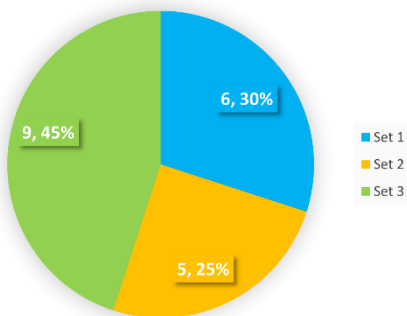


Figure 40: Entered Munitions Chart

Platformed Chandeliers

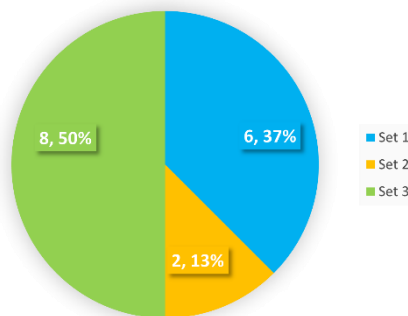


Figure 41: Platformed Chandeliers Chart

Explored Captain’s Corridor

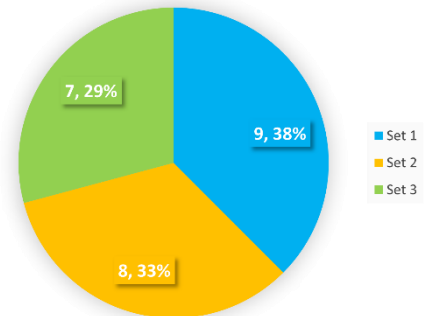


Figure 42: Explored Captain’s Corridor Chart



Figure 43: Linear Build of Captain’s Corridor

Guards

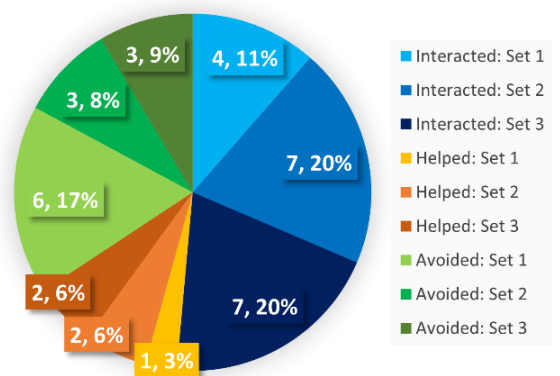


Figure 44: Guard’s Chart

Lack of variation in 'Heat-Trail' results:

A final piece of evidence comes from looking at the 'Heat-Trail's (Figure 45). Less exploration took place in 'Set 2' and 'Set 3' than in 'Set 1' which suggests the strength of 'On-Screen Objectives'. Though the difference you would expect to see between 'Set 2' and 'Set 3' as a result of the linear guidance in 'Set 3', is simply not there.

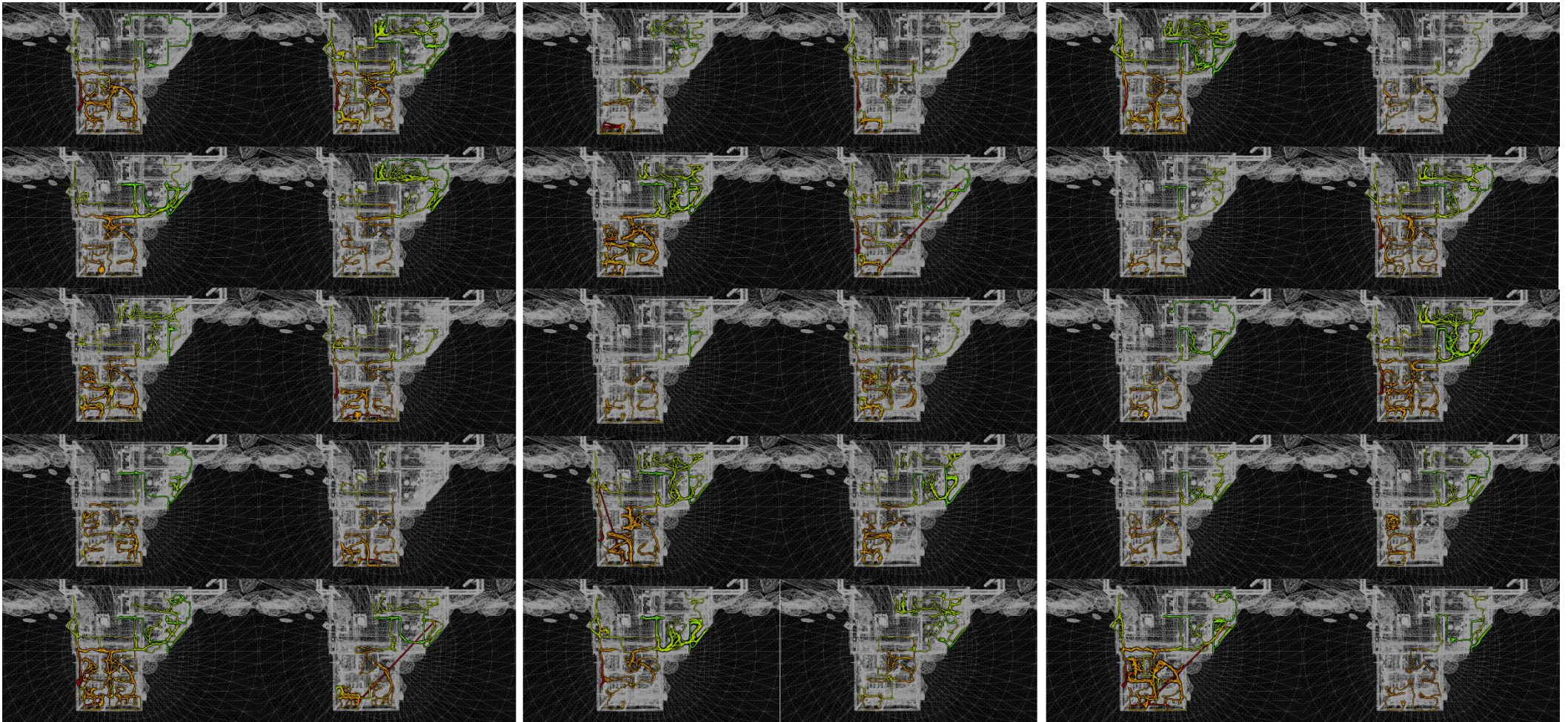


Figure 45: 'Heat-Trail' results of Play, Set 1, Set 2 and Set 3

GUIDANCE BEING EFFECTIVE

Counter to my hypothesis, evidence of the effectiveness of guidance was also apparent. 'Found Vent Room' (Figure 47) shows that less guidance led to fewer players finding the secret 'Vent Room', with only 20% being from 'Set 3'.

Another example, 'Exited Gaol – Door' (Figure 46), shows that 63% of all players who initially exited the 'Gaol' through the double doors, came from 'Set 3', which linearly guided the player to do so.

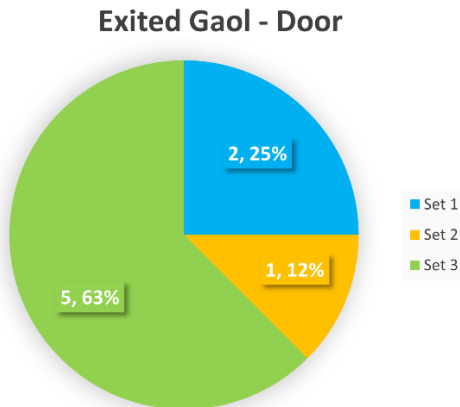


Figure 46: Exited Gaol – Door Chart

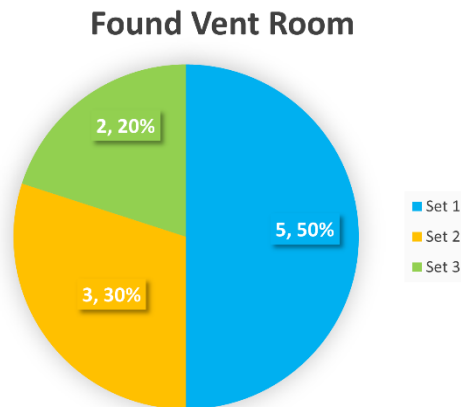


Figure 47: Found Vent Room Chart

A final example is 'Exited Cell Block A (First Time)' (Figure 48) which catalogues each player's first exit from 'Cell Block A'. The 'Wall' had the clearest guidance and 67% of players used it. 'Set 3' especially shows this with a 9 to 1 ratio.

However, 'Used – Cell Block A' (Figure 49) details how many players accessed each option at any time during their session and shows that even though most players exited using the wall initially in 'Set 3', more returned using the vent than any other set, meaning that less guidance led to more exploration and backtracking.

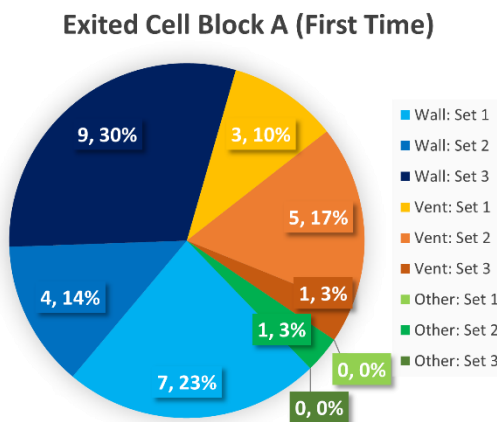


Figure 48: Exited Cell Block A (First Time) Chart

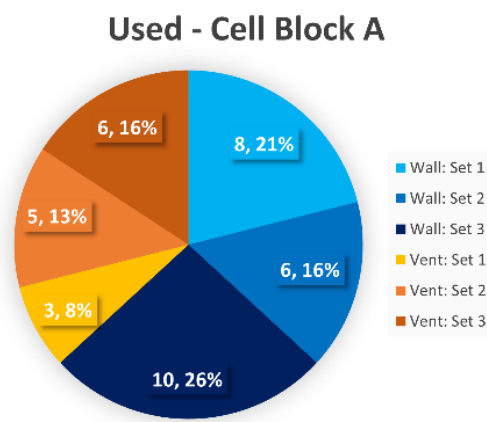


Figure 49: Used- Cell Block A Chart

REFLECTIONS

Overall, the product and research were completed in advance of the deadline and to a high standard, with testers stating, “I really hope to play the level again if it’s finished”, and “Amazing level design”. The results were of a high quality and show great promise for further study, though my methodology, especially relating to testing and data gathering, was flawed.

The research conducted was thorough, using a breadth of sources to study a variety of areas. However, collation could have been improved as inconsistent organisation led to time consuming searching and cherry picking of usable elements.

Development of the product went well, allowing me to extend and display my skillsets. Research into level design principles (Appendix G), and utilisation of industry standard practice, coalesced into a high-quality level. Furthermore, research of guidance methods informed effective use and bolstering my understanding.

The technical side of the product also went smoothly. Level scripting (Appendix A) and controller development was straightforward if messily Blueprinted. As I am not a technical designer, I utilised the skills I have to the best of my ability. The most challenging aspect was the creation of the ‘Heat-Trail System’, though I was able to develop an efficient system which was fit for purpose.

Testing was handled successfully, though methodology could be improved.

Having thirty testers provided a strong research sample; however, most were current or former game development students and this education may have affected their play style. I also feel that the context of testing could have informed how they played, if they played without knowing that I was gathering data or testing, their play may have differed.

My note taking during testing was also flawed as it was all handwritten and based on observation. In future I would devise a suitable system to organise and store notes ideally for future reference.

Testing mostly took place in labs at Teesside University, therefore testing audio elements consistently was impossible due to noise and lack of suitable equipment. This meant that audio guidances were mostly untested, though one player stated, “I heard voices and instincts kicked in, so I snuck around”.

Finally, the methods with which I gathered and analysed play data weren’t perfect.

The ‘Heat-Trail System’ yielded great data, but it could have been better. For example, the lines left by player movement became hard to trace (Figure 45) if the player went back on themselves. Debug arrows along the line would fix this.

I also could have recorded actions with triggers, instead of relying on hand tallying (Appendix C) which took unnecessary time and was open to human error.

While the data I gathered was high quality, I’m certain that better methodology would yield even better results if this hypothesis were studied further.

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APPENDIX A - Level Scripting

While not a technical exercise, this project required a number of blueprint scripts for triggered events such as NPC dialogue and the collection of keys.

Guard Interaction Sequence:

The most complicated blueprint sequence was the Guard's Hall NPC interaction, with triggers for their dialogue, the player being caught, and the act of freeing the guards in two different ways.

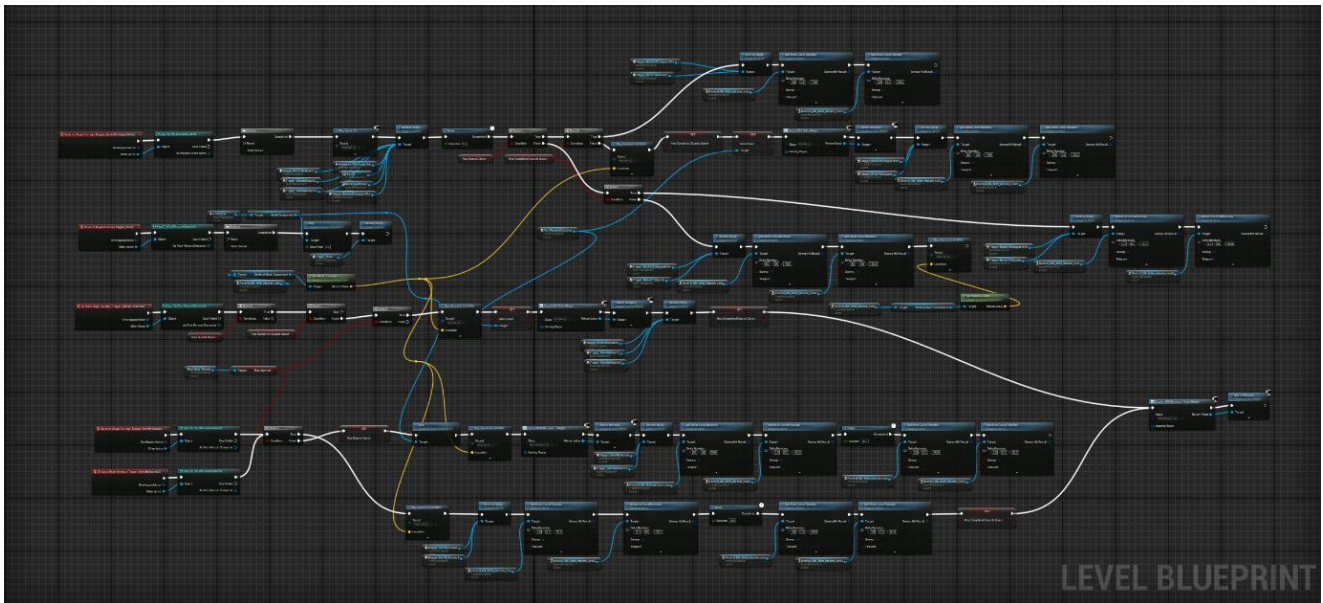


Figure: Guard interaction Blueprints

The dialogue was triggered by a box outside of the Guard's Hall with the intent of being audible from the Munitions room vent.

The rest of the triggers surround the NPC guards, two of which trigger the 'caught' sequence when the player enters them. One at ground level and the other above in case the player falls from the chandeliers. The third and final trigger only generates an overlap event with the player when the player has opened the Briefing room door. This action signifies that the guards can escape from the Guards Hall.

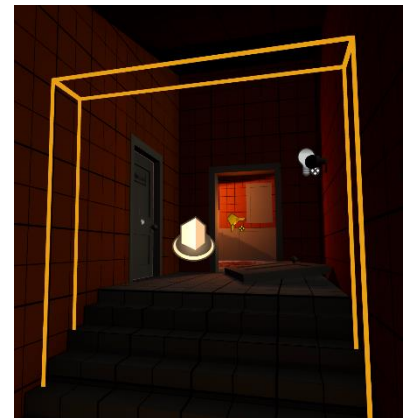


Figure: Stairway Dialogue trigger



Figure: Guard interaction triggers

A final important aspect of the scripting of this sequence was a series of Boolean conditions and branches. These allowed me to create a timeline of different events depending on whether certain triggers have been overlapped or actions have been taken.

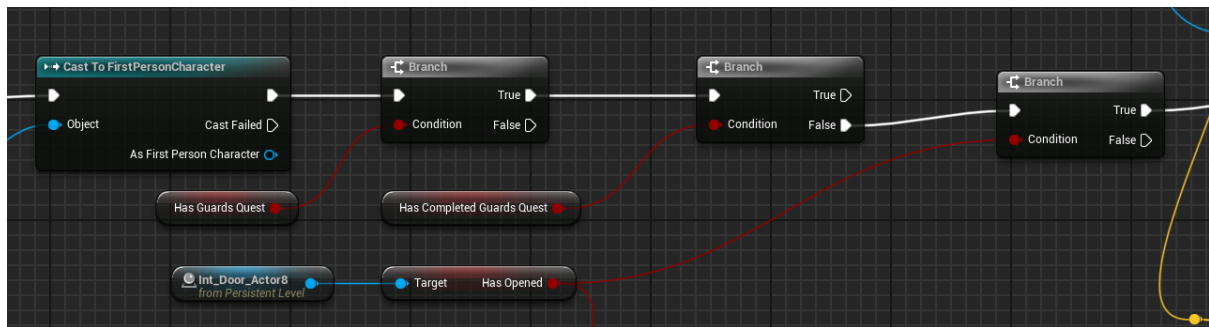


Figure: Example of Booleans and Branches

Double Door:

The first scripted sequence players come across is the guard on the other side of the double doors. This sequence has the player overlap a box, triggering three 'door locked' events and an audio cue, informing the player that the captain has the Gaol key.

Two separate triggers were needed for this event as the player can escape the Cells from the hole in the wall or the vent.

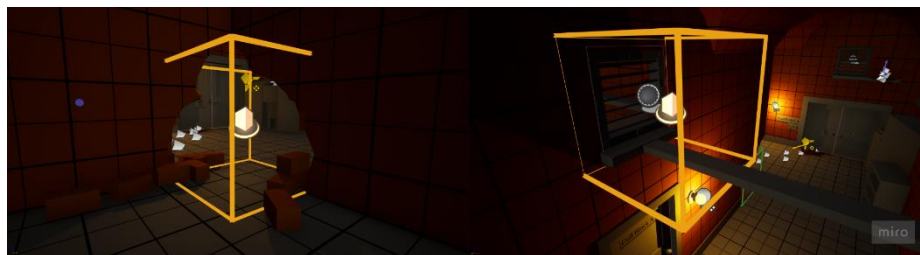


Figure: Double door sequence trigger

Falling Vents:

This small sequence simply applies physics to two vent meshes and plays an audio cue when the player overlaps a trigger box. The inclusion simply spices up gameplay along one of the better hidden paths.

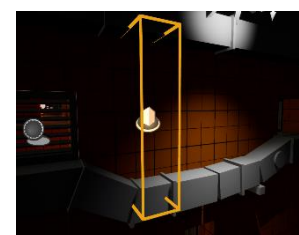


Figure: Falling vent trigger

Level Endings:

The level had two endings that both utilised the same blueprint string. Simply, when overlapped, each trigger would create a widget and add it to the viewport, disable player input and end the play session.

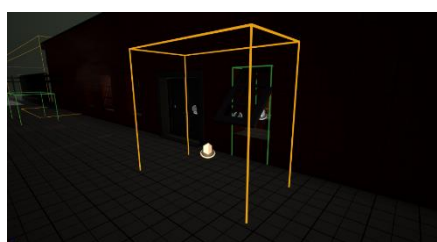


Figure: Window ending trigger

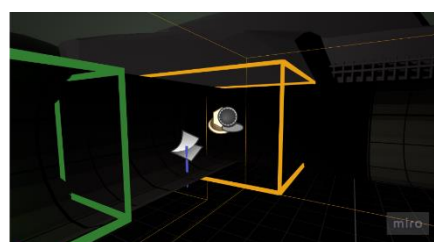


Figure: Sewer ending trigger

APPENDIX B - Research Quotes

Pinching:

- “Pinching (or funnelling) is a great way to steer a player in linear gameplay or can be used to bring a player to a specific point” (Wheeler, J.R. 2021).
- “Pinching basically means your layout funnels the player to a specific spot” (Shaver, D. 2018).

Landmarks and Weenies:

- “Towering and unique landmarks... can give the player a general idea where to head” (Wheeler, J.R. 2021).
- “They’re a great way to orient players in your world... If used correctly, players will see this object over and over as they get closer to it to let them know they’re headed in the right direction” (Shaver, D. 2018).
- “The purpose... is to catch the player’s eye and give the player a general idea on level directions” (Piaskiewicz, M. 2015).
- “Can you see how the weenies tower up on the horizon? They give the guest/player a purpose and direction to move in” (Raman, C. 2012).

Framing:

- “Framing is used... to manipulate the player... to be positioned in a precise way, at a specific point... The reasoning for using framing is... to ensure the player sees something” (Wheeler, J.R. 2021).
- “By framing your subject... you draw attention to it” (Shaver, D. 2018)
- “Frame a view, don’t merely exhibit it” (Frederick, M. 2007).
- “We can... manipulate their field of view through level geometry and scripted events to guide the player’s eye to a specific area of interest” (Gunson, L. 2013).

Colours and Lighting:

- “Contrasts in lighting can... show the player interesting places to explore. Contrasting colors are often used for defining the player’s critical path but can also be used to guide the players eyes” (Wheeler, J.R. 2021).
- “Path implied by light placement, visibly lit entrances and exits, color contrasts” (Yang, R. & Yoder, A. ND).
- “Light and God rays are useful for guiding players to a goal” (Shaver, D. 2018).
- “You can use lighting to draw attention to exits, points of interest and enemy locations and it can be used as an effective way to guide players through a level” (Pugh, T. 2018).

Leading Lines:

- “The goal with leading lines is to guide the players eyes to some specific area of the screen” (Wheeler, J.R. 2021).
- “Leading lines... draw the eye to a specific place in the scene” (Shaver, D. 2018).
- “Use leading lines to subtly move players in the right direction” (Pugh, T. 2018).
- “Leading Lines are a self-fulfilling prophecy when you move the game camera into a specific place to frame a specific view” (Yang, R. & Yoder, A. ND).

Signs and Arrows:

- “When used sparingly or seamlessly integrated into the world props, signs and arrows can be used to help guide the player exactly where they are supposed to go” (Wheeler, J.R. 2021).
- “Wayfinding signs play an important role in guiding users to navigate in a virtual environment” (Huang, H. 2017)

Environmental Clues:

- “Trail of blood on floor (Doom), trail of destruction (BioShock)... clear authored path formed by a character or event” Yang, R. & Yoder, A. ND).
- “Guide the player to areas they might explore next” (Wheeler, J.R. 2021).

Audio and Dialogue:

- “Sound effects are also a good way to orient the player or let them know that something is happening nearby” (Wheeler, J.R. 2021).
- “Ambient sound (e.g. hearing the sound of flowing water in the distance), dynamic use of music (e.g. hearing tense music upon entering a dangerous area)” (Yang, R. & Yoder, A. ND).
- “The amygdala is extremely sensitive to sound. That is why human beings have such a strong emotional response to things we here” (Dr. Marzhagar, S. 2022).
- “Sound can provide guidance in many ways, such as directional cues, spatial cues and auditory icons” (LinkedIn. ND).

Breadcrumbs:

- “Breadcrumbs are used to guide a player to a specific point in a close by area. Often, breadcrumbs are stones for paths or floor clutter leading to a door or other small area or opening” (Wheeler, J.R. 2021).
- “Breadcrumbing can come in many different forms including a different texture on the floor, gold coins that put the player back on track and collectibles dotted along a path” (Pugh, T. 2018).
- “Breadcrumbs lead the player, a little bit at a time, to the goa. They can be almost anything...” (Shaver, D. 2018).

APPENDIX C - Tally Results

Cell Block A - Exit Wall			Explored Cell Block B		
S1	S2	S3	S1	S2	S3
8	6	10	9	4	9

Cell Block A - Exit Vent			Captain's Oosice - G Vent		
S1	S2	S3	S1	S2	S3
3	5	2	5	4	6

Escaped - Window			Captain's Oosice - W Vent		
S1	S2	S3	S1	S2	S3
5	3	4	2	2	1

Escaped - Sewer			Found Vent Room		
S1	S2	S3	S1	S2	S3
5	7	6	5	3	2

Opened Secret Wall			Briefing - Climbed Shelter		
S1	S2	S3	S1	S2	S3
3	0	4	5	7	5

Found Docks			Briefing - Climbed vents		
S1	S2	S3	S1	S2	S3
5	5	4	6	5	7

Entered Maintenance Vent			Briefing - Found key / Used door		
S1	S2	S3	S1	S2	S3
6	5	9	4	3	4

Gaul - Exited Doors			Oosice - Entered Door		
S1	S2	S3	S1	S2	S3
5	2	6	5	6	5

Gaul - Exited Window			Oosice - Entered G Vent		
S1	S2	S3	S1	S2	S3
6	2	4	5	3	2

Climbed Barricade			Oosice - Entered W Vent		
S1	S2	S3	S1	S2	S3
5	5	5	3	0	1

Jumped on Chandeliers			Guards - Interacted		
S1	S2	S3	S1	S2	S3
6	2	8	4	7	7

WC - Entered Roof			Guards - Feed		
S1	S2	S3	S1	S2	S3
5	1	4	1	2	2

WC - Entered Door			Safe - Opened		
S1	S2	S3	S1	S2	S3
6	9	8	2	3	2

Entered Guards Hall via vent			Entered Maintenance		
S1	S2	S3	S1	S2	S3
6	4	8	6	5	3

Storage - Opened		
S1	S2	S3
8	6	5

Storage - Vent		
S1	S2	S3
8	5	4

Maintenance - Found Key		
S1	S2	S3
1	3	2

Docks - Plotted to vent		
S1	S2	S3
5	5	4

Briefing - Plotted to lobby		
S1	S2	S3
3	6	3

Cell Block B - Entered through vent		
S1	S2	S3
1	0	0

Guards Hall - Entered Door		
S1	S2	S3
6	9	8

Explored Captain's Oosice corridor		
S1	S2	S3
9	8	7

Gaul Exited vent		
S1	S2	S3
2	6	2

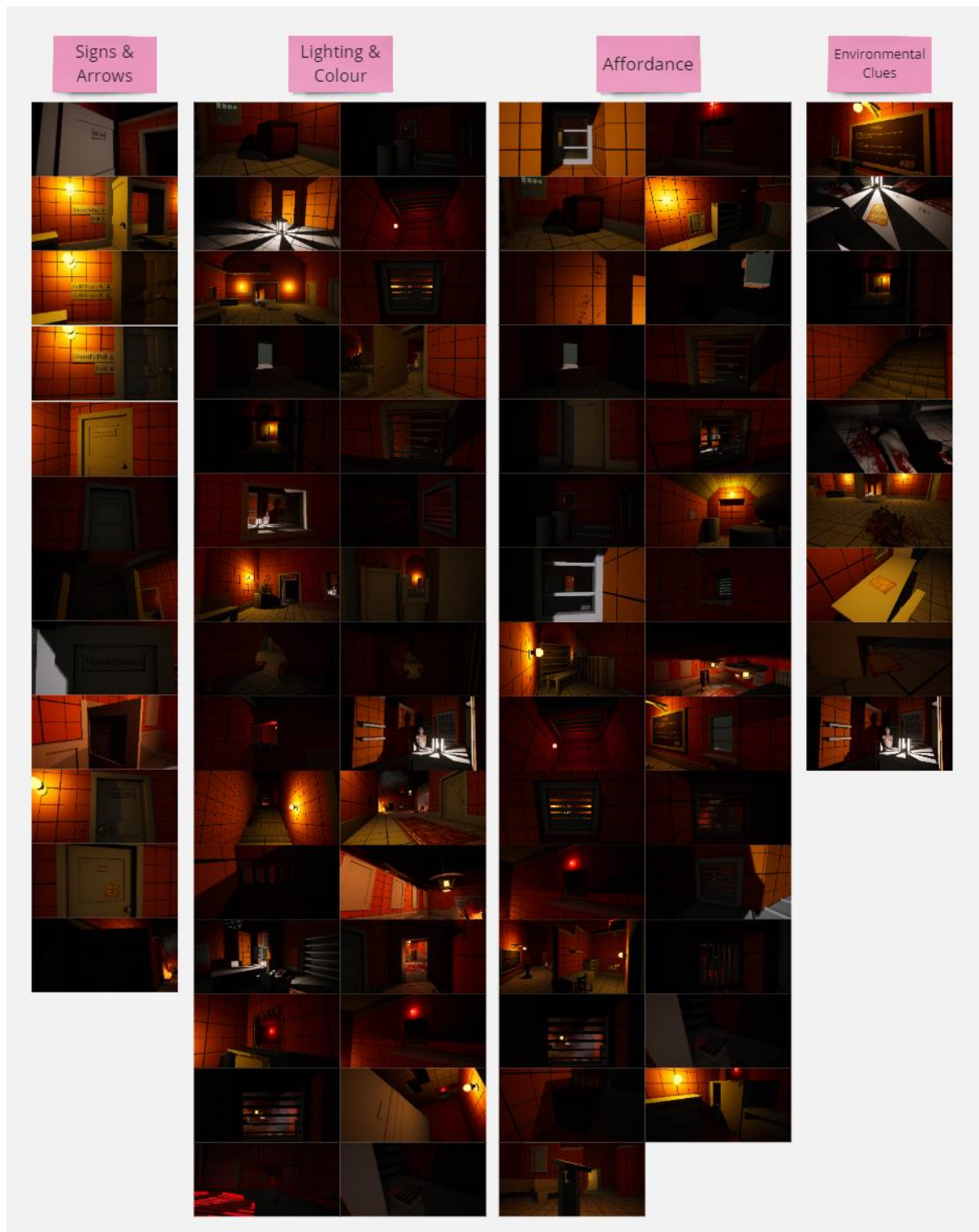
<u>179</u>	<u>158</u>	<u>173</u>
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Exited first time - Cells A		
S1	S2	S3
8	9	9

Exited first time - Gaul		
S1	S2	S3
vent		
vent		
Other		
1	1	1

Entered Maintenance		
S1	S2	S3
6	5	3

APPENDIX D - Complete List of Guidances In Use



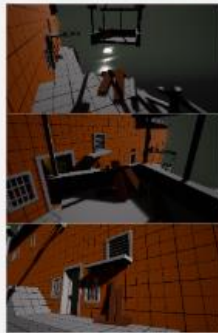
Landmarks & Weenies



Anti-Affordance



Leading Lines



Pinching



On-Screen Objectives



Framing



Breadcrumbs



Audio and Dialogue



Alluring Map Areas



APPENDIX E – Playtesting Quotes

Set 1:

“I did notice that mark but didn’t think there was more to it” (Asked about decals on the bookcase in Cell Block A)

“If there’s been a riot, what would be left in the safe?” (Asked why they didn’t go for the safe)

“Outside felt like an escape route”, “I have pre-cognition to dishonoured” (On why they spent so much time exploring outside)

“There was no tangible reason to stay and explore” (On escape being the only objective)

“I didn’t even notice the blood trail” (On the blood trail in the Gaol area)

“I heard voices and instincts kicked in, so I snuck around” (On hearing voices in Guard’s Hall)

“I only play Sims”

“Is there anything I missed?”

“Oh no, I have to do it again” (When they fell from the ledge into Briefing)

“I don’t pay attention to guidance; I just explore at my own pace”

Set 2

“I wanted to collect everything before finishing”

“Oh, I could have just walked through” (On not realising they could just enter the Guard’s Hall)

“I wouldn’t have thought to go out the window”

“You can’t tell which is a prop and which is interactable” (Talking about windows)

“It’s kinda dark”

“I’m not actually sure where to go”

“I’m assuming I’m supposed to go this way”

“I saw people and thought, I’ll do that last”

“I wanted the axe, I thought it offered another way out”

“I would have reset the game to explore before leaving”

“I thought “I’m getting away with it, I’m cheating the game””

“I want to kill things”

“There was nothing that made me want to be a killer, so I became an explorer”

“I noticed the decals as a way of climbing”

“I saw things and then forgot” (ADHD/ Autism and object permanence)

Set 3

“I would normally backtrack when I know I’m on the right path”

“I tend to explore until I find out there’s not much more to find”

“I’d try and get out of the sewer but didn’t think I could”

“How I play depends on the game”

“Sometimes if I see the way to go I’ll go the other way”

“My player type depends on my mood, but I am an achievement hunter”

“The game wants you to go here”

“I’m the sort of person that would spend an hour walking around a random place”

“My play style depends on the game, I play all sorts”

“I really hope to play the level again if it’s finished”

“I could go back but I’m already here now”

“Whatever game I play I just want to get 100%”

“I was looking for the main path so I could avoid it and find secrets”

“My player type changes per game”

“It felt really natural, like flow”

“I went back and found the key but just went the way I thought I should”

“Just didn’t think to go out the window”

“When I had the key I didn’t think to go another way”

“There’s light”

“I have a habit of checking my options and following one of them”

“I play games like this so I look for hints. If I didn’t, maybe I would miss the wooden planks and not try to jump”

“Amazing level design”

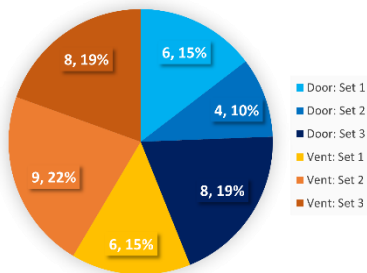
“I feel like I should be sneaking”

“It seems I could have gone that way”

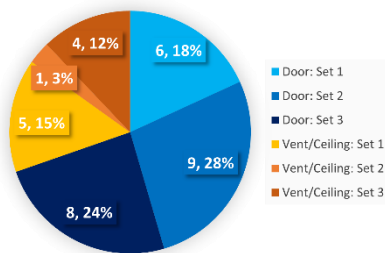
“It seems like there are a lot of options, so I want to try out my first thought to see if it will work”

APPENDIX F - Un-Referenced Pie Charts

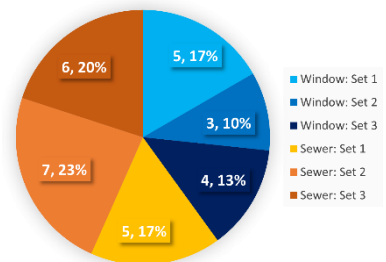
Used – Guard’s Hall



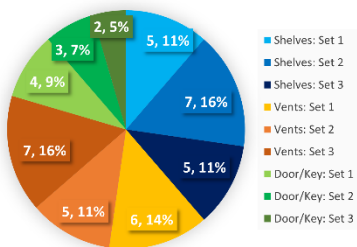
Used - WC



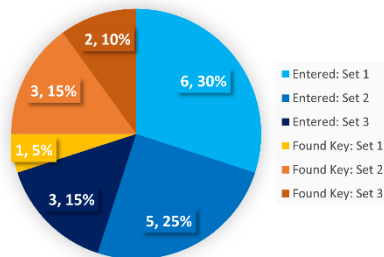
Escape Route



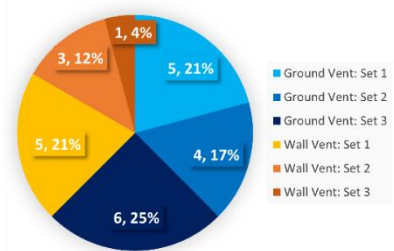
Used - Briefing Room



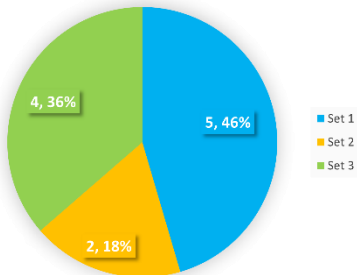
Maintenance Room



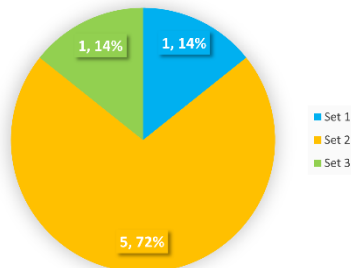
Entered Captain’s Office Via



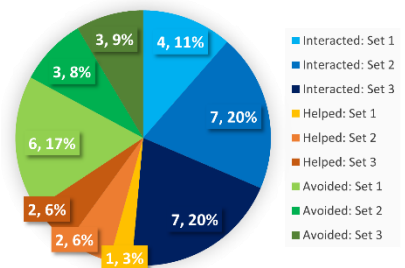
Exited Gaol - Window



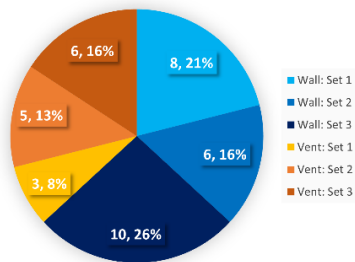
Exited Gaol - Vent



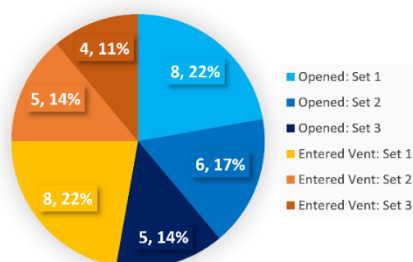
Guards



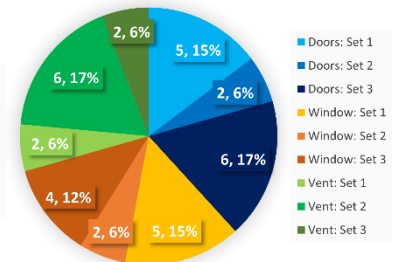
Used - Cell Block A



Storage



Used - Gaol



APPENDIX G - Research of Level Design Principles

This section contains a comprehensive collection of research materials on level design principles. It includes:

- Game Developer** articles and tips, such as "Level Design Tips and Tricks" and "Building levels - TC 1005 - 2009".
- Text excerpts from various sources, including:
 - "Take on Henry's challenge: a balanced approach..."
 - "The player should be able to see the goal..."
 - "Don't make the player missable..."
 - "The player wants to play the game..."
 - "What happens if the player dies today?"
 - "19. Playtest while you iterate!"
- Diagrams and flowcharts, such as a "Level Design Flowchart" and a "Level Design Process" diagram.
- Thumbnail images from various games, including Dishonored, Deus Ex, and others.
- References to GDC talks and other industry events.

Videos, Report

Videos, Development

This section displays a grid of video thumbnails and report covers. The thumbnails include titles such as "GDC Level Design", "Dishonored", "Deus Ex", and "Level Design". The reports are organized into two columns: "Videos, Report" and "Videos, Development".

Sites/Articles

This section displays a grid of website thumbnails and article covers. The thumbnails include titles such as "Game Developer", "Dishonored", "Deus Ex", and "Level Design". The articles are organized into a grid under the heading "Sites/Articles".