Hypothesis:

1. How can the exploration of space as a concept be used within a puzzle game to teach players how navigate it effectively through limited moves to reach a solution ?

Interrogation and Exploration:

With this game , there's two things I am looking to find out and learn from :

a. Players being exposed to limitations of space and movements and what that does for the internal and external economy of the game?

b. How can limitations with regards to space and movements be integrated to the genre of puzzle games mechanics to create engaging challenges and solutions.

Within the above key points, this game will open up the avenue to discuss the impacts of limitations in relation to how they may enhance creative , critical thinking and may ultimately lead to intellectually stimulating gameplay experiences.

Process:

At its core , this game is a puzzle that revolves around mechanics of tactical movement and basic arithmetic operations to create solutions that are perfect square numbers. This implies that players need to strategize their movements and perform mathematical calculations to achieve the desired outcome of creating perfect square numbers.

What was first point of reference when creating the game ?

- To create the game , i first had to think about the size of the grid that would define the limited space that players inhabit or where the game would be taking place. I settled for a 5x5 grid as it seemed fixed or reasonable. This in terms of how a 5x5 grid helped a convey a sense of limitation and "tightness" within a game aspect ratio frame.

Furthermore, because i had a goal of making players create a fixed number of perfect squares, I had to relate that number to the size of the grid that would allow for that certain umber of squares to be created.

How do players create the perfect square numbers number and how would the game communicate to the player that they have successfully created a perfect square?

-Considering the basic algebra foundation this puzzle game is underpinned by, I had to think

about how to visually communicate to players that they have multiplied two numbers to create a perfect square.

-This is where Unity's Collision in built function came in full clutch to aid in better representing the above scenario. I used two 2d square game objects which would represent the numbers and the I used Unity's physics system of colliders and rigid bodies and attached them to the game objects, tagging them and putting them in layers that resonate with the perfect square number to be formed. That is, if two numbers (lets say 2) needed to be multiplied together to form the perfect square 4, I put the two 2s in the same layer and tagged them the same way so that when i then used unity's ray cast function , the process of facilitating collisions would be seamless.

- That being said, the collision of two game objects would mean they are "multiplying" each other within the game world and thus effectively creating a perfect square number.

Feedback as a communicative tool in the game was important for players to know whether they have successfully created perfect squares or not. The moment -to-moment gameplay from a referential point of view within this game was achieve through the use of a readable user interface which consisted of giving players a clear display of the number of moves they are making against the maximum they could reach in the top left corner. In the top center , a display of the points players get or obtain for successfully creating a perfect square number was also important for giving players that motivation or satisfaction for their input actions and it increased engagement within the game. In the top right corner, a display of the number of perfect square numbers to be made by players aided players in being given a clear indication of their long term goal or objective for engaging with the system and mechanics of the game from the first place.

The instantiation of tiles at different positions that required players to figure out how to create their perfect square numbers played a significant role in communicating constant state changes of the game to the players. While the mechanic remained consistent throughout the game , the stage of the game constantly changed because players were created different perfect square numbers each time and the positions of the tiles or numbers were different at each instance in the game. This also helped communicate a sense of progression from the time the player first made their first perfect square number to the last one the created before they won or lost the game.

How is the level of difficulty being handled to symbolize progression from start of game until end of game?

-To address a gradual increase of the level of difficulty , Unity's Instantiation in-built function helped create a challenge variety within the game. By this I mean that at the start of game, players are easily introduced into how the game works and the instantiated number of 2d square objects is strictly kept at two for the first two to three challenges of the act of creating the perfect square number. After the latter challenges have passed, more 2d square objects gets introduced. That is, more than 2D square game objects get instantiated, increasing the how tricky it gets to control multiple game objects or "numbers" at once , utilizing the same input controls for all objects. This way, players have to think about how to move in a way that would increase the likelihood of creating perfect squares . At the same time, they also have to consider the movements made because there is a max limit players need to reach or have made together with the number of perfect squares to be made before they lose that round .

Key:

Color = Number representation

-Orange= the number 1.

-Blue = the number 2.

-Purple = the number 3.

-Yellow = the number 4.

Reflection:

Upon completion of this prototype around "Limited Space", there's a lot I've learnt around the nuances concerned with feedback layering within games, the understanding of system data processes and how space can be used as an experiential tool to create various natures of games. To answer my hypothesis question , these are some of the main points worth noting that illustrate my biggest takeaway from this exercise:

-Limitations regarding space and movement can be creatively applied to puzzle games to foster strategic thinking and problem-solving among players. By imposing constraints on the player's ability to navigate the game environment(so the limited moves and marked boundaries), developers can introduce unique challenges that require careful planning and resource management to overcome.

-These limitations can manifest in various forms, such as a limited number of steps or movements allowed per level, restricted access to certain areas of the game world, or obstacles that impede progress.

-By integrating these limitations into the core mechanics of the game, players are prompted to think critically, plan ahead, and experiment with different approaches to find optimal

solutions. The satisfaction of overcoming these challenges fuels engagement and motivates players to continue exploring and mastering the game's mechanics. I also realized that limitations within gameplay do not always have translate to difficulty or pressure . It can integrate the latter terms with a bit of fun to balance it out, which helps make the game interesting in various aspects of its design.

-Overall, limitations related to space and movement serve as catalysts for creativity and innovation in puzzle game design, offering players a rewarding and intellectually stimulating gaming experience.

Furthermore, within using the feedback from one of my play testers , I also recognized the importance that feedback layering has on improving player understanding , no matter how small the feedback layer is. Players appreciate good design because it helps them focus more on applying themselves into understanding how to “master” or successfully complete even more trickier tasks.

Trials and Tribulations:

I was torn between adding more difficulty in the game by instantiating more tiles in different positions and keeping the game easy yet still trickier. More difficulty however does not always equate to fun and in most cases players end up feeling overwhelmed and pedantic about solving that particular “hard” level.

To manage my predicament , i decided to introduce a risk/punishment mechanic into the game to up the difficulty just a little bit by having players think about what it would mean to not create a perfect square number within the context pf the game. If players “multiply” or combine tiles or numbers that would not yield a perfect square number, a punishment was introduced to make players feel a sense of risk in not following the main instruction. This punishment entailed players losing a certain amount of their perfect square number. This added a layer of depth in the game in terms of introducing risky actions within puzzle game design and the impact of that on players .

Playtest Feedback/Report

In this section , much of the feedback from external playtesting done included various ways of incorporating various layers of feedback, as already alluded to above. This included the possible use of a screen shake or a particle effect that would let players know that they are not allowed to move or cross a boundary section . Initially (before the playtest) , i had mapped out the boundaries of the grid where player are not allowed to move over in code, but had not visually communicated anything to the players about the extent to which their space within the grid is “limited” or restricted. After the playtest, this is when the use of

visually communicating the areas that players are allowed to move in and not allowed was implemented. Instead of the suggested ways, i decided to go with a straightforward and intuitive approach of using red boundary markers. around the areas of the grid space that players were not allowed to move over. This clearly communicated to players where their movements are allowed and the the extent to which they end. This, in turn increased player conventional understanding of danger or restriction and thus implored them focus on their movements considering their boundary markers and moves count.