Cosmic Canteen:
Exploring Stress in Time-Focused Interactive Experiences

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A Project Submitted

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Abstract

I developed and tested a management simulation game made using GDScript in the Godot Engine as a Master of Science project in Interactive Media and Game Development. The game features original art assets in addition to some free-to-use audio and visual elements. The goal of the project was to create an experience for players where they could feel the confusion and stress around looming deadlines and being able to manage the tasks needed to reach that deadline, as more tasks pile in.

Acknowledgements

This project would not have been possible without the assistance and support of so many throughout the development process. Firstly, I'd like to thank Professor Ben Schneider and Professor Karen Stewart, whose insights, guidance, and advice was invaluable in helping *Cosmic Canteen* make it off the ground. I'd also like to thank Bashar Alqassar and Daniel Brower. They both joined the project as additional contributors in the crucial final stretch, and without their contributions in technical and audio design, the project would never have been able to launch. Additionally, I'd be remiss if I didn't thank every participant in the testing sessions held throughout the project's development. Feedback from testers was crucial in informing the development, and it wouldn't have been attained without their time and input.

Lastly, I'd like to thank all my professors, peers, friends, and family who've lended support throughout both the development of the project and throughout my tenure at WPI. I appreciate it more than I could ever possibly express. Thank you.

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1. Introduction

I began the project in the fall of 2023 with the goal of developing a strong project that could incorporate a strong feeling from my own life - stress - and build a meaningful game experience around struggling through and conquering that feeling. To convey that feeling, I brainstormed the idea of a restaurant simulation game focused on preventing an impending doom, crafting gameplay systems and art to reflect the chaotic setting and disastrous scenario. While working on the game, I conducted testing sessions in order to gauge feedback, and researched other media and publications to gain a better idea of the themes and mechanics I wished to explore.

The result is a game I'm very proud of: *Cosmic Canteen*. This restaurant simulator game puts the player in the role of an unnamed bar owner who serves as the proprietor of a bar situated in the middle of outer space. He makes enough to make ends meet, but one day his entire life is thrown into disarray upon learning that an asteroid is due to collide with his establishment some time in the very near future. Only a special energy shield could help the bar he's worked to build up over the years survive, but such a shield won't come cheap. Now he must work frantically over the time he has left to amass enough funds to purchase the shield generator and save his life's work.

2. Origins

When setting out on this project, I had strong considerations when developing my initial design. Firstly, I wanted to design a game that took some inspiration from my own life and specifically, my own college experience and experiences with stress. In designing the game, I also wanted to try and craft a project that was tonally, aesthetically, and atmospherically different from any project I'd developed previously. Perhaps most ambitiously, I also wanted to work to develop the project on my own, doing as much work as possible by myself in order to showcase the wide variety of skills I'd developed during my time at Worcester Polytechnic Institute.

2.1 Stress

The main idea I wanted to explore with this project was how stress can affect player response in gameplay. After several stressful years during my time at WPI, stress only seemed the most appropriate theme.

I began my tenure as a student in 2018, and initially struggled to adjust to the school. A death in the family shortly into the term along with difficulty adapting to my then-major, Computer Science, meant that I was dealing with stress as a part of student life from the start. Although I began to do better towards the end of the academic year, as I started a double major in the IMGD program, I quickly ran into more stress the next year as programming classes grew more advanced. Eventually, I hit a turning point, and decided to shift my major away from programming to focus on art. Unfortunately for me, I made this change just before the COVID-19 pandemic hit the United States, and lockdowns were issued as WPI's courses shifted to an online setting. The pandemic proved to be an incredibly stressful situation in its own right, and while I managed to do alright, and did well upon my return to campus and in-person coursework, I hit another snag upon starting graduate school. The challenges of starting a new program, alongside a new living situation and a new sense of loneliness stemming from being in a school without several close friends from my undergraduate days, led to arguably my worst time as a student. I was constantly stressed out, and my physical and mental health suffered as a result. I took steps to improve my health after my first year ended, and as of the publishing of this report I'm feeling better than ever. These challenges, however, were still a very recent

thought in my mind when developing a concept for the project, and this led to the initial conception of an exploration of stress in some form.

Looking back at my experiences with stress, I was most struck by how insurmountable it seemed at the time. It was almost like a giant wall, that with each new challenge, grew and grew, no matter how much I attempted to scale it. While I did want to deliver this part of the stress - a seemingly insurmountable obstacle - to the player, I also wanted to present the flipside of that struggle - the feeling of triumph upon conquering it.

2.2 Setting

With regards to the setting, it was initially conceived through thinking about the main theme I wanted to explore - stress. When considering what sort of environment would provide the most natural analog to stress, I naturally first considered some sort of workplace, like a factory. In this hypothetical scenario, a player would have to deal with tasks at work while also dealing with pressure from their supervisor. Feeling that an industrial workplace would be a bit too direct of a metaphor, I decided to pursue a less obvious setting for the game. Given my own experience working in food service, I next gravitated towards some sort of restaurant or bar, and settled on the idea of a gameplay loop involving needing to earn money through working at the bar.

Figure 1. A tavern the protagonist Ziv visits to ask a villager for information in *Another Fantasy Quest.* Art by Julian Herman and Fernando Barzuna. Source: Screen capture

In order to make sure that the game's setting still had an element to make it unique, as opposed to setting it in a regular, modern bar, I looked at popular fictional genres for inspiration. I initially briefly considered fantasy, a personal favorite genre of mine, as taverns and bars often play a role in many fantasy tales. However, this element actually led me to reconsider using fantasy, as one specific tale they appeared in happened to have been my undergraduate MQP project, a satirical fantasy visual novel called *Another Fantasy Quest*. During the course of that game's story, the protagonist Ziv visits taverns on more than one occasion looking for their next objective. With ruling out fantasy, I then turned to another longtime love of mine: science fiction. I surmised that a setting in the middle of outer space would be both a sharp contrast and fresh departure from the settings of other large projects I'd worked on. Not only would space serve as an instantly distinguishable setting, but the scope of what I would be able to explore in terms of stress could be expanded on a galactic scale. With a terrestrial setting, for example, the worst consequence facing a player would likely be termination from their job, whereas in space, on a given day annihilation could be looming overhead by way of an approaching meteor. In addition, settling on the science fiction setting aided in my brainstorming on gameplay mechanics, as it

immediately led to me calling to mind tropes and game designs from other sci-fi media and games. The space setting was so crucial in the conceptualization stage of the project that I gave the project itself the working title of *Untitled Space Bar Game*, which was eventually shortened to *Space Bar Game*, a name which it retained for the majority of its development.

2.3 Solo Aspirations

One strong desire I had for this project was to work on a solo development project as a part of my last of six years at WPI. Throughout four years as an undergraduate and two as a graduate student, I came to amass a wide variety of skills throughout varied disciplines of game development, and I wanted an opportunity to put as many of them to use as possible in what would be a final capstone to my tenure at the university.

I wanted to develop a project that would be feasible to develop as a solo developer, so I initially looked at concepts based on what would be practically possible within the timeframe I had. This meant that large-scale 3D projects would be out of the question, as would anything programming-intensive. During my academic career, I primarily focused on writing and design, and while I had done some work in 3D modeling and heavier programming-focused work, I didn't feel nearly confident enough in either skill to pursue a design heavily utilizing them.

2.4 Media Influences

Figure 2. Pikmin carrying a ship part to Olimar's spaceship in the original *Pikmin*. Source: Screen capture.

The project took influence from several different pieces of media - games, films, shows, and even other interactive spaces - that I've enjoyed over the years. Chief among those was *Pikmin*, a real-time strategy series inspired by game developer Shigeru Miyamoto's love for gardening. In the *Pikmin* series, players assume the role of a space captain who must utilize the help of tiny plant/animal hybrids - the titular Pikmin - to complete tasks in order to collect items. Each title in the *Pikmin* series has a slightly different goal, and I took inspiration from multiple titles in crafting this game.

Figure 3. The UI of *Pikmin*. The ever-present clock and day counter served as inspiration for *Cosmic Canteen*. Source: Screen capture.

In the original *Pikmin*, Captain Olimar, the main character, must collect all thirty parts of his spaceship within thirty days in order to be able to successfully escape the world of the Pikmin and return to his home planet to see his family. In wanting to explore themes of stress in a game, I found that the day limit mechanic of *Pikmin* provided a well-balanced element of pressure when I first played the game in the fall of 2023, as I was formalizing concepts for this project.

Figure 4. A message in *Pikmin 2* that illustrates how much debt has been paid. Source: Screen capture.

In a similar vein, some of the later games in the series, specifically *Pikmin 2* and *Pikmin 4*, the player's goal is instead to collect treasure, with no day limit being imposed upon them. In *Pikmin 2* in particular, this goal is even more paramount, as while there is no time limit on doing so, the President of the Hocotate Freight Company has entrusted Olimar and his colleague Louie with collecting enough treasure in order to pay off a large debt the company has incurred. I took note of this aspect as well - the need to accumulate wealth in order to achieve a specific goal rather than simply for its own sake - when in early development.
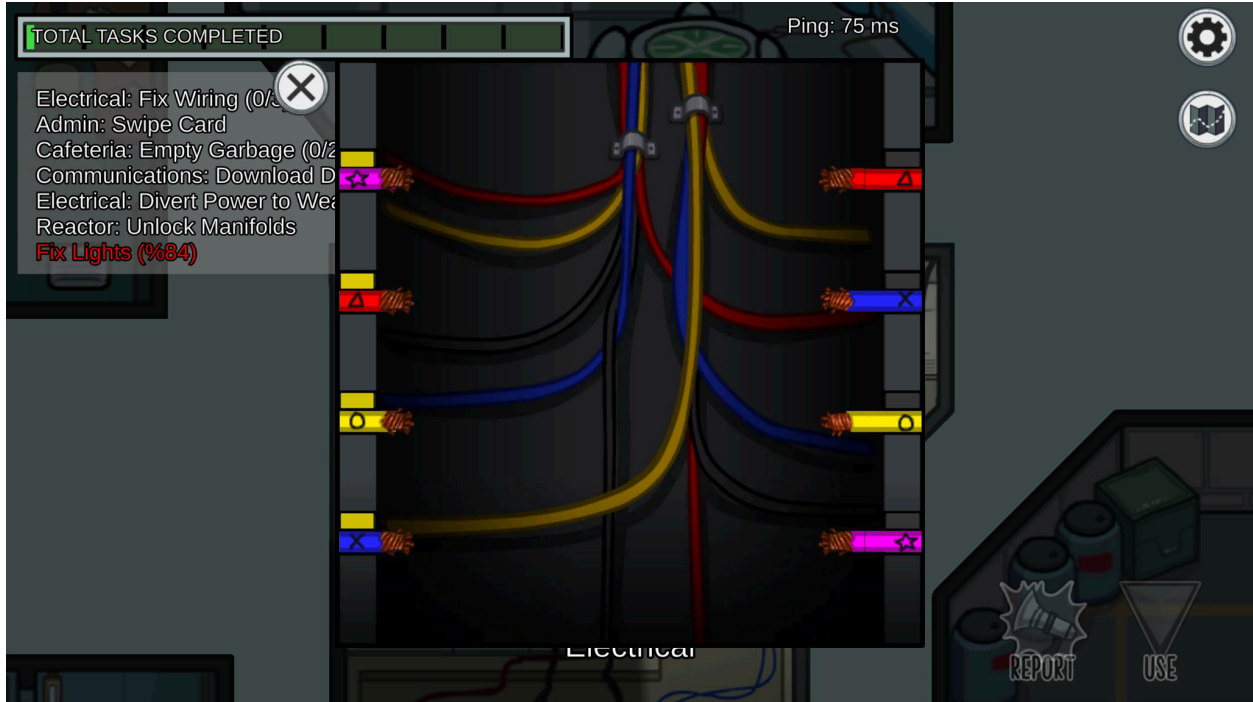
Figure 5. A minigame task in *Among Us*. Source: Screen capture.

Another surprising source for inspiration was the popular multiplayer game *Among Us*. The game became immensely popular during the COVID-19 pandemic, and its use of simple minigames to represent tasks completed on a spaceship, such as reconnecting wires or emptying trash chutes, served as a large inspiration for how I wanted the minigames in *Cosmic Canteen* to be structured. The *Among Us* format of featuring a simply-controlled minigame inside a pop-up window wasn't the only aspect of *Cosmic Canteen* I took inspiration from, as the game's art style also partially inspired mine.

I additionally took some inspiration from the restaurant simulation genre as a whole. While I hadn't played much in the genre, and no one title contributed exclusively to the game, I was generally aware of how such titles are structured, and many testers made comparisons between my game and restaurant simulation titles they had played in the past. The impending approach of the asteroid, looming as it threatens destruction, was also inspired by *The Legend of Zelda: Majora's Mask*, which remains to this day one of my favorite titles in the *Legend of Zelda* series ever since I played its remake in high school.

Aesthetic-wise, in addition to *Among Us*, I took some cues from *Star Wars*, one of the most-well known science fiction franchises and a favorite of mine since childhood. In particular,

I was inspired by some of the sleek, bright environments seen in the films, such as Princess Leia's starship in the opening of *A New Hope*, Cloud City in *The Empire Strikes Back*, and in particular, the diner featured in *Attack of the Clones* as well as another shown in the episode "Brothers" of *Star Wars: The Clone Wars*. Ironically, those two lesser-known scenes in particular stuck with me when devising the setting of a bar in space, and it wasn't until very late in the project, when I was brainstorming names, that I made any connection to the famous Mos Eisley Cantina scene from the original film. I also took some design sensibilities from the retro-futurism aesthetic of the Tomorrowland area at Walt Disney World, which uses a similar color and shape direction that I ended up using in the final designs.

2.5 Related Scholarship

I additionally did some research into stress, which helped to confirm with data what I'd heard colloquially and online in recent years relating to the subject. According to research by Gallup conducted in spring of 2023, 66% of college students in the United States felt stress during much of the day prior to being polled. In the same poll, 51% of college students reported feeling worried the previous day (Hrynowski and Marken). A study conducted by researchers from Fordham University, Stanford University, and the University of California Los Angeles from 2021 supported this, declaring that "Constant stress has become the new normal." (Hoyt et al. 272). Much of the stress was attributed to the then-rampaging COVID-19 pandemic, thought it was noted that 58.7% of college students reported "more than average" or "tremendous" stress in 2019, suggesting the issue has been widespread for some time (Hoyt et al. 270). Based on this recent and ongoing research, I determined that tackling stress in game form could make for an interactive experience that would resonate with more than just myself.

3. Design

When designing the game, I wanted to make sure the gameplay was able to remain at the forefront of the experience, crafted in a way that it'd be easy-to-understand for players. I also wanted to take care not to alienate players with the visual and audio elements, which needed to be developed to complement the gameplay and remain pleasing in their own right. I focused heavily on writing during my academic career, so it was also important to me to be able to incorporate narrative in a satisfying way.

3.1 Gameplay

The gameplay of *Cosmic Canteen* relies heavily on two primary loops: a passive loop, and an active loop. Both loops are crucially intertwined throughout a session of play.

The passive loop begins as soon as the player begins the game. The bar opens and a clock begins, starting the day at 9:00 a.m. sharp. The game will then advance onward, with the minutes increasing every second, until the evening when the day ends. During this time, two other systems are advancing in conjunction with the clock: the stamina system and the passive money system.

Figure 6. A screenshot of the start of a day in the game. Source: Screen capture.

Over the course of the day, the player character will start with 100 stamina but begin to lose it gradually, impeding their ability to work if they run out of stamina by forcing the day to roll over. Normally, however, the rate at which they deplete stamina throughout the day will not cause any issue, however, engagement with the active loop will affect stamina as well.

The other system, the passive money system, ensures that the player will continue to make money regardless of whether or not they engage with the active loop. Throughout the course of a day, the money counter will increase at a faster rate than the clock, ensuring that a constant stream of cash is coming in. While this may initially seem to be a simple way to reach the objective with little effort on the part of the player, they will not be able to attain enough income to win the game using this method alone.
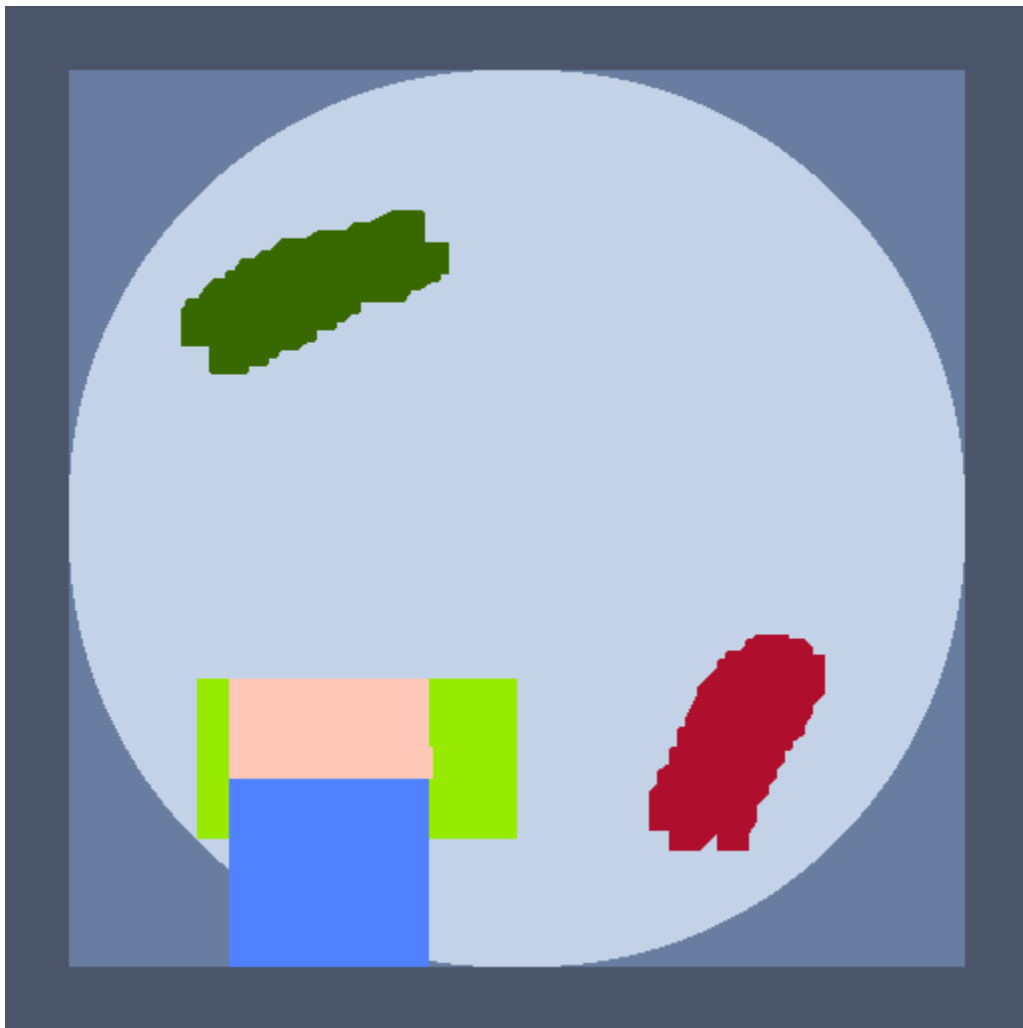

Figure 7. An early mockup for a cleaning minigame that was ultimately not included.

This is where the active loop comes into play. The active loop involves short minigames that can be played around the bar that will result in a larger chunk of money being obtained immediately, but at the cost of a large chunk of stamina being lost, putting the player closer to being out of commission for that day. Multiple minigame concepts were proposed, and eventually one was selected to build out and test before implementing more.
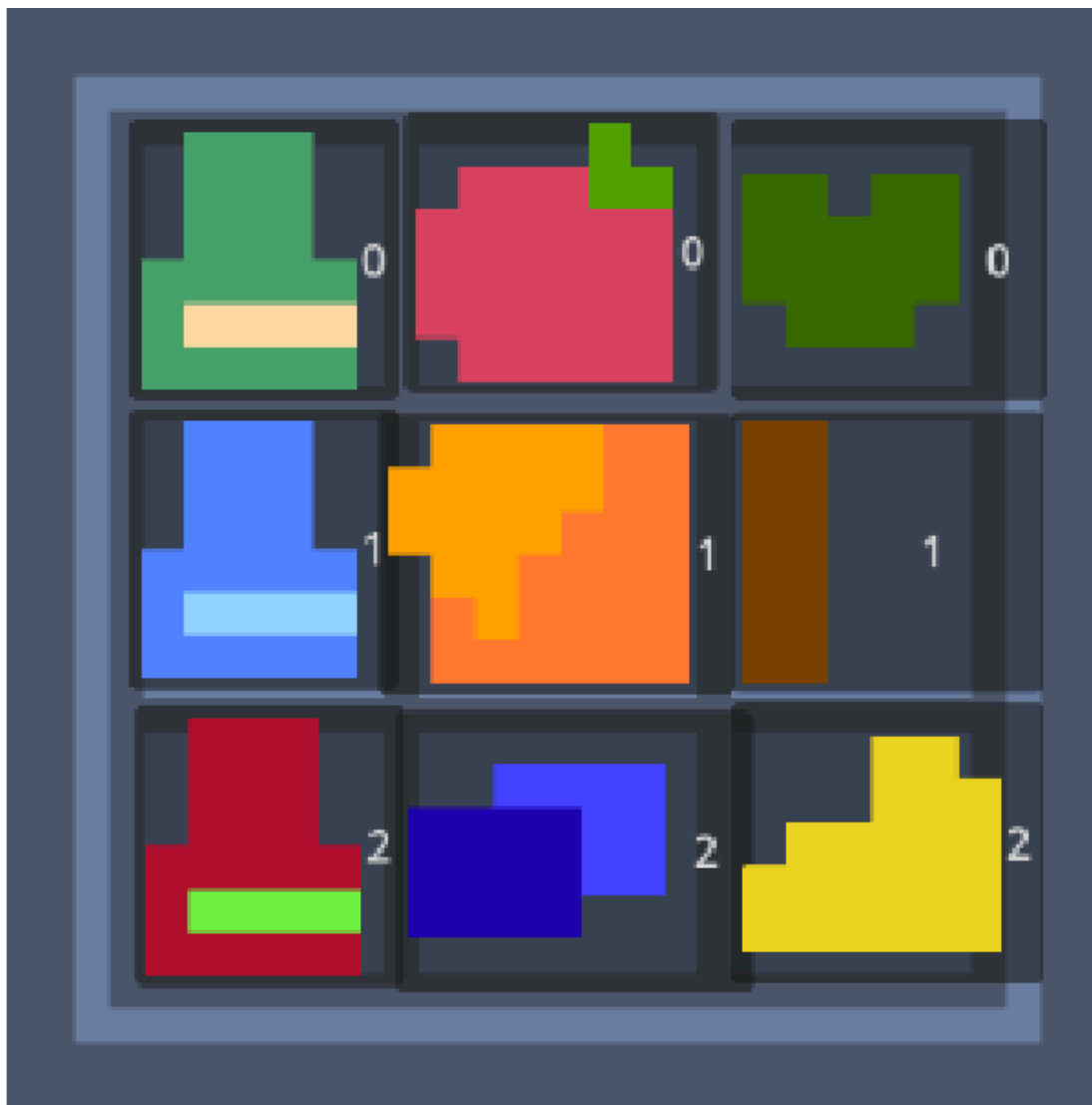

Figure 8. A near-final version of the minigame grid. During this phase of testing, customer orders were replaced with number combinations.

Whenever a customer enters a bar, an exclamation mark appears above their head, indicating they have a minigame the player can play. A small separate window then opens, allowing for the minigame to be played. The minigame involves reading a customer's order and clicking the correct icons to properly make their cocktail. The icons in question are laid out in three separate columns: drink base, fruit, and garnish. As the player plays the minigame, the customer spoken has a chat bubble icon above their heads, in order to differentiate them from any other customers entering the bar. If the player successfully completed the game, their icon changes to a green thumbs-up, the player receives a large increase in their total money, a portion of stamina is instantly be lost, and the customer leaves the bar. If they got an incorrect solution, they are instead met with a red thumbs-down, and the customer leaves.

The player wins the game by reaching a certain monetary milestone before the day limit is up. Should they succeed, they will be met with a congratulatory message and celebratory music, however failure will result in destruction visiting the bar, and a much more ominous tune will play. The game is designed to be short enough that it can be replayed for players seeking to improve their time and strategy, and is also designed so that the benchmarks for money and maximum days could be adjusted.

3.2 Art

Art for the game was developed using Aseprite, an art tool focusing on pixel art that I've used in the past. In wanting to pursue a more minimal and simplified artistic design for this game, I decided that using polygonal shapes and single-color designs for both the characters and environments would be a clear way to keep the game looking simple while also reducing the time needed to create new art assets for the game.
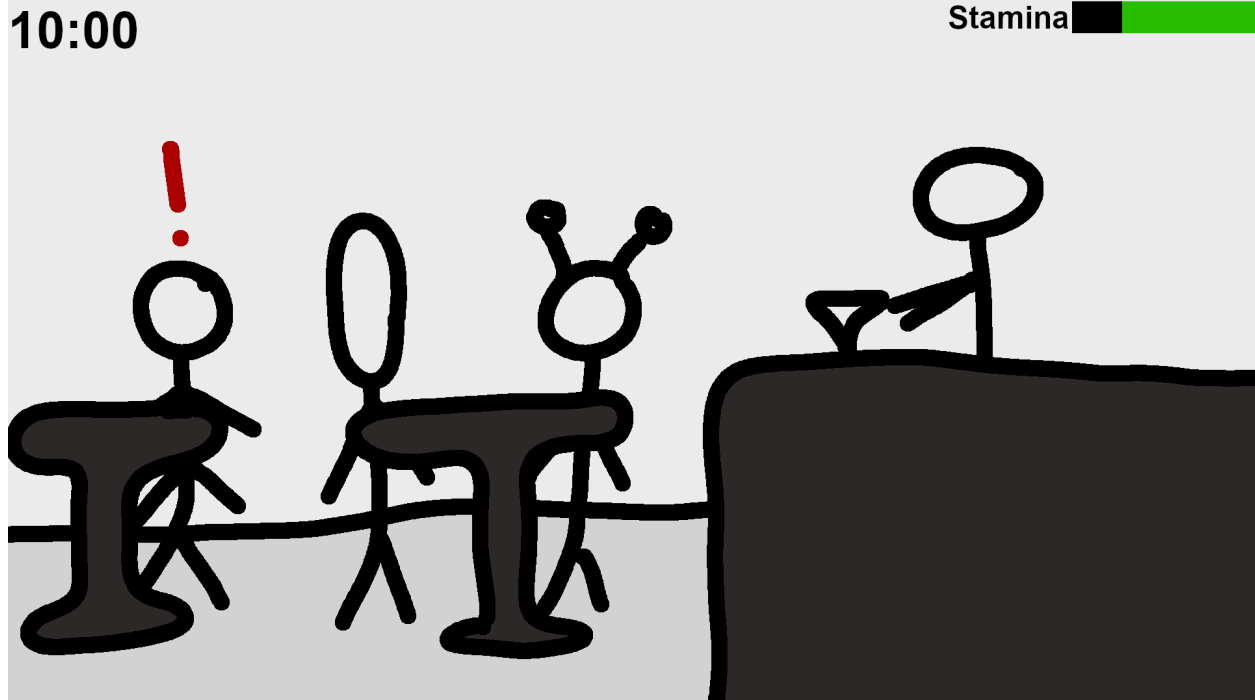
Figure 9. An early mockup of the game that was created shortly after development began.

I'd previously used a more minimal pixel art style in the development of a previous project of mine, *Elderly Esquire*. That game was a visual novel designed as an homage to the *Ace Attorney* series that utilized an art style reminiscent of games found on the original Nintendo Entertainment System, and it helped me become familiar with Aseprite as a tool. For this project, I tested out a few different styles for characters, experimenting with more rounded designs, more details on faces, before ultimately deciding to go with a simplified style devoid of any obvious facial features. In doing so, I was able to streamline the design process for characters by focusing solely on bright colors and easily-to-understand geometric shapes. Additionally, I was able to cut down on the need for facial animation or additional animation frames for characters, instead implementing simple two-frame walking animations to easily and clearly convey character movement.

The main character of the game was never named, but I still wanted to make sure they were distinct in their appearance, as well as sufficiently unique enough so as to fit in with an environment where aliens would be appearing with regularity. I eventually decided to go with the first of these designs, as I felt it would be the most easily understandable at a glance.

Figure 10. Three different designs for the main character.

The designs for the alien patrons all stemmed from modifications of the bar owner himself, with changes made to give them variations in proportions as well as non-human features and complexions in order to give them a recognizably alien appearance. Additionally, making additional alien sprites out of palette swapping existing ones allowed for a quicker expansion of the variety of the bar's patrons.
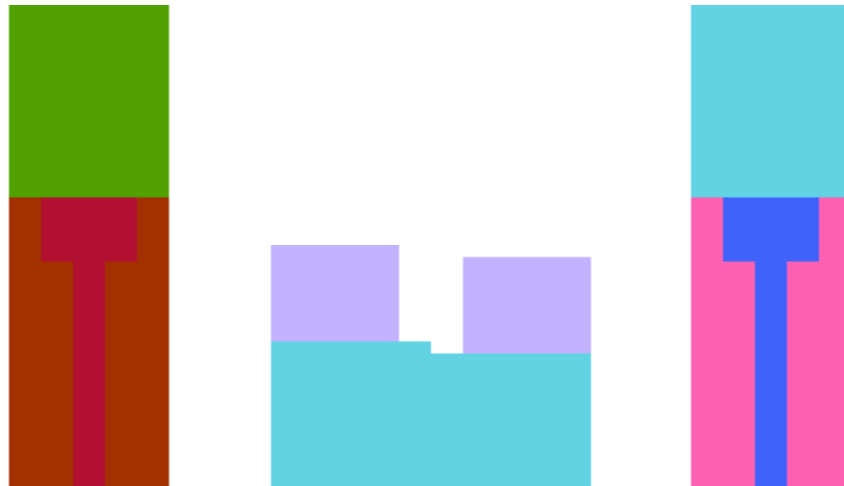

Figure 11. Three of the aliens designed for the game.

The background was inspired primarily by the aforementioned diners found in *Star Wars*, and features a blue-and-gray background, both to complement the black expanse of space behind it, and to match with the attire of the main character. In addition to the background, a bar element was created and placed on the right side for the player to be able to walk behind. Although walking doesn't mechanically serve any function in the game, as the minigames are activated via clicking, I believe it serves to further immerse the player into the game experience.
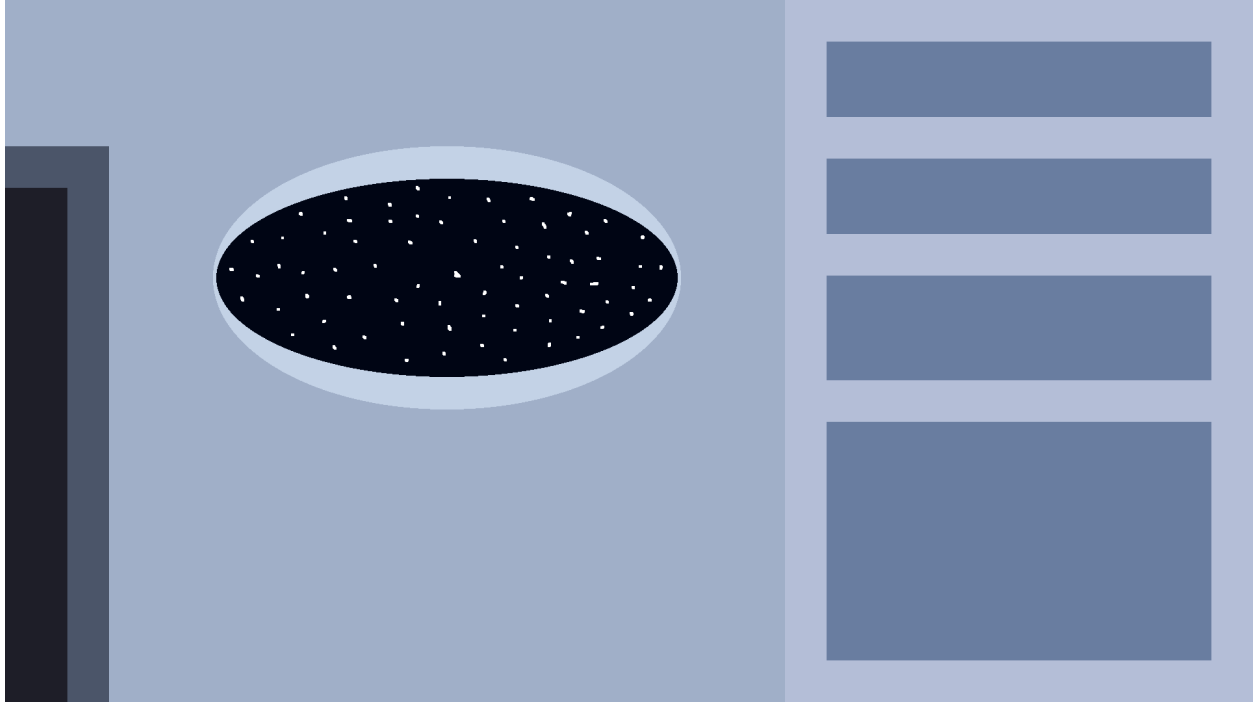
Figure 12. The background of the bar, seen throughout the game.

In sharp contrast to the normal blue tone of the game, as the player gets closer to the deadline, a red filter is applied to immediately convey a sense of danger to the player. Additionally, throughout the game's runtime, the asteroid placed in the background continuously gets larger as it approaches the bar, with a light shaking effect applied to it helping to accentuate the ominous nature of its arrival.

Figure 13. A screenshot of gameplay displaying the red "danger" filter and larger asteroid.
Source: Screen capture.

With regards to the minigame designs, I sought to continue the trend of using simple shapes like those that were utilized in the character designs. I crafted simple icons to represent items like drinks, fruit, and garnishes, items that would be selected during the minigame off a grid that I designed to match the background of the bar. These items were also added to the shelves in the background of the bar in order to increase cohesion between the minigames and the rest of the game.

Figure 14. An example of a drink base, fruit, and garnish from the minigame.

I additionally designed the icons that appear above the head of the customers, though with these icons, I took the liberty of adding an additional black outline around each one. I

believe it was a necessary change that helps the icons to stand out, given their role in activating one of the two core loops of the game.

Figure 15. All four icons that appear over the heads of the customers.

I would be remiss if I didn't mention the sole art element not designed by myself: the font for the game's UI. The font was one called "Lixdu", which was distributed by user "byffoco" on the FontSpace website under a free license.

3.3 Audio

Though I began the project with the original intent of developing all aspects of the project myself, I did have the most wariness about creating original audio assets from the start. While I studied and worked in most aspects of game development during my academic career, audio is the area I had worked in the least. Prior to this project, I'd only taken one course in the subject, a course which I happened to take during the spring of 2020, right after the COVID-19 pandemic hit and WPI went completely virtual with its courses. Through a combination of the amount of time since having taken that course, the difficulty in retaining information from that course due to the global situation at the time, and the lack of practice, outside of occasional testing of VSTs and soundfonts, in the years since, I came to the realization that I needed to bring in someone with more expertise in audio in order to make sure I could even get it into the project at all.

In D-Term, I turned to Daniel Brower, an undergraduate IMGD student studying audio, in order to compose tracks for the game via an independent study. Working with Daniel was a pleasure, and it was great to be able to collaborate creatively with him in order to improve *Cosmic Canteen* in the auditory realm.

Daniel ended up making four full tracks for *Cosmic Canteen*, as well as a variety of sound effects used throughout the game. Chief amongst these was the idle theme found playing throughout, as well as a faster variant for the endgame when the danger filter is turned on. Additionally, he composed separate themes for both the good and bad endings of the game. He also made sounds for customer interaction, money collection, and the minigames. I was thoroughly impressed, and incredibly pleased that not only was I able to help him get a chance to further hone his craft via working on this project, but that the final product as a whole was greatly enhanced.

3.4 Narrative

While the narrative ultimately made up a small part of the development of the project, the roots of it nevertheless were instrumental in informing design decisions throughout. I originally conceived of the plot by trying to think of what a suitable goal for the player to achieve would be, as well as a suitable motive to achieve it. Given the business setting, the answer to the first question was answered rather clearly with a goal of attaining a certain amount of money, but I still needed to figure out the motive for doing so. After settling on the space setting, I thought of dangers that could arise because of the setting, and one of the most prominent was a collision. Meteors and asteroids have long been shown to have destructive power in many works of media, so it would be a threat that would be immediately obvious to the player and one that I would be able to communicate entirely visually. It would also serve as a strong metaphor for the critical underlying theme of the game - stress. I then parlayed this threat of an impending collision into the idea that the player needed to get money to purchase a shield generator - another common element of science fiction media - to keep the bar safe from the impact.

Although I initially envisioned more direct narrative elements in the final product, including conversations with customers and the main character reminiscing on the day's events after closing for the night, I nevertheless was pleased with how I was able to work the narrative in as more of a background element. Often, older games would include background story only in outside material like a game's manual, and although I did not originally set off with this direction in mind, I nevertheless came to see a certain appeal to this simplistic and once widely-used approach.

4. Implementation

When developing the game, I initially looked at the Unity engine after settling on pursuing a 2D game design. I'd used Unity for several 2D game projects in the past, including platformers, point-and-click games, and a platform fighting game, so I certainly felt comfortable enough with both the features and interface of the engine. In addition, given I was planning on programming the project by myself, it was important to me that the engine I chose had a scripting language I was familiar with. Unity uses C# for its scripting, and given I'd taken the programming role on several of the aforementioned projects, I felt it was a strong option to consider.

I was making a final decision in the fall of 2023, when outside circumstances gave me reason to reconsider. On September 12, 2023, Unity announced that it would be making changes to its pricing model, with the proposed change costing developers every time a game developed in Unity was installed. Reaction from the developer community was largely negative, and Unity faced massive backlash at the time. In response to the backlash, Unity made changes to the proposal about a week later, but their initial plan, coupled with the firing of CEO John Riccitiello a few weeks later, did not inspire much confidence in me about the future of Unity as a platform and as a company. To be clear, I had no intention of trying to make a profit off my game, but rather, I felt that if Unity was going through such turmoil, it might benefit me to build my game using a different engine, considering the future of Unity was looking far less certain.

I looked next to Godot, an engine that was getting a lot of attention after the controversy with Unity. Godot primarily utilizes two types of scripting languages: the aforementioned C#, as well as GDScript, a language built specifically for use in Godot. It should be noted, however, that for new users of Godot: both are not necessarily equally viable. GDScript is the far more documented of the two, with complete documentation on Godot's own site as well as plenty of tutorials and instructional content from third-party creators. And while some of this extends to C# as well, it is not to the same magnitude at all. Nevertheless, I initially chose to use C#, out of a belief that I'd be able to channel prior knowledge gained from Unity development and out of a belief that honing my skills in a language used by multiple engines would be of more future benefit than learning one designed only for a single engine.

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Eventually, however, the lack of documentation and my own shortcomings in programming led progress on the game to stall. Without being able to find resources to help me along, it took far longer than I'd hoped to build out only the game's background systems that would support the core loop.

4.1 Code

I initially began developing the game in C#, drawing on both my prior knowledge of the language as well as online resources made for Godot to build out many of the passive systems for the game, providing a strong foundation to build the active systems on.

```csharp
public void NewGame()
{

    var player = GetNode<Player>("Player");
    var startPosition = GetNode<Marker2D>("StartPosition");
    player.Start(startPosition.Position);
    GetNode<Timer>("StartTimer").Start();
    GetNode<CanvasModulate>("Danger").Visible=false;
    GetNode<Sprite2D>("AsteroidFar").Visible=true;
    GetNode<Sprite2D>("AsteroidClose").Visible=false;

    var hud = GetNode<HUD>("HUD");
    hud.ShowMessage("Open for Business!");
}
```

Figure 16. The NewGame() function started up the game in Main.cs. Source: Code sample.

This version of the project primarily ran on four C# scripts. Player was the simplest, used only to control the movement of the player character across the screen. The Main script was used for starting up the game, and passing information to the HUD script. The HUD, meanwhile, was responsible for updating the Score, Stamina, Time, and Day values using information it gleaned from the final script, the Clock script.

```csharp
public void UpdateScore(long moneyValue)
{
    GetNode<Label>("ScoreLabel").Text = ("$"+ moneyValue.ToString());
}
public void UpdateStamina(long staminaValue)
{
    //GetNode<Label>("StaminaLabel").Text = (staminaValue.ToString()+"/100");
    GetNode<ProgressBar>("StaminaBar").Value = staminaValue;
}
public void UpdateTime(long day, long hour, long minute)
{


    GetNode<Label>("DayLabel").Text = ("Day "+(day+1).ToString());
    if(hour<12){
        GetNode<Label>("TimeLabel").Text = string.Format("{0:00}:{1:00} AM", hour, minute);
    }
    else if(hour==12){
        GetNode<Label>("TimeLabel").Text = string.Format("{0:00}:{1:00} PM", hour, minute);
    }
    else if(hour>12){
        GetNode<Label>("TimeLabel").Text = string.Format("{0:00}:{1:00} PM", (hour-12), minute);
    }



}

public void DayCheck(long day)
{
    if ((day+1)>=2){
        EmitSignal(SignalName.Tint);
    }
    if (((day+1)==3)){
        ShowGameOver();
    }
}
```

Figure 17. The methods in HUD.cs for updating the Score, Stamina, Time, and Day. Source: Code sample

I was most pleased with how I set up the Clock script, which worked to take the seconds since the game started and calculate the current day and time from that. Initially, the biggest struggle I faced was in figuring out how to make sure the time could jump ahead at the start of a new day to 9:00 a.m., rather than simply starting from 12:00 a.m. or resetting earlier on each consecutive day. I was not only eventually able to solve this problem, but made a section of the code where I was able to adjust the rates of all values in order to tweak them during testing.

```
        //The crucial code to adjust for the timing is right here
        currentDayMinutes=currentDayMinutes+0.01;
        staminaValue=staminaValue-0.01;
        moneyValue=moneyValue+0.01;
        //currentDayMinutes=currentDayMinutes+1;
        if(staminaValue<1){
            currentDayMinutes=1440;
        }

        if(currentDayMinutes==1440){
            day++;
            //currentDayMinutes=0;
            currentDayMinutes=540;
            staminaValue=100.0;
        }

        int hour = Convert.ToInt32(currentDayMinutes/MINUTES_PER_HOUR);
        int minute = Convert.ToInt32(currentDayMinutes%MINUTES_PER_HOUR);

        if(pastMinute != minute){
            pastMinute=minute;
            EmitSignal(SignalName.TimeTick, day, hour, minute);
            EmitSignal(SignalName.StaminaDrop, staminaValue);
            EmitSignal(SignalName.PassiveMoney, moneyValue);
            EmitSignal(SignalName.DayCheck, day);
        }

        //GD.Print("TM: " + totalMinutes + " CDM: " +currentDayMinutes);
        //GD.Print("Day: "+ (day+1) + " CDM: " +currentDayMinutes);


    }
    public void TaskComplete(){
        moneyValue=moneyValue+1.00;
        staminaValue=staminaValue-0.10;
    }
}
```

Figure 18. Part of the Clock.cs script, which sets the rates for all major values in addition to converting the time into hours and minutes. Source: Code sample

Despite this, however, I struggled immensely with implementing the more active elements of the game, such as minigames and customers. With so much else on the project that required my attention, I brought in another independent study student, undergraduate IMGD and CS double major Bashar Alqassar, to assist on the project in D-Term. Bashar had developed in GDScript before, so I was confident that he would be of great assistance as the project headed for its final stages.

The first major change Bashar implemented was converting all existing code from C# to GDScript. This was a huge change, and one that we discussed at length. I was initially unsure, as it felt like I would be tossing much of my existing work. However, given the new scripts would ultimately still be using my gameplay design, and Bashar's track record with using GDScript in Godot, I decided it was the right decision to go forward with.

```gdscript
func new_game():

    var player = $Player
    var startPosition = $StartPosition

    player.start(startPosition.position)

    $StartTimer.start();
    $Danger.visible = false;
    $AsteroidFar.visible = true;
    #$AsteroidClose.visible = false;

    var hud = get_node("HUD")
    hud.show_message("Open for Business!")
```

Figure 19. The new_game() function of Main.gd. Source: Code sample.

This ultimately proved to be the right call. Figure 19 shows just how effective this is, as it features the same function from Figure 16, only more concisely written in GDScript. It was a bit of a rocky road converting, as functions did not always translate one-to-one, and it required communication between myself and Bashar in order to illustrate how certain features were supposed to work. After it was finished, however, it led to a massive increase in pace on the coding side of the project, something I was very pleased by.

```gdscript
extends Marker2D



var customer = preload("res://scenes/Customer.tscn")
@export var spawnDelay = 10; #In secconds


func _ready():
    spawnCustomer()



func _process(delta):
    pass



func spawnCustomer():
    var newCustomer = customer.instantiate()
    add_child(newCustomer)



func _on_spawn_timer_timeout():
    spawnCustomer()
    $SpawnTimer.start(spawnDelay)
```

Figure 20. customer_spawner.gd handles customer generation. Source: Code sample.

Bashar was able to pick up where I left off on the two pieces I didn't manage to crack on the C# side: the customers and the minigames. The customers are now spawned via customer_spawner, as seen in Figure 20, which spawns new character objects into the scene. Those customers are handled in their own script, which manages their movement via simple AI, controls their exit, and determines when they have a minigame available.

```gdscript
func player_win():

    GScoreData.moneyValue += reward_money
    emit_signal("add_money", reward_money)
    parent_customer.get_node("ChatDetectionArea/AnimationPlayer").play("win_minigame")

    end_minigame()


func player_lose():

    parent_customer.get_node("ChatDetectionArea/AnimationPlayer").play("lose_minigame")
    end_minigame()


func end_minigame():
    minigame_box_animation.play("close_minigame")
    GScoreData.staminaValue -= stamina_cost

    #Send Signal to parent
    parent_customer.minigameEnd.emit()


#Called at the end of the closing minigame animation
func close_minigame():
    #Remove this
    self.queue_free()
```

Figure 21. generic_minigame.gd sets up a blueprint for additional minigame implementation.
Source: Code sample.

With regards to the minigames, Bashar worked to standardize how they could be implemented so that a template was there to build future additional minigames on. Figure 21 demonstrates how all the vital elements for setup in a minigame, such as adding the reward

27

money for completion or determining when a minigame can end, can be arranged via abstraction in order to develop future games.

It was a pleasure to work with Bashar as well, and his insight as well as design input was quite valuable in managing the latter stages of this project. I'm confident that the project would not have been in half as good of a state as it was had he not joined it, and I was very impressed by the quality of his work throughout the development process.

5. Evaluation

This project had the opportunity to be formally tested three times during the course of development, in two self-run playtesting sessions in addition to a session run during the IMGD department's Playtest-O-Rama Colloquium.

5.1 Methodology

Informal testing took place on two occasions during the late fall of 2023 prior to IRB approval. Participants were shown early concept documents and builds of the game that featured limited interactivity. I wrote down any notable observations I saw and any feedback that was volunteered by the players, but the players were not given any form of survey instrument.

Formal testing took place during several different sessions held during the late winter and early spring of 2024. All formalized testing took place in accordance with WPI's Institutional Review Board (IRB)'s policies on human subject research. I completed the CITI training course as required by the IRB to familiarize myself with all necessary protocols to ensure that all testing would be conducted in a fair manner, and in a manner that was safe for all participants.

Formalized testing sessions took place on set dates on WPI's campus. Participants in these sessions were asked to sign an Informed Consent Agreement, approved by the IRB, that detailed how the testing would be structured, the rights they had as participants, as well as any risks that the participants would face. Following testing of the game, participants were offered the opportunity to complete a post-test survey to give feedback on the in-development build. The surveys included questions in the checkbox and Likert scale formats, with the latter formatted to present participants with a statement related to the game before asking if they agreed with its contents. Participants were asked how much they agreed with the presented statement on the

scale, with a "1" indicating they strongly disagreed, and "5" indicated they strongly agreed. A complete copy of the Informed Consent Agreement can be found in Appendix 1, while the February, March, and April testing instruments can be found in the Appendices 2, 3, and 4, respectively.

5.2 Early Feedback

When the project was still in the early stages, I took a rudimentary game design document and an early mockup, as seen in Figure 9, to IMGD's Protofest on October 4, 2023, in order to gauge some early feedback via informal canvassing. I was pleased to hear a lot of positive reception to the nascent concepts, and found it useful to hear what other games attendees found the concept to be similar to. These included games like *Papa's Burgeria*, and *VA-11 Hall-A*, which I later included as options in future survey instruments as a result.

At IMGD's Alphafest on November 17, 2024, I once again conducted informal canvassing, this time with a very early build that contained nothing but the passive money counter and clock implemented. I once again received positive feedback, with some attendees noting how they liked how it, at that stage, "played itself."

One interesting note is that the game for most of its early life throughout testing was known as *Untitled Space Bar Game* or *Space Bar Game*. While I'd initially given it this title based on the setting and concept, it did result in some amusing confusion, as many testers assumed the name might refer to the prominent key of the same name found on keyboards. I even implemented this myself in a later build in order to test the accruement of money from minigames before the minigames themselves were implemented, but the space bar ultimately was not used to control the final game.

5.3 February Playtesting

My first formal playtesting session was conducted on February 28, 2024. The build at this stage was in an early state, with little interactive functionality implemented at the time of testing.

Testing initially began in a rough state, as an unexpected issue with building on the project on the computer used for testing meant that the first two playtesters of the total 6 respondents - a small number in its own right - played a build with some broken features before I

was able to pinpoint the issue and quickly fix it prior to other playtesters arriving. As such, the data did end up segmented and basic given the number of respondents, but nevertheless, still proved to be helpful at an earlier stage.

Please indicate how much you agree with the following statement: "I understood the game's theme's clearly."
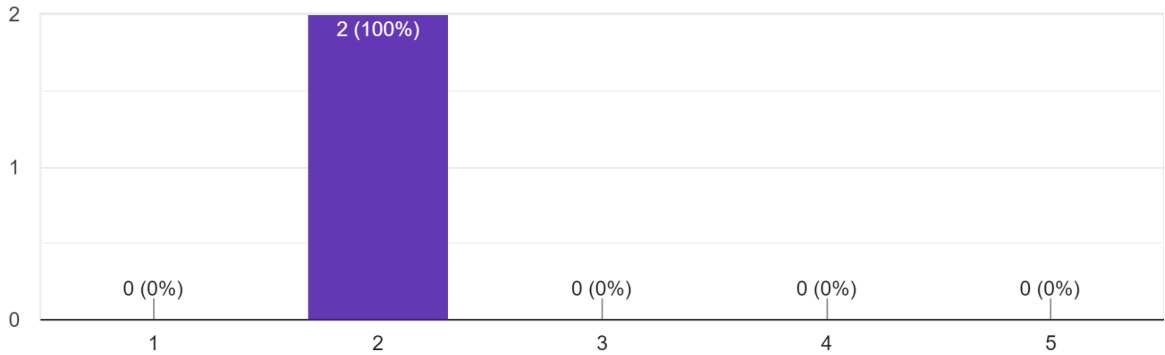2 responses

Figure 22. Survey responses (pre-fix) on how clear the game's theme was to the participants.

Please indicate how much you agree with the following statement: "I understood the game's theme's clearly."
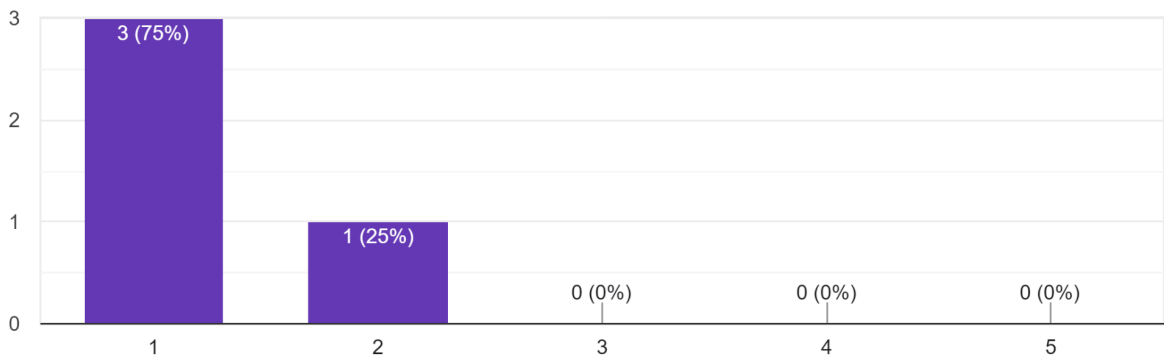4 responses

Figure 23. Survey responses (post-fix) on how clear the game's theme was to the participants.

As seen in Figures 22-23, at such an early stage, the themes and direction of the game still seemed to be unclear to players. Despite this, there was still a great deal of good information to be gleaned from the testing. In particular, I was able to get information on what the testers would prefer to see in future iterations of the project. Notably, as shown in Figures 24-25, the idea of including minigames and interaction with characters garnered strong support in both iterations of the survey, even in light of an errant "Option 4" being mistakenly included as an option in both iterations of the survey.

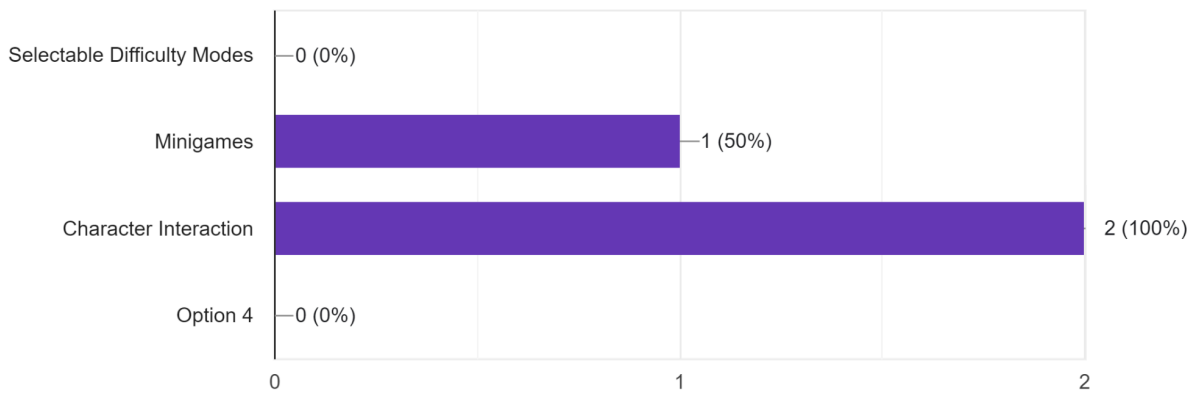Would you like to see any of the following features implemented into the game?
2 responses

Figure 24. Survey responses (pre-fix) on which of a list of then-planned features the participants were most interested in seeing included.

Would you like to see any of the following features implemented into the game?
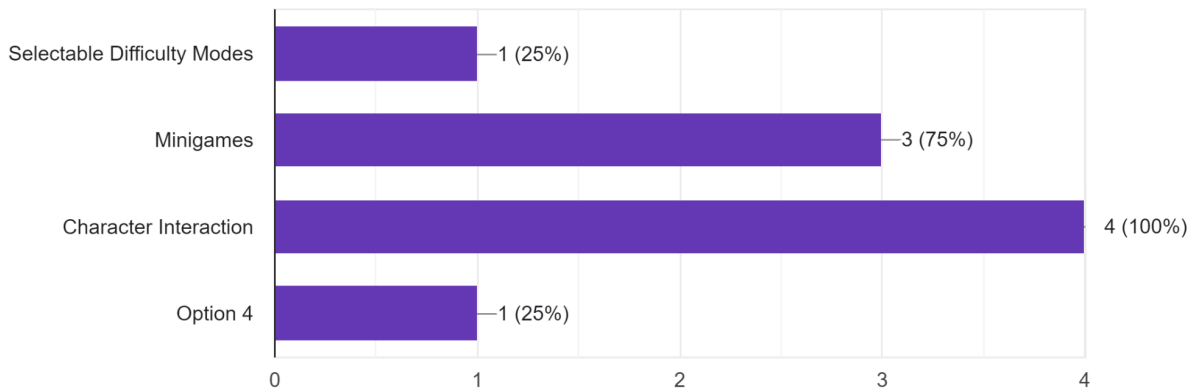4 responses

Figure 25. Survey responses (post-fix) on which of a list of then-planned features the participants were most interested in seeing included.

5.4 March Playtesting

A second playtesting session occurred on March 28, 2024. As a result of changes that occurred behind-the-scenes of the project, as well as a break in the academic year, the build that was tested was largely the same as the one used in the previous testing session.

Only 2 playtesters participated in this session, so while the pool of data was not particularly large, I did use it in conjunction with the data from the previous month to see that a lot of the opinions of testers remained consistent. I knew that I'd barely be able to get much usable data from the session as a result of low participation, but I at least wanted to be sure nothing was drastically different in the opinions found here than were previously discovered. For example, as shown in Figure 26, there was still a strong desire to see minigames and character interaction implemented. Conversely, there was barely any interest between the two sessions in seeing selectable difficulty modes as a feature. At the time, I had begun working with Bashar on discussing features, and as a result of the testing feedback, I placed the difficulty modes lower on a list of priorities we determined at the start of the term.

Would you like to see any of the following features implemented into the game?
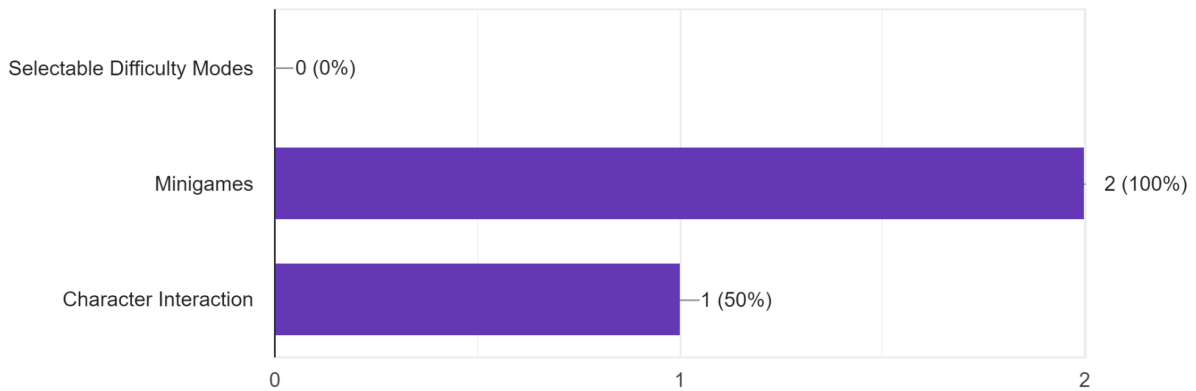2 responses

Figure 26. Survey responses on which of a list of then-planned features the participants were most interested in seeing included.

Additionally, I took the opportunity to see how participants felt about a number of potential final names for the project. I brainstormed a list of 9 different potential names - all referencing the prominent meteor and the impending destruction in some fashion - and presented them to playtesters for feedback. Unfortunately, due to the low, even number of participants, I only received interest in 2 of the names, with 1 participant each expressing interest, as depicted by Figure 27. Although the names "Meteor Misfortune" and "Meteor Meltdown" still felt like strong names, and I grew more fond of "Meteor Misfortune" after the participant pointed out that the "fortune" part of the word "misfortune" could refer to the money-making objective, after further discussion with my advisors, I decided to continue brainstorming names in hope of choosing one that more clearly communicated the bar aspects of the title to the player.

Which of these names, if any, do you feel best fits the game after playing it?
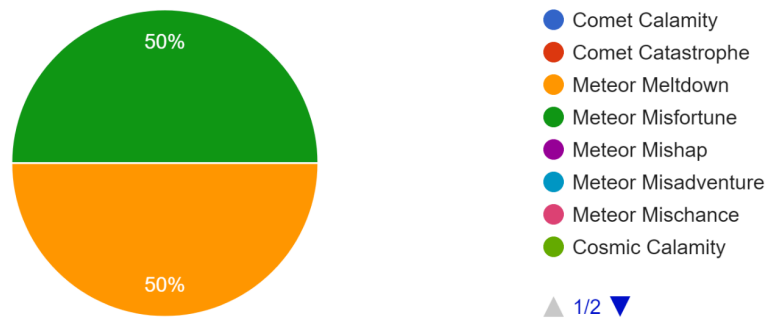2 responses

- Comet Calamity
- Comet Catastrophe
- Meteor Meltdown
- Meteor Misfortune
- Meteor Mishap
- Meteor Misadventure
- Meteor Mischance
- Cosmic Calamity

▲ 1/2 ▼

Figure 27. Survey responses on which of a list of then-potential names for the game the participants felt best fit the game as they experienced it.

5.5 April Playtesting

While a third playtesting session was initially scheduled for April 5, 2024, it failed to garner any student volunteers, and thus, no data was collected at that time. Following this, more testing occurred on April 10, 2024, during a Playtesting Colloquium organized by the IMGD Community Committee, during which I had five playtesters try out the game. While this was still a smaller number than I'd hoped for, and still led to much more simple conclusions, I was still thankfully able to notice some positive trends in my data.

Given I'd by this point made massive additions to the game, I made larger adjustments to my survey instruments in advance of the testing session. I wanted to make sure that I was accurately gauging playtester reactions and seeing which aspects of the game they felt the most positively about, in order to make sure that we were prioritizing the elements of the game that seemed to be working the best. Because the end-of-year IMGD Showfest was fast approaching, we wanted to make sure that we used our time most effectively in the two weeks we had remaining in the term.

Please indicate how much you agree with the following statement: "I understood the game's theme's clearly."
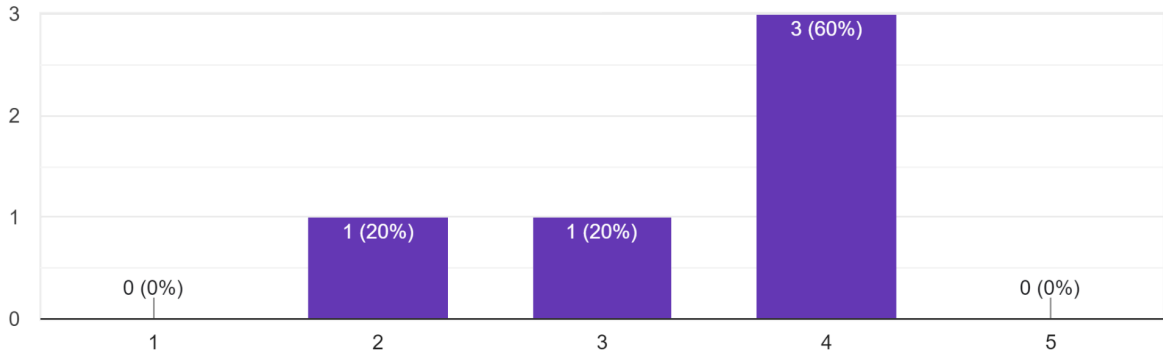
5 responses

Figure 28. Survey responses on how clear the game's theme was to the participants.

When compared to my earlier survey in February, I was pleased to see that the theme of the game appeared to have become more clearly understood by playtesters, as shown in Figure 28, with a majority now saying they understood the theme clearly. I was also pleased to see that the UI elements were positively well-received, as seen in Figure 29.

Please indicate how much you agree with the following statement: "I found the UI elements well-integrated."
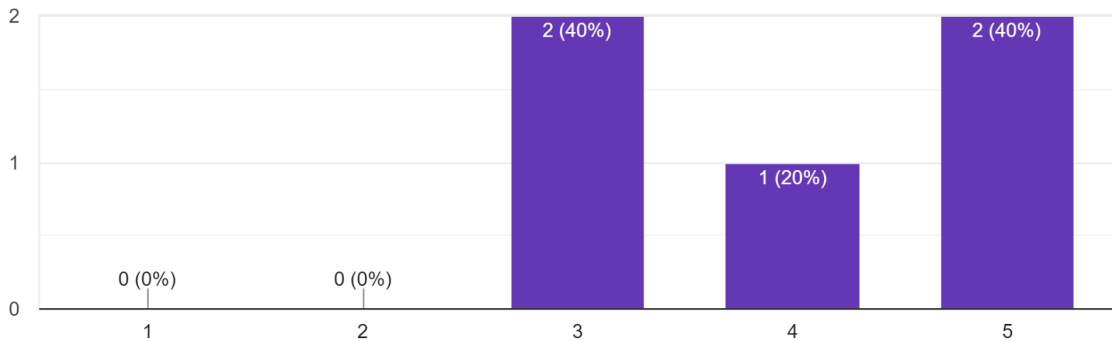
5 responses

Figure 29. Survey responses on how well-integrated the participants found the UI elements.

Unfortunately, the timed element of the game was not having as large of an impact on players as I'd thought it might, as over 50% of participants did not agree that the timed element greatly impacted how they approached the gameplay, as depicted in Figure 30.

Please indicate how much you agree with the following statement: "The timed element greatly impacted how I approached the gameplay."
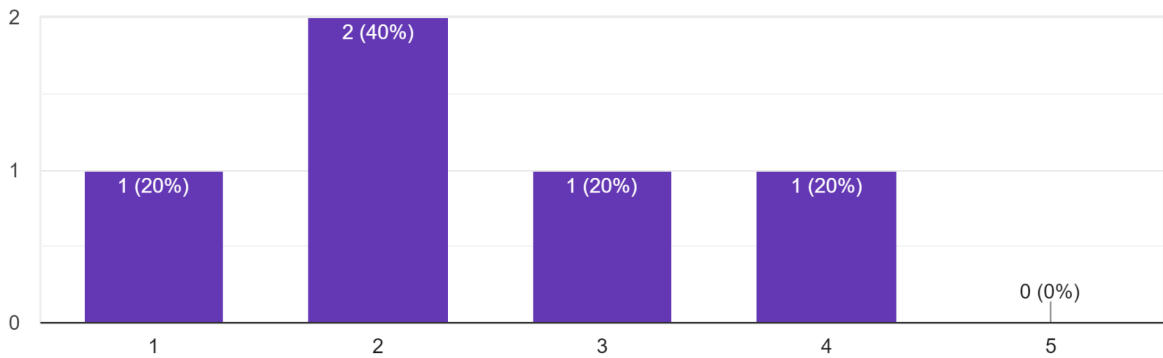5 responses

Figure 30. Survey responses on how much the timed element impacted how players approached the gameplay.

I also received several comments on the need for clearer feedback during the minigame portion. Participants seemed less sure about the impact of failing a minigame, and there seemed to be a need for further visual and audio feedback in order to make sure the game was clear for players. After this session, I created the visual icons seen in Figure 15, as well as worked with Daniel to implement more audio feedback pertaining to player success and failure.

Would you like to see any of the following features in the game expanded?
4 responses
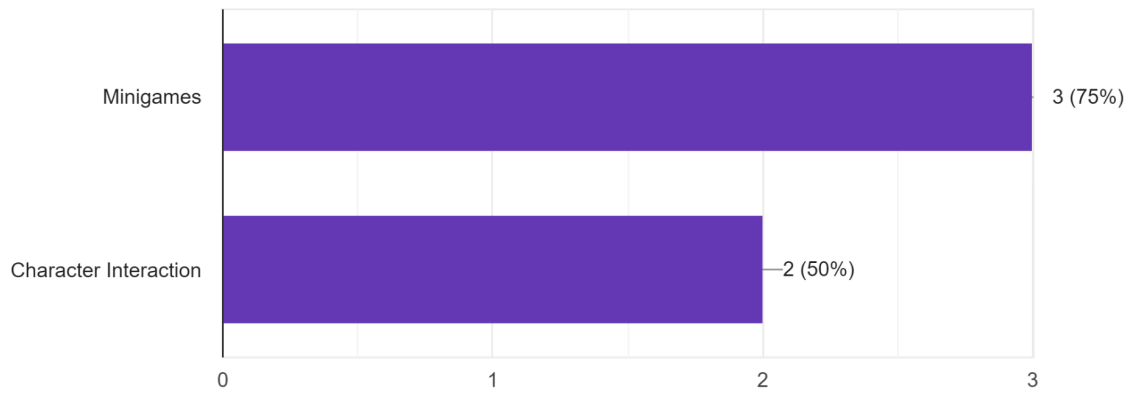
Figure 31. Survey responses on which current features the participants would want to see
expanded.

With regards to the future of the game's development, I heard from participants both on what currently-implemented features they wanted to see expanded, as well as which proposed features they most wanted to see included in the game. As seen in Figure 31, the minigames were the most requested to be expanded, while there was also a healthy interest in increased character interaction.

Would you like to see any of the following features implemented into the game?
5 responses
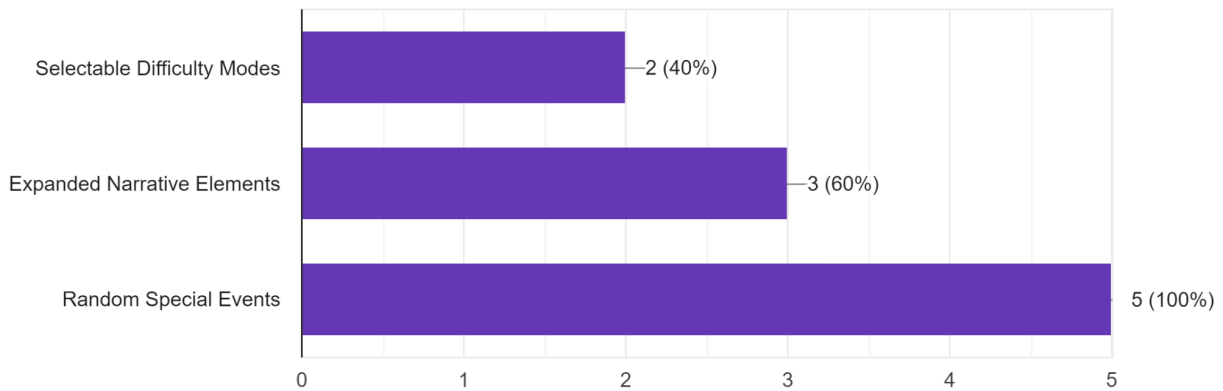

Figure 32. Survey responses on which proposed features the participants would want to see implemented into the game.

Participants also responded strongly to an idea I'd conceived early in development, but since put on hold: random special events. The concept was that, on certain days in the bar, something unexpected might happen, like a real estate agent offering to buy out the bar, or the power going out. By this point in testing, it was clear that this feature and the others shown in Figure 32 would not be implemented with the time we had left, but I was pleased at the feedback, given it gave a clearer roadmap for where to take the game in the event I wished to expand on it in the future.

6. Conclusion

Cosmic Canteen turned out to be a very rewarding project. In a relatively-short span of about eight months, I was able to craft a vision for a project that explored a prominent and impactful theme in my own life, before bringing that vision to life. I believe that not only was I strengthened in individual crafts, such as art or coding, but overall as a creative game developer. Above all, I am perhaps most pleased with how I was able to conceptualize an idea and carry it through to the finish line without compromising much of that initial concept. It certainly led to a lot of introspection, and though my mental health is in a much better place than it's been at other times in my college career, I certainly had to keep reminding myself to keep pushing forward with development. Making a project like this as a solo developer was not easy, and I certainly came out of this with an even stronger respect for independent developers who do this regularly.

That isn't to say there aren't areas I wish I could've done things differently. It wasn't as grand a project as I initially hoped it might be, and there were certainly a fair amount of stumbling blocks. Despite my initial intent, I wasn't able to make a game where I solely crafted every element, nor was I able to deeply explore stress as much as I would've liked. Often times, I felt as if I was experiencing more stress in developing the game than was actually reflected in the game, and playtest data seemed to show more player stress coming from confusion rather than as a result of intentional design. I also absolutely wish I'd sought out help, especially with regards to the coding, earlier in the process, and perhaps it even would've been best had I begun the project with a programmer from the start, leaving me free to focus solely on the design.

Additionally, I certainly wish I'd have been able to manage my time better in order to fit more into the game. Plenty of features from early in development that I was fond of unfortunately ended up being cut, most prominently, more overt narrative elements. I had planned to include more direct narrative elements, such as the main character's pride in the bar, in order to explain why this was the route the player must take, as opposed to simply moving to another location. I'd certainly like to include more direct narrative elements in *Cosmic Canteen* if I have the opportunity to revisit the project in the future, but I'm nonetheless pleased with how, with how it influenced all aspects of the game's direction, it still made its way into the final release. Originally, multiple minigames were also planned for development, however as we went on, eventually we decided to focus on including one singular polished game, though reworking

the code to a template-based structured helped to leave the door open to include more in the future should we wish.

The previously mentioned random events were also scrapped, as was difficulty selection, which would've provided set benchmarks for these statistics in order to make the game easier or more challenging. All are still features I'd like to take a look at in the future if given the opportunity.

However, if there's one lesson I've learned from the development of this project, and indeed, the one lesson that can probably sum up my entire academic career at WPI, it's that constantly looking back at the "what-if?" scenarios and constantly questioning your own decisions will be absolutely maddening. I am overall pleased with how *Cosmic Canteen* turned out. There's a lot I wish happened differently, both throughout my academic career as a whole and this project in particular. But there's nothing I can do about it. I've learned that all we can do as people is play the hand we've been dealt, work with the limits we've set for ourselves and the choices we've made, and move forward. Wrestling constantly with the past can be our own personal asteroids if we let it: it will loom over us unceasingly until we're crushed by the weight of it. But maybe, if we look to the future, then just like the protagonist of this little game, we can ensure that a new day does indeed dawn.

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Appendices

Appendix 1: IRB Informed Consent Agreement

Informed Consent Agreement for Participation in a Research Study

Investigator: Daniel Enriquez, Ben Schneider, Karen Stewart

Contact Information: djenriquez@wpi.edu, bschneider@wpi.edu, kstewart3@wpi.edu

Title of Research Study: Exploring Stress in Time-Focused Interactive Experiences

Introduction: You are being asked to participate in a research study. Before you agree, however, you must be fully informed about the purpose of the study, the procedures to be followed, and any benefits, risks or discomfort that you may experience as a result of your participation. This form presents information about the study so that you may make a fully informed decision regarding your participation.

Purpose of the study: This study will collect feedback on the project in development in order to make future improvements and find any critical errors that may need fixing.

Procedures to be followed: You will play a short demonstration of an in-development game project, after which you will be asked to fill out a short survey asking for your reflections and feedback.

Risks to study participants: There are no reasonably foreseeable risks or discomfort involved in this study.

Benefits to research participants and others: You will be able to assist in an in-development project and enjoy an early build of the game, and give feedback which can improve the game in the future.

Record keeping and confidentiality: Records of your participation in this study will be held confidential so far as permitted by law. However, the study investigators, the sponsor or it's designee and, under certain circumstances, the Worcester Polytechnic Institute Institutional Review Board (WPI IRB) will be

able to inspect and have access to confidential data that identify you by name. Any publication or presentation of the data will not identify you.

Compensation or treatment in the event of injury: There are no reasonably foreseeable risks or discomfort involved in this study, however you do not give up any of your legal rights by signing this statement.

For more information about this research or about the rights of research participants, or in case of research-related injury, contact those listed in the contact section at the top of this form. For additional questions, contact WPI IRB Manager Ruth McKeogh (Tel. 508-831-6699, Email: irb@wpi.edu) and WPI Human Protection Administrator Gabriel Johnson (Tel. 508-831-4989, Email: gjohnson@wpi.edu).

Your participation in this research is voluntary. Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty or loss of other benefits. The project investigators retain the right to cancel or postpone the experimental procedures at any time they see fit.

By signing below, you acknowledge that you have been informed about and consent to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before signing. You are entitled to retain a copy of this consent agreement.

Appendix 2: February Survey Instrument

1. Did the mechanics in this game remind you of those in any of the following games? Please check all that apply. (Checkboxes)
   a. Pikmin
   b. Among Us
   c. Restaurant Simulation titles (Ex.Papa's Pizzeria, Diner Dash, Cake Mania)
   d. VA-11 Hall-A

2. Please indicate how much you agree with the following statement: "The core gameplay loop was satisfying to play"

       [Likert Scale 1-5]   1=Strongly Disagree | 5=Strongly Agree

3. Please indicate how much you agree with the following statement: "I understood the game's theme's clearly."

       [Likert Scale 1-5]   1=Strongly Disagree | 5=Strongly Agree

4. Please indicate how much you agree with the following statement: "The timed element greatly impacted how I approached the gameplay."

       [Likert Scale 1-5]   1=Strongly Disagree | 5=Strongly Agree

5. Please indicate how much you agree with the following statement: "I found the UI elements well-integrated."

       [Likert Scale 1-5]   1=Strongly Disagree | 5=Strongly Agree

6. Would you like to see any of the following features implemented into the game? (Checkboxes)
   a. Selectable Difficulty Modes
   b. Minigames
   c. Character Interaction
   d. Option 4

7. Please add any additional comments or suggestions here. (Short Answer)

Appendix 3: March Survey Instrument

1. Did the mechanics in this game remind you of those in any of the following games? Please check all that apply. (Checkboxes)
   a. Pikmin
   b. Among Us
   c. Restaurant Simulation titles (Ex.Papa's Pizzeria, Diner Dash, Cake Mania)
   d. VA-11 Hall-A

2. Please indicate how much you agree with the following statement: "The core gameplay loop was satisfying to play"

       [Likert Scale 1-5]   1=Strongly Disagree | 5=Strongly Agree

3. Please indicate how much you agree with the following statement: "I understood the game's theme's clearly."

    [Likert Scale 1-5]   1=Strongly Disagree | 5=Strongly Agree

4. Please indicate how much you agree with the following statement: "The timed element greatly impacted how I approached the gameplay."

    [Likert Scale 1-5]   1=Strongly Disagree | 5=Strongly Agree

5. Please indicate how much you agree with the following statement: "I found the UI elements well-integrated."

    [Likert Scale 1-5]   1=Strongly Disagree | 5=Strongly Agree

6. Would you like to see any of the following features implemented into the game? (Checkboxes)

    a. Selectable Difficulty Modes
    b. Minigames
    c. Character Interaction

7. Which of these names, if any, do you feel best fits the game after playing it? (Multiple Choice)

    a. Comet Calamity
    b. Comet Catastrophe
    c. Meteor Meltdown
    d. Meteor Misfortune
    e. Meteor Mishap
    f. Meteor Misadventure
    g. Meteor Mischance
    h. Cosmic Calamity
    i. Asteroid Anarchy
    j. N/A

8. Please add any additional comments or suggestions here. (Short Answer)

Appendix 4: April Survey Instrument

1. Did the mechanics in this game remind you of those in any of the following games? Please check all that apply. (Checkboxes)
   a. Pikmin
   b. Among Us
   c. Restaurant Simulation titles (Ex.Papa's Pizzeria, Diner Dash, Cake Mania)
   d. VA-11 Hall-A

2. Please indicate how much you agree with the following statement: "The core gameplay loop was satisfying to play"
   a. [Likert Scale 1-5]   1=Strongly Disagree | 5=Strongly Agree

3. Please indicate how much you agree with the following statement: "I understood the game's theme's clearly."
   a. [Likert Scale 1-5]   1=Strongly Disagree | 5=Strongly Agree

4. Please indicate how much you agree with the following statement: "The timed element greatly impacted how I approached the gameplay."
   a. [Likert Scale 1-5]   1=Strongly Disagree | 5=Strongly Agree

5. Please indicate how much you agree with the following statement: "I found the UI elements well-integrated."
   a. [Likert Scale 1-5]   1=Strongly Disagree | 5=Strongly Agree

6. Would you like to see any of the following features implemented into the game? (Checkboxes)
   a. Selectable Difficulty Modes
   b. Expanded Narrative Elements
   c. Random Special Events

7. Would you like to see any of the following features in the game expanded? (Checkboxes)
   a. Minigames
   b. Character Interaction

8. Which of these names, if any, do you feel best fits the game after playing it? (Multiple Choice)
   a. Comet Calamity

b. Cosmic Canteen

c. Doomed Diner

d. Space Bar Game

e. Space Saloon

f. Stardust Saloon

g. Stardust Speakeasy

9. Please add any additional comments or suggestions here. (Short Answer)