**Final Progress Report**

**Team Name:** ZenScape

**Team Members and Roles:**

**Sadie Forbes** - Game Integration Developer
**Bryce Olivier** - Game Design and Development
**Harrison Juneau** - Physical Computing Specialist
**Preston Schnell** - Lead Art and Asset Designer
**Zavien Kellum** - Art and Game Design
**Madelyn Zambiasi** - Storyboard and Asset Designer

**Goal:** *"Train users to improve task management skills in environments filled with sensory distractions."*

**MVP:**

ZenScape is an experience that helps users train task management in a VR office space, providing cognitive tasks for the user to complete amidst a variety of sensory distractions. The experience is affected by the user's heart rate, which controls the difficulty of distractions. The choice to include a pulse sensor to monitor heart rate is intentional, as we found that heart rate is a good indication of cognitive load; and cognitive load directly affects one's ability to manage tasks.

**Implementation Vehicle:**

ZenScape has been successfully implemented using Virtual Reality (VR) and Physical Computing as the primary vehicles. We have continued to work with Unity, our chosen game engine, to create an immersive and realistic VR experience. Through VR, we created a highly interactive environment by simulating fine motor skills and providing realistic auditory and visual feedback to users throughout their tasks and distractions. The advantage of utilizing VR technology in this context is its ability to engage multiple senses simultaneously, adding to the immersion of the project.

**VR Experience:**

ZenScape's user experience is its most important functionality. The VR controllers have been designed to mirror the user's hand movements and gestures within the virtual space, allowing the user to pinch or grip objects. Users can also navigate within the environment using the implemented character controller and locomotion system. The user is placed inside of a VR world with various scenes that track the user's task performance and biometrics. ZenScape has a total of six scenes:

- **Login:** Users begin by being placed in a room where they must enter their user ID or select "New User" to receive an ID.

- **Tutorial Video:** The tutorial video familiarizes users with the VR environment, providing essential instructions and guidance. The video plays for any new users before they enter the lobby environment.
- **Lobby:** In the lobby, users can navigate and choose their actions. They can review metrics, watch the tutorial video again, or proceed to different levels (Day 1, Day 2, and Day 3) using designated buttons.
- **Day 1:** This introductory level serves as a demo, presenting users with simplified versions of the three tasks at easy difficulties. It offers a brief, easy-going experience to get users accustomed to the VR world, tasks, and distractions.
- **Day 2 and Day 3:** These days build upon the tasks in Day 1, increasing the complexity and difficulty of the tasks and distractions each day, with Day 3 being the hardest.

**Tasks:**

Tasks refer to cognitive challenges that require focus and accuracy. We have implemented a total of three tasks in our MVP. Tasks are inspired by common cognitive load challenges common in research that require sorting, timing, and organization. Tasks are created to be dynamic; their difficulty can be modified and altered to fit the environment.

Our first task that we developed is a cognitive sorting task inspired by the Stroop test. The task presents a file sorting test that challenges users' information processing speed. In this task, users are given binders with a label that states a color. The goal of the task is to sort all binders into the colored bins that match the label of the binder, ignoring the color of the binder itself. Based on a common cognitive testing method, the Stroop Effect is a phenomenon in cognitive psychology where there is interference in reaction time when the brain processes conflicting information. To introduce difficulty, more colors are added each day.

Our second task tests timing. Users must fill a coffee mug in the kitchen, inspired by the need for a perfect cup. Once filled, the coffee will be too hot to drink immediately. Drinking it too soon results in a penalty. Conversely, waiting too long leaves the coffee too cold, leading to another penalty. The objective of the task is to find the ideal time to drink the coffee. This task enhances time management skills, requiring users to balance coffee readiness with other tasks. The mug's color signals the coffee's temperature: red for too hot, blue for too cold, and green for just right.

Our third task focuses on handling phone calls. Users must decipher between spam and real calls by analyzing the tone and word choice of the speaker. If a call seems like spam, they hang up; otherwise, they press a green button to "forward" it. Rooted in auditory and language processing research, this activity demands active listening and critical thinking. To add excitement, we've incorporated over 50 randomly selected audio calls using advanced AI text-to-speech technology, ensuring variability in stimuli to keep players engaged.

**Distractions:**

Distractions are external stimuli or interruptions that divert attention away from tasks, and are affected by the user's heart rate. There are three difficulty tiers of distractions, with each tier determined by the distraction's level of expectedness and intensity. The distractions introduced in a level are determined by the user 's heart rate. If a user's heart rate is low, then more distractions are pulled from the hard category. On the contrary, if the user's heart rate is high, more distractions are pulled from the easy category. This will ensure that every playthrough is unique. Distractions can be visual and auditory. Our nine distractions and their categories are:

- **Easy Distractions:** Fan Buzzing, Quiet Conversation, Lights Flickering
- **Medium Distractions:** Alarm Clock, Monitor/TV Static, Record Player
- **Hard Distractions:** Passing Ambulance/Sirens, Heart Beat, Construction Noise

**Physical Computing:**

Updated Pulse Sensor Data Flow Architecture

The physical computing portion of the project was engineered for collecting heart rate data. The data collection method for the user's pulse is an ear clip that attaches to the user's earlobe. This placement was chosen to allow the user to enjoy a wider range of motion while using the VR controllers without disturbing the sensor. Our pulse sensor data flow architecture has several layers. The data is communicated by connecting our Arduino's script output to a terminal emulator (Putty) to read the BPM output from the serial port and write it into a .log file. Next, a python script listens for new BPM recordings in the log file, updating a Firebase Realtime Database with the user's pulse history, average pulse, and live pulse JSON data every second if new data is detected.

**Art & Design:**

Throughout the art and design process for this project, we have carefully handpicked assets from references gathered from real and virtual office environments. Deciding what the overall look of our game was going to be was not a process that could be sped up. The art and design of a virtual reality experience must create a safe space for the integration of challenging game mechanics that players will eventually become comfortable with navigating. In the beginning of our project, we worked on modeling and texturing assets that are commonly found within any work environment. Some examples of these assets include filing cabinets, L-shaped desks, computer monitors, pens/pencils, and folders. These models were completed in the first few weeks of our project and were critical in setting a foundation for the game mechanics implemented in the future. After adding these assets, we focused on restructuring the environment's layout to have more twists and turns, and we gathered PBR textures to provide a more refined and realistic feel. For the tasks, concept sketches and storyboards were drawn out

to show what assets needed to be made for each task, such as the file sorting, coffee brewing, and phone answering tasks. Throughout our process, we brainstormed different environments that could be included in the office to encourage users to balance mindfulness and stress such as a break room and zen garden. We also discussed and designed various potential logos and color palettes that would best complement the look and feeling we wanted our project to emulate.

**Reflections on Goal:**

ZenScape's goal is significant because it addresses a common challenge faced by individuals today: the need to maintain focus and manage tasks efficiently despite constant external distractions. For instance, students at LSU face distracting external stimuli when trying to focus in class, such as nearby conversations, ringing phones, and the sounds of typing keyboards or tapping pencils. In a world where information overload and competing demands are everywhere, developing strong task management skills is essential for productivity and well-being.

Keeping our end goal in mind, we believe ZenScape's immersive VR experience provides a unique environment where users can train their task management abilities. By placing users in a dynamic environment that simulates cognitive challenges, ZenScape helps them gauge their focus and task skills. Additionally, through the in-game metrics section, users can monitor their performance over time. The metrics section displays the user's pulse history and task accuracy for each day, allowing users to see trends and patterns in their performance. We hope that by using this feedback, users can gain insights into their areas for improvement. This experience and its feedback aims to support continuous learning improvement over time. As a result, ZenScape aims to help users by equipping them with the training tools needed to excel in environments filled with distractions.