

Blurring the Lines Between Reality and Fantasy

– A Critical Making Essay by Dominique Vyborna



Figure 1: The Self We Find Forest Scene inside the Bristol VR Lab at Arnolfini Gallery

Introduction

“Play touches and stimulates vitality, awakening the whole person—mind and body, intelligence and creativity, spontaneity and intuition.” – Viola Spolin, American theatre coach

As children, play is inherent to life. It is through play that we begin to relate to the world around us and relate to ourselves as individuals in the world. We socialize through play, we learn boundaries through play, and we simply have fun through play (Brown and Vaughan, 2009). While engaging in play, we develop skills, including social skills, motor skills, and spatial comprehension (Panksepp, Siviy and Normansell, 1984, p. 485). Anecdotally, we learn about what we are good at and what we enjoy doing. But as we grow up, we are encouraged to leave these frivolous pastimes behind. We are told that we need to study, to work, to be serious, to be professional, to be taken seriously by the people who are authority figures. And we lose a part of ourselves in the process. We lose the art of play.

The intention for the project, *The Self We Find*, was to create a clear pathway for audience members of all ages and experience levels with Virtual Reality (VR) technology to reconnect with that lost part of themselves, to give them access to reintegrating that joy, and benefit from the positive impacts to health and well-being that play creates. Additionally, I sought to answer the question: How can experimental or novel affordances for immersive extended reality be used to create an experience that blurs the lines between reality and fantasy, causing joy and playful engagement in participants?

To answer this question, my team and I were led on an existentially delightful journey through the science of play, exploring the neurological and social value of play, and to engage with a whimsical and often hilarious level of creativity. The project went through several iterations as I followed a double-diamond design planning process, experimenting with new or as-yet little used affordances of technological developments in Virtual Reality (VR), audio engineering, and Android App creation.

During the course of the project, I faced and overcame several challenges. I redesigned the project to increase effective storytelling and affect generation in immersants. Story-world creation was approached pragmatically given the time constraints for production. Throughout the project sound, sight, and interactivity was utilized to enrich user experience. These elements went through several experimental phases. Inevitably technological issues arose and were resolved due to the emerging nature of passthrough and hand tracking for the Oculus Quest 2 in Unity.

The majority of the literature and media that I pursued centered around three main topics: The science of play, the direction of technological development, and a review of recent immersive media experiences that utilize passthrough or hand tracking.

A Review of the Literature and Industry Practice

“The creation of something new is not accomplished by the intellect but by the play instinct.”
-Carl Jung, Swiss Psychiatrist

The Science of Play

The current critical research on play establishes the legitimacy of playfulness from a psychological, psychobiological, and neurological perspective. Well-known play researcher, Jaak Panksepp, “has shown that active play selectively stimulates brain-derived neurotrophic factor (which stimulates nerve growth) in the amygdala (where emotions get processed) and the dorsolateral prefrontal cortex (where executive decisions are processed)” (Brown and Vaughan, 2009, p. 33). Stuart Brown goes on to assert that play causes an increased ability to innovate by creating new cognitive combinations, allows humans to adapt to changing environments, and increases our ability to handle stress. Additionally, human beings naturally retain juvenile traits as adults, and due to this neoteny, we also retain a vulnerable yet valuable ability to be flexible in life (Brown and Vaughan, 2009, p. 58). Clifford *et al.* (2022), determines that playfulness is a personality characteristic that serves as a psychological resource to increase resilience and boost adaptability in stressful circumstances, as demonstrated in the COVID-19 pandemic. According to an online survey of 4100 German speaking people between the ages of 18 and 92 years, playfulness correlates across all age groups with four different indicators of wellbeing: happiness, pleasure, engagement, and meaning (Proyer, 2013). And finally, Lynn A. Barnett (2017) notes that, at the time of

publication, all studies on playfulness had been done on Westernized cultures, which are highly individualistic, and thus the study focuses on Chinese culture, “as an example of a collectivistic society.” I have chosen to have this study inform my practice in creating a project that is universally engaging regardless of cultural background of participant.

For a structural definition of games Finite and Infinite Games, by James P. Carse, distinguishes finite and infinite games by many points of interest and criteria. The essential points that will be covered in this essay relate to the choice to build an app that is aligned with infinite game principles, specifically in reference to their potential for playfulness, human connectedness, and innovation (Carse, 2013).

The Direction of Tech Development

The current direction of travel for technological element development in the VR industry is being led by Meta. This project solely concerns itself with the Meta Quest 2, which utilizes a black and white low resolution passthrough camera. Newly released headsets, the Quest Pro and the Pico 4, both utilize color passthrough cameras with higher resolution rates. Passthrough on the Quest 2 intermittently experience lagging frames per second rates (FPS) causing cognitive dissonance and dizziness in users. With the energy put into developing the Passthrough API and the improvements seen in the passthrough quality in both the Quest Pro and Pico 4, we can deduce that passthrough is a feature that is currently underutilized but is intended to see increased creative exploration and innovation in the coming years.

A second element which I explored was the use of hand tracking. Currently this feature uses passthrough cameras to track physical hand location and position. Limitations include hand drift due to tracking issues and uncanny phenomenon due to virtual hand size and shape not conforming to user hand appearance (Buckingham, 2021).

Recent Immersive Media Utilizing Passthrough and Hand Tracking

While designing The Self We Find, I performed data analysis in market viability and potential traction of passthrough and hand tracking specifically for the Meta Quest 2. I looked at twenty-one games and apps to analyze what has already been done and what genre has an opportunity for innovation. Please see Appendix A for a full list and summary of each application genre.

Genre	Amount of Games
First Person Shooter	3
Puzzle Game	3
Horror/Jumpscare	3
RPG - Miniature obstacle course	2
Block-based Game	2
Fitness/Martial Arts	2
Music Education	2
AR Home Mapper	1
Art and Creativity	1
Passthrough video player	1
Classic Game	1
Grand Total	21

Available through:	Amount of Games
SideQuest	15
Meta App Store	4
www.blockverseXR.com	1
3dar studios	1
Grand Total	21

Table 1: Analysis of Appendix 1 Data

Data analysis showed that the most common games were first person shooter games, puzzle games and horror/jumpscare, and that 71% of the games were available on SideQuest – with only 19% available on the Meta Quest App Store (Table 1).

The Process of Creating Joyful Interactions

“You’ve achieved success in your field when you don’t know whether what you’re doing is work or play.” – Warren Beatty, American Actor and Filmmaker

When I began ideating this project, one foundational principle that I incorporated was that the process determines the product. If the process is generated in alignment with the intended outcomes, the product will naturally be in alignment as well. Beginning with the end in mind, the first step was a choice: What will this project generate in the lived experience of participants? The answer was clear: joy and playfulness. And based on the principles of process

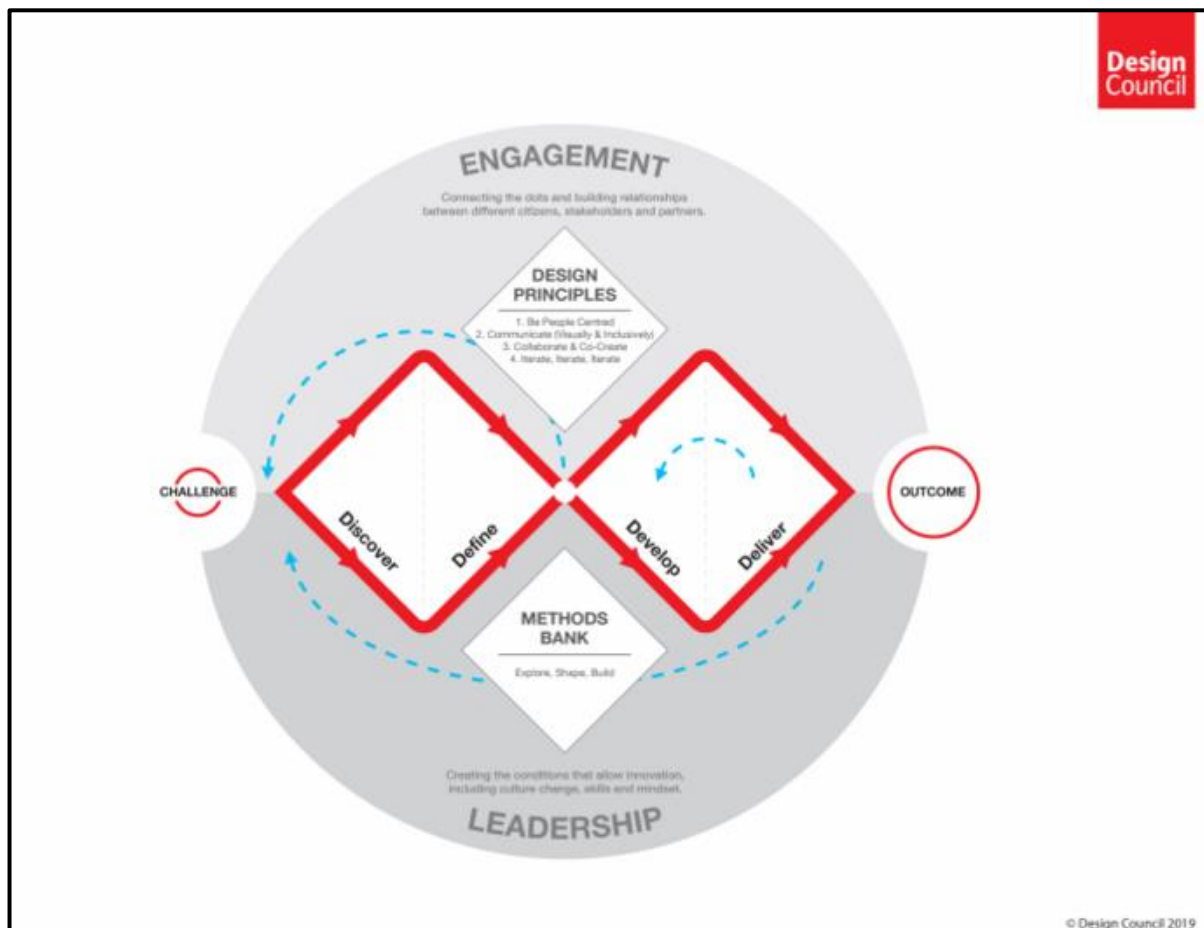


Figure 2: Double Diamond Design Process (Design council, 2019)

begetting product, play became intrinsic to not only the product itself but was a crucial ingredient in its construction. The style of process would inherently show in the deliverable. During planning and creation, I was deliberate in how I approached scheduling and project management. I created a production schedule and utilized an adapted version of the Double Diamond Design Process method (Figure 2) created by the Design Council and updated in 2019 (Design council, 2019), which I amended slightly to accommodate the nature of immersive project development.

The Challenge Space: Discover and Define

During the initial four weeks of this project, I created prototypes and assessed elements to discover the effectiveness of each in supporting the intended outcome. In week five, I defined which elements would be incorporated based on peer feedback.

Initially, I explored a three-dimensional audio installation project concept. Using noise canceling headphones and ambisonic audio, this project intended to lead single audience members through two tandem experiences: one through physical space in an empty art gallery, and second, an internal journey through their own history of self. The intention of the concept was to create an opportunity for audience members to reconnect with an authentic part of themselves that they may have left behind during the process of growing up.

Google Creative Lab had produced a deployment-ready android app called Sounds in Space (Figure 3), with a collection of AR audio experiments available at the Experiments with Google website (Google Creative Lab and Google LLC, 2020). The code was made available through a public GitHub repository. I downloaded the code and through several weeks of trial and error, was able to create and test an initial Sounds in Space prototype. Several key limitations were found:

- Sounds were not ambisonic.
- The application was not reliable to save the settings created.

These limitations ultimately led me to choose a more effective and reliable option.

I then explored utilizing the Meta Quest 2 with passthrough capability and hand tracking. Passthrough cameras create an artistic constraint due to being grainy and currently for the Quest 2 render in black and white. I chose to incorporate hand tracking with the purpose of creating a lower barrier to participation for immersants of all ages and experience levels. According to Gavin Buckingham (2021), there are several opportunities and challenges to using hand tracking. In this case, the opportunities of increased immersion and more effective interaction outweighed the challenges of awkwardness in object interaction, and issues with tracking drift.

In Unity, coding for passthrough and hand tracking in the same app provided an obstacle. I explored several video tutorials and was able to create either a project with hand tracking or a project with passthrough but was unable to create a project with both. In the end I was able to create a foundation project with both passthrough and hand tracking by following a tutorial by Dilmer Valecillos (2021) and downloading opensource code from his publicly listed GitHub repository.

At this point, I assessed the pros and cons of all prototypes, evaluated by the intended outcome and challenges of each element. Both prototypes had positive points, but ultimately a VR project utilizing passthrough and hand tracking posed many more opportunities for joy, playfulness, and creativity. This choice also supported an exploration of underutilized or innovative affordances for future project research and development.

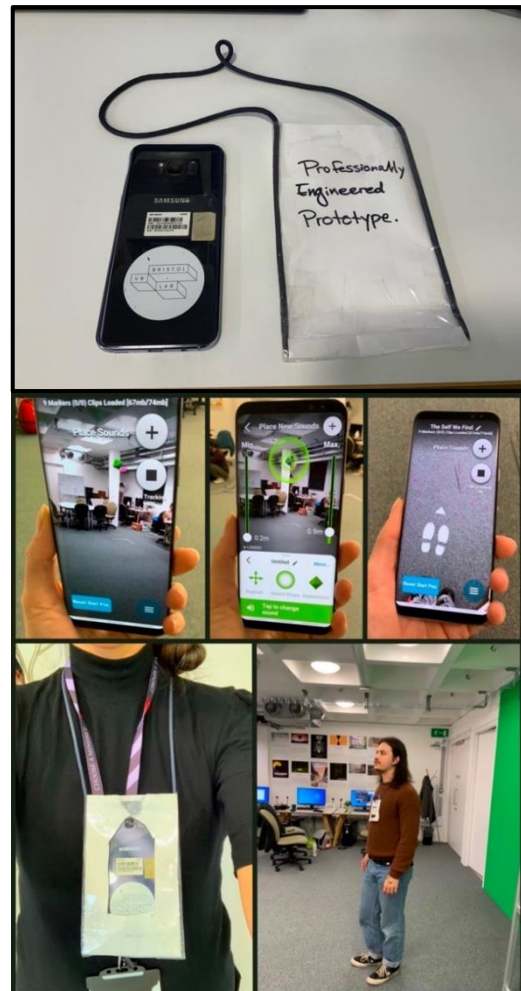


Figure 3: Sounds in Space Prototype Test

The Outcome Space: Develop and Deliver

At this point in the project, I knew that I would use Unity and that the intended function was to create a VR immersive project with passthrough and hand tracking that brought people joy regardless of age group or previous VR experience and gave them access to reconnecting with a part of themselves which they may have left behind. My next steps involved exploring exactly how to create that outcome.

I began to look at the fundamental question: What is play? Stuart Brown (Brown and Vaughan, 2009, p.17) has narrowed the definition of play down to seven “Properties of Play” which I took into consideration when creating each aspect of The Self We Find:

- Apparently Purposeless (done for its own sake)
- Voluntary
- Inherent Attraction
- Freedom from time
- Diminished consciousness of self
- Improvisational potential
- Continuation desire

Through reading *Finite and Infinite Games* by James P. Carse, I made the choice that this experience would be an infinite game. Therefore, game play would not have a prescribed endpoint, the ability to innovate by gameplayers would give rise to a sense of surprise, and players would have the option to give themselves over to the vulnerability of openness, and to allow themselves to be transformed by this sense of surprise (Carse, 2013, p. 34).

I began to explore the types of play that people found most engaging, anecdotally. Through informal peer feedback, several recurring themes became apparent. To feel playful, creating foundational safety is key. To establish this element, I wrote an onboarding script that inherently creates security in knowing what could be expected during the experience. Several people shared that a feeling of mischief by establishing a rule that is intended to be broken or by bucking arbitrary social conventions in specific permissible circumstances can be exhilarating. Towards these outcomes, I created a blanket fort in Gravity Sketch to invite people to sit on the ground (Figure 4). Additionally, I created a VR button created using a tutorial by J.P. Barnett (2021) that causes a scene change, with a sign above it that read “Do Not Press!” to generate that mischievous tension in the moment before taking the action (Figure 7). A multi-player option was a highly discussed recurring theme, which was not possible to code for in the limited time-frame available. Through a creative compromise I chose to have people explore their own single-player virtual worlds, with up to three people in the physical environment, able to interact and communicate which scene they were in, so that they could share their version of the virtual environment. This idea touched on a deeper element which was not fully compatible with the intended outcomes of this project, but which I will continue to develop for future use: That every human being is engaging with their own inner life, and that communication is key to getting on the same page with other people, to make an agreement to share this human experience, moment by moment.

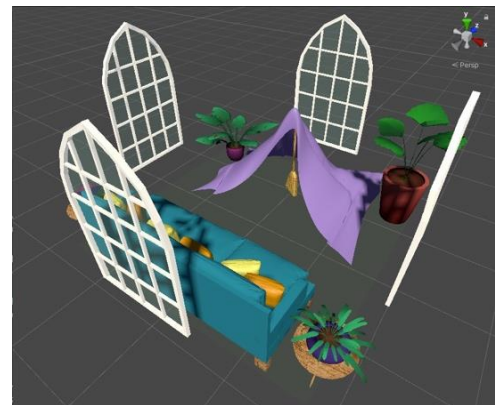


Figure 4: Blanket Fort Scene

From this exploration of playfulness, the practical creation process began by designing a framework of constraints. I created a 3D Unity project, adjusted my settings for passthrough and hand tracking, and created five scenes to limit the scope of the project. The experience starts with an onboarding scene, created for the practical purpose of aligning the physical and virtual environment orientation and which could be used to complete the onboarding process for participants (Figure 5). The second scene contains an animated particle effect Narrator, known as the Sparkle, to take participants on a minute-long tour of how to use their virtual hands by playing a game of Bristol Skittles, a bowling game (Figure 6). These two scenes were only able to be visited once during the onboarding process. All scenes were created to conform to a 3m x 3m square floor space, with the intention to use a completely empty gallery space with lights pointed at the walls and the physical play space to be illuminated with reflected light.

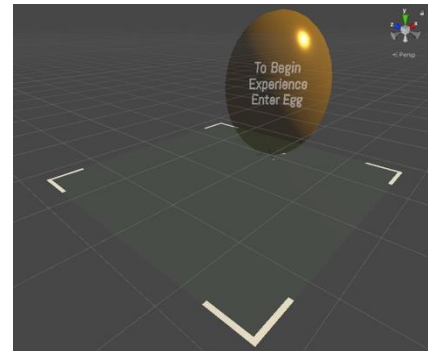


Figure 5: Onboarding Scene

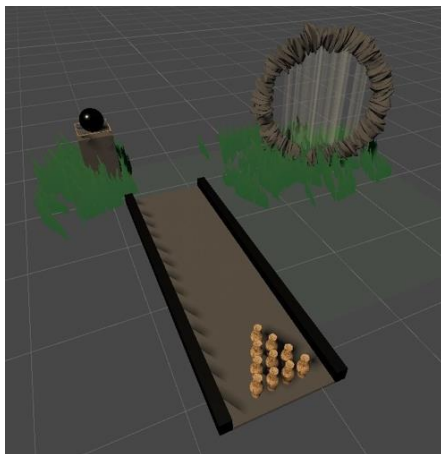


Figure 6: Intro Scene Bowling Game

The emotional journey mapping process included understanding what elements would elicit emotional responses, and whether it was possible to elicit a target response. I began designing these virtual environments through assessing elements of mood inducing procedures, such as audio and particle effects as explored by Felnhofner *et al.* (2015). Additionally, colour, textures, and light can be used to evoke specific emotions (Steinhaeusser *et al.*, 2022). I continued to assess the effectiveness of my elemental choices through ongoing peer user testing.

I next explored the area of affordances for objects designed to trigger scene changes. The three main scenes could be rotated through, infinitely. I chose to make all three of

these objects red, to draw the eye of users and facilitate interaction desire (Figure 7). I designed the first rotating play scene be highly emotionally engaging with colorful and surprising being triggered by five VR button objects. Three of the buttons were coded to trigger falling food, paper cranes, or ball pit balls. A fourth was coded to instantiate simple Christmas decorations.

The fifth button has a sign, warning participants, “Do Not Push!” This button triggers a scene change. The location of this button was situated so the participant would be facing the corner when pushed, and the following scene begins with birdsong, with the participant still facing this corner. As the immersant turns around, they see they are now in a forest. This was designed to be surprising yet soothing, with grass swaying in a breeze, light beams coming from the ceiling of the room, and dust motes floating through the air (Figure 1). This design was in direct juxtaposition to the emotional tone of



Figure 7: Scene Change Trigger Objects

As the immersant turns around, they see they are now in a forest. This was designed to be surprising yet soothing, with grass swaying in a breeze, light beams coming from the ceiling of the room, and dust motes floating through the air (Figure 1). This design was in direct juxtaposition to the emotional tone of

previous scene. When the immersant touches the mushrooms the third scene is triggered. The immersant finds themselves in a comfortable living room with a blanket fort in the middle of the room. The cushions on the sofa were designed to be interactable. This scene generates emotional connectedness between participants and gives them opportunities to share moments sitting inside the blanket fort, where they can reflect on the experience. From this last scene, immersants have the option to rotate back to the button scene, now reset to clear away any play detritus from the previous visit to the space, by touching a ladybug. Participants can rotate through these three scenes infinitely, giving them agency over when to end the experience or whether to continue sharing moments with other users (Figure 8). This autonomy allows them to come to a natural and fulfilled completion point, from which they re-enter their adult life.

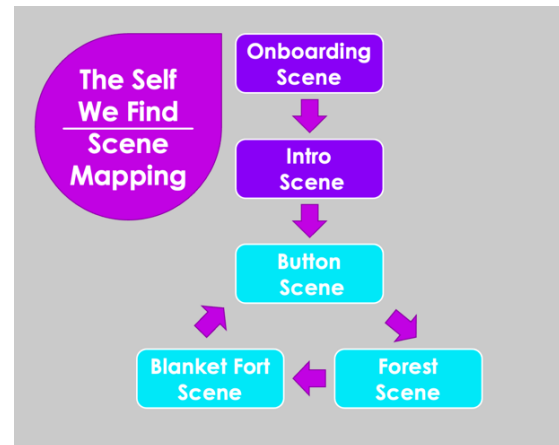


Figure 8: Scene Mapping

Conclusion and Reflections

“Play has been man’s most useful preoccupation.” – Frank Caplan, Contemporary American author

In this essay and through creation and testing of the VR immersive project, The Self We Find, I have explored the novel affordances of both passthrough and hand tracking. When used in tandem, these experience elements do blur the lines between reality and fantasy. We have also successfully created and tested many possible elements of virtual environments which cause emotional elation in users (Steinhaeusser *et al.*, 2022). During testing, users of all ages were seen to be laughing, interacting with virtual elements in emergent ways, and communicating with co-immersants to share the experience.

Areas for future development were identified. Testers in all age groups were able to navigate to all scenes and hand tracking enabled all users to interact seamlessly with the virtual environment with low barrier to entry. However, it was noted that there would potentially be a limit at a certain age or physical capability for people to be able to squat or lean over far enough to trigger the mushroom scene change element. These limits are highlighted as an issue to be addressed. Some elements that were explored conceptually and may be included in future iterations are interactive audio chimes in the light beams of the forest scene, code mechanisms that destroy items in the button scenes when FPS rate becomes impacted by poly count, more precise item interaction, and an ability to build a cushion fort in the blanket fort scene.

Overall, The Self We Find fulfilled its intended outcome, connecting all participants to the part of themselves that has access to elated joy, delightedness, and playfulness.

Wordcount: 3061

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Appendix A:

Overview of VR Games and Applications utilizing Passthrough in 2022

Sources:

Tetiana and DiscoVR (2022)

‘Venice Immersive 2022 - Eggscape’ (2022)

No.	Name:	Available Through:	Type of Game:	Notes:
1	Eggscape	3dar studios	RPG - Miniature obstacle course	Won 3rd Place at Venice Film Festival Immersive 2022
2	Blaston	Meta App Store	First Person Shooter	
3	Cubism	Meta App Store	Puzzle Game	One of the first passthrough games
4	Unplugged VR	Meta App Store	Music Education	Guitar
5	BlockverseXR	www.blockverseXR.com	Block-based Game	Similar to MineCraft
6	VRtuous Passthrough Beta	SideQuest	Music Education	Piano
7	Custom Home Mapper	SideQuest	AR Home Mapper	
8	Air Hockey VR	SideQuest	Classic Game	Air hockey
9	Gravity Lab	Meta App Store	Puzzle Game	
10	Dungeon Maker	SideQuest	Block-based Game	Create obstacle course
11	Arcaxer	SideQuest	RPG - Miniature obstacle course	
12	Contour Demo	SideQuest	Art and Creativity	Sign Lettering
13	Zombies in your Home	SideQuest	Horror/Jumpscars	
14	Hauntify MR	SideQuest	Horror/Jumpscars	
15	MR Wild Animal Escape	SideQuest	Horror/Jumpscars	
16	Crazy Kung Fu	SideQuest	Fitness/Martial Arts	
17	Moon VR Video Player	SideQuest	Passthrough video player	
18	Cactus Cowboy AR	SideQuest	First Person Shooter	
19	Hitmotion MR	SideQuest	Fitness/Martial Arts	
20	Rhythm n' Bullets	SideQuest	First Person Shooter	
21	Brewit	SideQuest	Puzzle Game	Potion Brewing