



# WPI

## Level Design in a Music Education Video Game

Interactive Qualifying Project completed in partial fulfillment of the Bachelor of Science degree at Worcester Polytechnic Institute, Worcester, MA

Submitted to:

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**Abstract:**

In both video games and teaching practices, the way that information is presented and experienced by the user is an important factor in information retention, immersion, and other components. This project examined the role of level design in an educational video game that introduces musical concepts to kids in an informal manner. I developed a prototype game demo that embodied the level design theory outlined in my background research, and administered a survey to a select group of past WPI music students to gather information about specific aspects of the level design in the game prototype. This validated that the world I created achieved its goals, but still has much room for improvement.

## **Acknowledgments:**

I would like to thank my advisor, V.J. Manzo, for his help, guidance, and understanding throughout the project. It has been a pleasure working with you.

I would also like to thank Daniel V. Manzo for his help in scripting the game.6

Thank you!

**Authorship:**

This report was written by Peter Starek.

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## **1 Introduction:**

This project examined the role of level design in an educational video game that introduces musical concepts to kids in an informal manner. I developed a prototype game demo that embodied the level design theory outlined in my background research, and administered a survey to a select group of past WPI music students to gather information about specific aspects of the level design in the game prototype.

To create my prototype level for this music education video game, I needed four main things. A landscape that fit the description of the game world, textures and models to fill it, a system to allow the player to explore the world, and a system to interact with game objects. To do this I used Unity's game engine and took inspiration from games like *Zelda: Ocarina of Time*, *The Witcher* series, and some multiplayer games like *Guild Wars 2*.

From the single player games, I focused on how they used the terrain to guide the player towards objectives and make relatively small maps feel spacious by not having a single path the player must follow. The multiplayer games I looked at, on the other hand, showed me how to create functional cities and towns that will be useful to the player and feel active without adding unnecessary space and clutter. I then used these methods and Unity's Editing tools and assets store to select textures and models and build the terrain to my specifications.

After completion of the prototype, a survey was given to undergraduates in which participants experienced the prototype video game, and responded to several questions about its usability and design. These results were then compiled and used to provide ideas for improvements to the level and the game as a whole.

## **2 Background:**

There have been many music games on a number of different platforms including both consoles and PC's. However very few of them actually teach you about music, and most that do are teaching you a specific instrument, not about music itself. Games like Guitar Hero and Rock Band focus on the rhythm of the music to emulate the experience of performing music, but they do not impart much knowledge on actual music to the player. While some other musical video games use the music as an important part of the game but not something the player is directly effecting like in dancing video games. Finally there are a fair number of games, albeit less popular games that are designed to actually teach you a specific instrument but often need expensive controllers and have limited success. Beyond heaven on the other hand, focuses directly on the music itself. The player will learn about music and it a creation that would apply to playing an instrument or digital creation or even composition. Then the game also acts as a community forum to share, explore, and create music.

### **2.1 The Problem:**

Today with Kids growing up surrounded by technology, and huge quantities of digital music being made without ever playing a physical instrument the time has come for a digital way to learn music creation. There are many people out there who have a passion for music and its creation but do not have the dexterity or desire to learn a physical instrument. Unfortunately, there are very few ways to learn the fundamentals of creating music without playing an instrument. The Idea of Beyond Heaven is to create a Digital game where people can learn the fundamentals of digital music creation, and

then take it further and create their own work in game and display it to other players or export it to traditional music formats.

## **2.2 Project Foundations:**

When I started work on this game it was mostly conceptual. It had a basic storyline for its four levels and seven zones with some dialog already written. However, the only portion of the game that actually existed was a small test island with a few placeholder buildings. This acted as an example of the game engine it would be running on and that it would be a third person view game. My project was determined to be to start work on the world for the first region you visit in level 1, the Ionian Province and its city Tonic. This first map will then act as both the first zone of the game and a test map for adding features and new content to the game.

## **3 Methods:**

The goal for this project was to create a game world for level one, and gather feedback about both the level and improvements to the game its self. To build the world I used Unitys asset store to find appropriate textures and models, and Unitys editor to create the landscape and place models textures and add scripts. To confirm that this world achieved what it needed to I constructed a short demo that would lead testers through the world, and wrote a short survey to examine the experience they had. This Demo was then shared with past WPI music students for testing.



### **3.1 Previous Steps:**

This project differed from many other IQP's in that it consisted of working on and improving a game that has already been partially created. Instead of creating something from scratch as most IQP's do I continued work on something that existed and will still be unfinished when I am done. The original Goal for this IQP was simply to improve the base functionality of the game however, this evolved to become more specific. It eventually became to design and create a game level for the first city you encounter in the game as well as come up with as many ideas as I could to improve the game for the future. This included building the terrain, selecting and placing models, city design, and building up as many ideas for future improvement of the game. As the game currently has strong vision and story, I focused on the mechanics. Adding models to the character, adjusting how the camera is controlled, adjusting the controls, and designing systems for the story to fill.

### **3.2 Existing game Foundations:**

When I Began My IQP "Before Heaven" was in extremely early development. The game consisted of a small island map with a few buildings water surrounding it and a skybox, and you could explore this world as an invisible character with a rudimentary control system. Beyond this, the game was mostly conceptual and had not yet been added to the game. This included a story and level timeline as well as scripted dialog for parts of the story. With this in mind, it seemed the next steps for the game and consequently the focus of my IQP was to create the first basic iteration of the first game city, and develop a more solid basis for the game while finding ways to improve all aspects of the game.

### **3.3 Designing the Geography and City:**

The first decision we had to make was what style of map we wanted to use.

Open world exploration or more linear instanced maps that direct the player, or something in between. I recommended an instanced map but with relatively large maps to ensure the player does not feel like they are confined to the main story, and professor Manzo agreed. With that decision made I selected Tonic the First City you encounter in the game to design and create. With this in mind, I started work on a design for Tonic. Because of the existing story for the world and the mini-games that the player would be participating on their way to the city, I chose an Oceanfront city complete with docks, airships, mountains, and estuaries.

With that choice made I began looking into how other games with similar requirements designed their cities. In particular, I took inspiration from The Legend of Zelda: Ocarina of Time, The Witcher 2 Assassin of Kings, and a few massively multiplayer games including Guild Wars 2 and Wildstar. These games served as inspiration and examples of both what works, and what does not.

I looked at The Legend of Zelda and the Witcher 2 as examples of heavily instanced games that do not feel claustrophobic or restrictive, as they allow the player to roam mostly freely and design each instance to feel open to exploration. Both games follow the same level of hand-holding we had decided on for my prototype level. They have a main storyline that takes you on a tour of the world, and after you have visited an area you are able to roam and revisit that area as you please.



This map in Guild wars 2 serves as the capital city for the human race in Tyria. It is a large circular mountain city, where housing and shops are concentrated around the outer reaches of the city and the higher center areas tended to be common spaces and gardens.



Figure 2: Central Gardens of Divinity's Reach

The Second map I drew inspiration from was the interracial capital city of Tyria, Lion's Arch.



Figure 3: Birds Eye View of Lions Arch city

This map has some areas that I found to function well and some that went unused due to essentially being filler to make the city larger. However importantly it featured a waterfront which inspired the waterfront I made for Tonic.

For the city layout, I decided to go with a city built into the side of a mountain, which expands out radially from the mountain with the center Concert hall music area at the center built into the mountain its self.

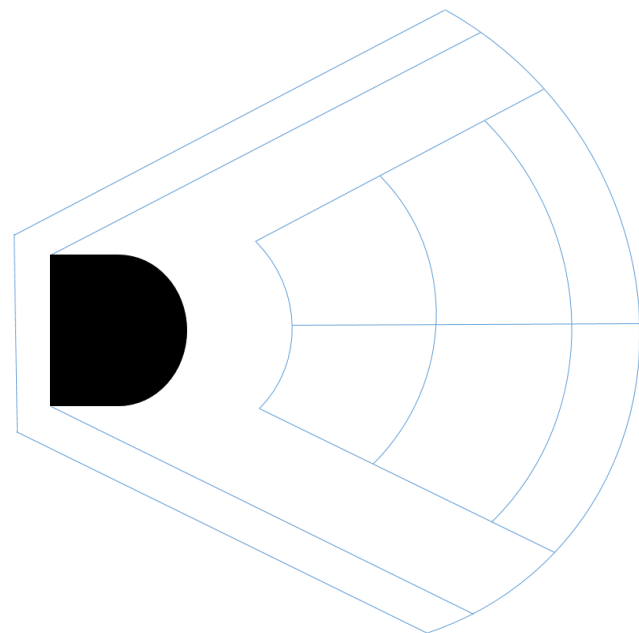


Figure 4: City Layout Plan



The area around the city was mainly determined based on the requirements of the first levels where you explore the city and surrounding areas. When the game begins you start on a boat voyage to the city of Tonic, later you arrive at the docks, disembark and travel a short way through the outskirts of the city to cross a bridge to the main city center. In addition to needing a separate docks area and a bridge to the city. It needed to fit the steampunk theme the game was planned to follow. To accommodate these requirements the main city has a river on one border, the ocean on another, and the rest mountains with a small ramp up into the mountainous area to allow for exploration. Then the bridge leads over the river border to a grassy area that is home to the docks the airship, and the outskirts of the city. Finally, I wanted an area up in the mountains for a future quest to use or failing that just to give the player additional land to explore.

### **3.4 Building the Level:**

The game uses Unity's game engine and editor, so I used their tools to construct my level. However before I could build anything I had to find appropriate assets and models to at least serve as placeholders. Fortunately, some assets have already been selected as well as the steampunk theme, making it easy to find additional similar assets using the unity store. I then needed a landscape to build my city into and enough surrounding area to prevent the player from easily finding or seeing the edge of the map. To achieve the mountainous oceanside aesthetic that I was looking for I ended up starting with a mountainous region I found on the asset store and modified it using a

large river passing through it to create an ocean out of half of the map divided by the river. With my coastal mountainous region created I simply created a coast side area to build my city and its surroundings adding a new river for the bridge to cross. Finally, I placed the buildings and made final adjustments to the landscape to help guild players and prevent overly steep terrain I expected the player to traverse.

With the map built, I proceeded to play on it extensively and fix areas that needed improvement that were hard to spot from the editor but was obvious from in game. This included ensuring all objectives were possible, ensuring hills were not too steep to climb, and editing the terrain to discourage wandering out of the map boundary.

#### **4 Data Analysis:**

To analyze the success of this project a game demo and survey was given to a group of past WPI music students. The data from this survey was then used to find weak areas of the level that need improvement and to find new ways to improve the game as a whole. Below are the results of that survey and its analysis.

## How would you rate your musical abilities?

Answered: 5 Skipped: 0

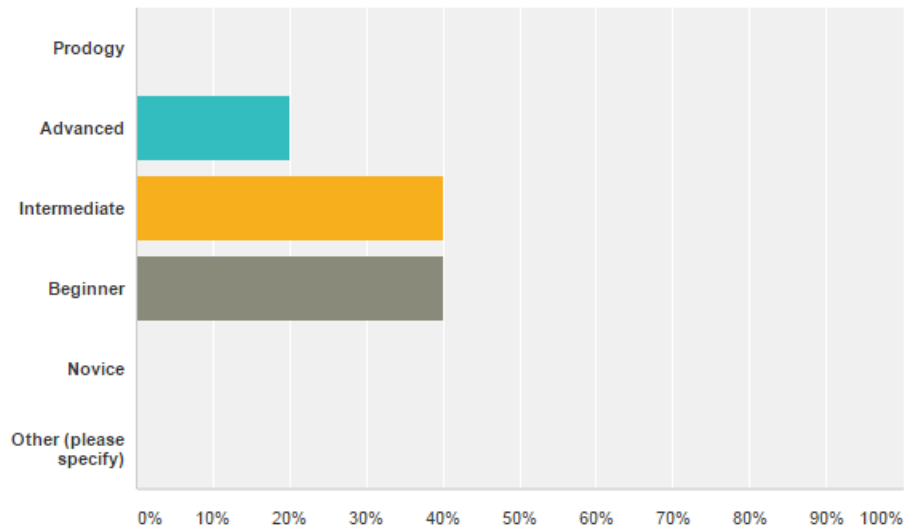


Figure 5: Survey Question 1

My survey pool consists mostly of beginners and intermediates with one advanced musician. Beginners could get the most out of an educational music video game as they could use it to learn music as well as explore to a higher degree than the others. However, advanced users can still benefit from the social aspect of the game.



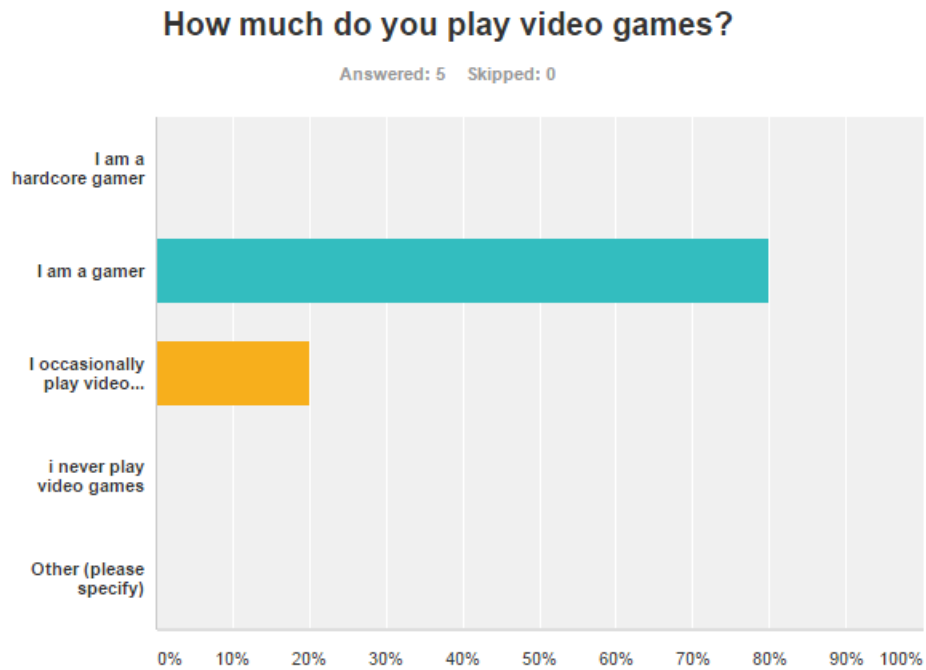


Figure 6: Survey Question 2

All of my survey participants play video games enough to be in the target group for an educational music video game. With four of the 5 identifying as “gamers”.

### Would you be interested in a music based multiplayer game?

Answered: 5 Skipped: 0

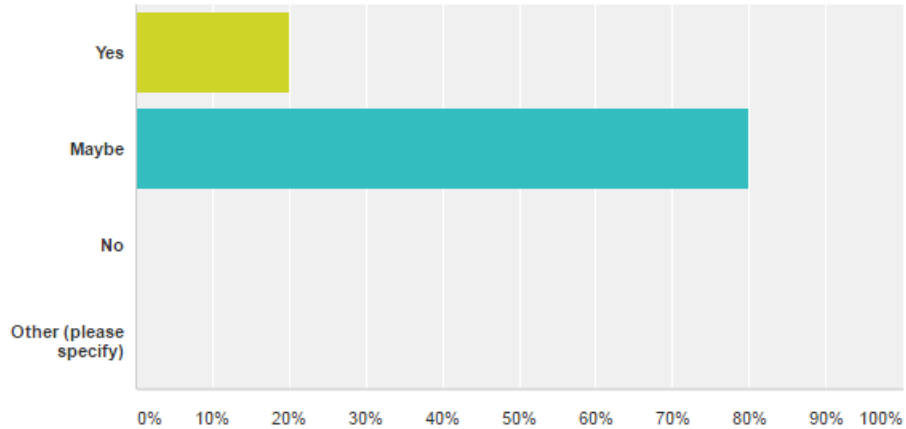


Figure 7: Survey Question 3

Most of the participants feel that they could be interested assumedly given the final game meets their expectations. While one participant stated they would be interested in a music based multiplayer game.

### Have you been interested in learning music but haven't done so?

Answered: 5 Skipped: 0

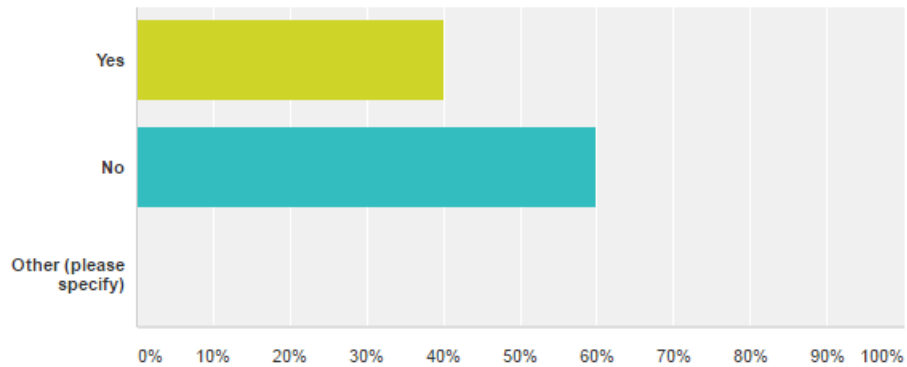


Figure 8: Survey Question 4

Two of the five participants stated that they want to learn music but haven't done so. This lends credit to the fact that there is an issue with the currently available methods of learning music.

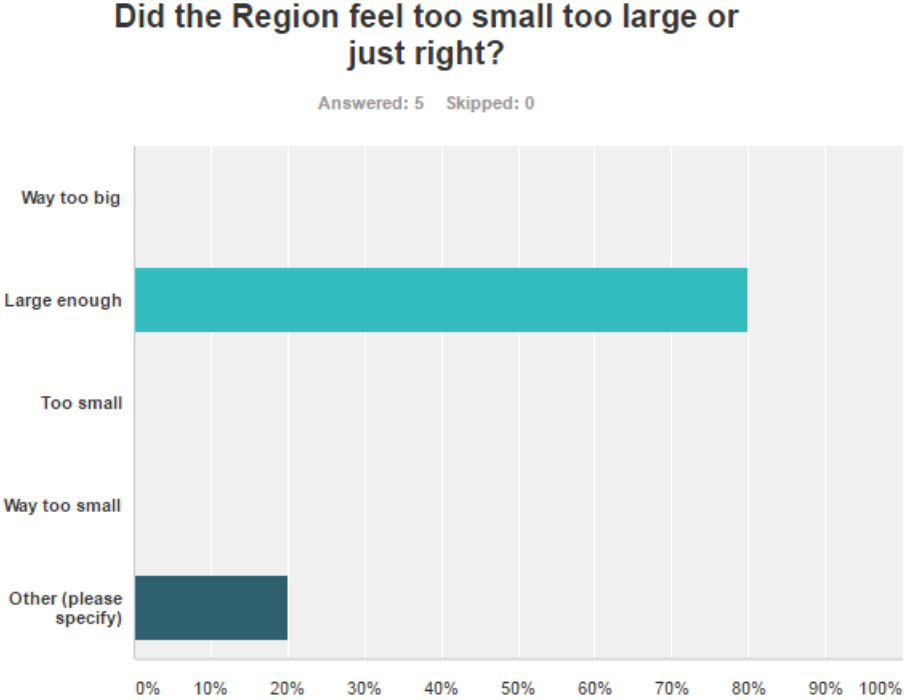


Figure 9: Survey Question 5

All participants thought the world map for the Ioian Province and its city Tonic was large enough but not too large with the exception of one who was ambiguous about his feelings stating "Depends what you need to accomplish in the space".

## How was character movement speed?

Answered: 5 Skipped: 0

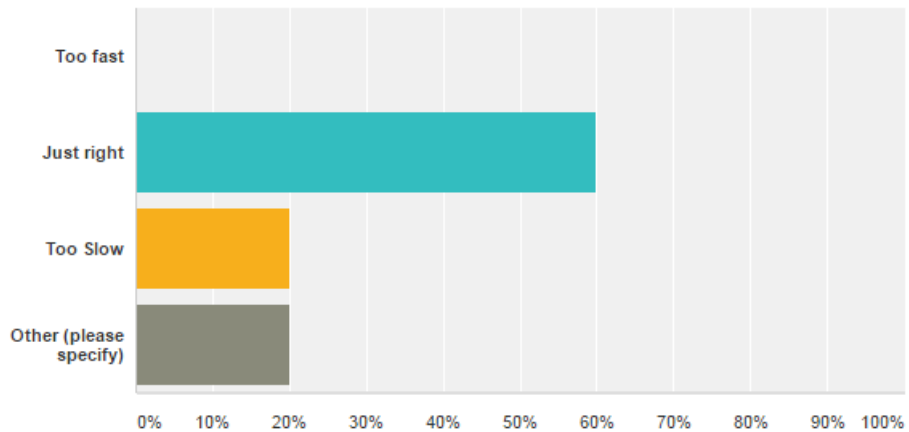


Figure 10: Survey Question 6

Most of the participants felt the character moved fast enough however, one disagreed, and another commented that “It’s not that the movement is too slow, more that the animations of the character movement is not in sync with the speed they are moving, so it looks and feels a little weird.”. This tells me that the speed should probably be increased slightly and that new animations are needed which makes sense as the current animations are placeholders.

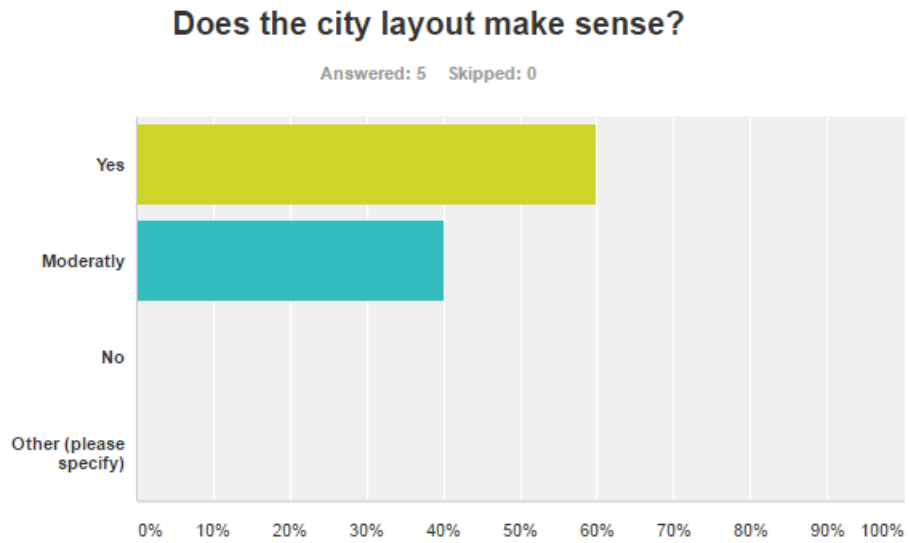


Figure 11: Survey Question 7

Most of the participants felt the city layout made sense however, it was clear that improvement is needed. This will be helped greatly when the buildings and roads are more developed with non-placeholder buildings with actual functions.

## How many barrels did you find?

Answered: 5 Skipped: 0

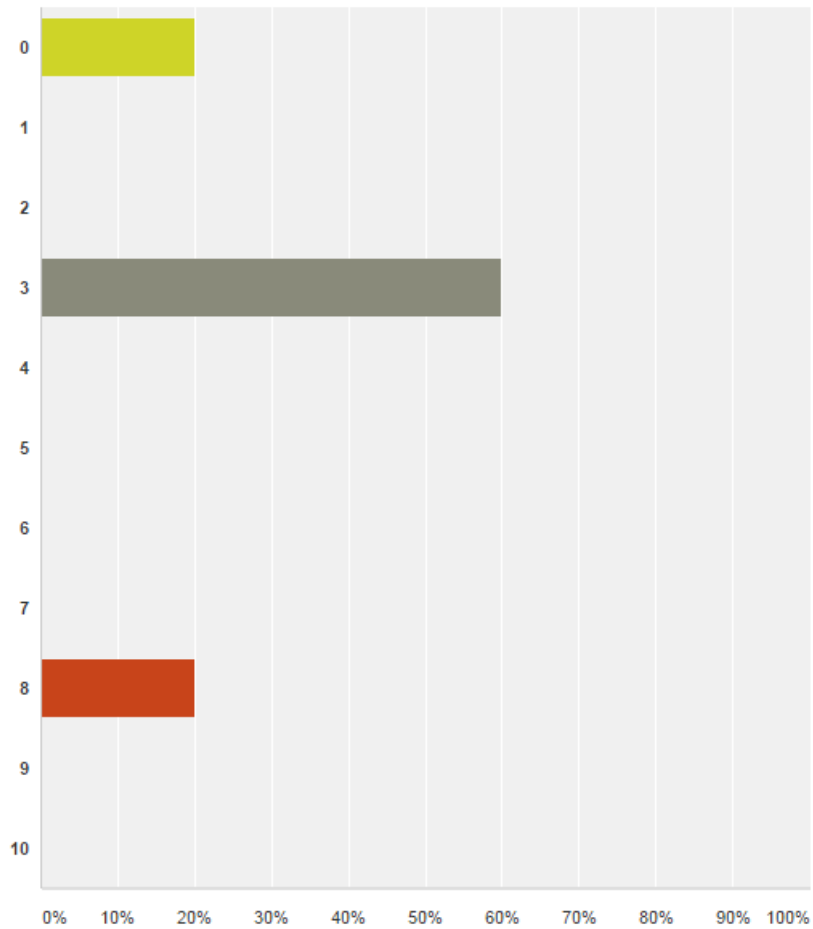


Figure 12: Survey Question 8

Most of the participants found the Barrels at the city center however, one found more than that, and one and one found none. This means only one person in five found the hidden camp in the forest. This tells me it is very findable but not in plain sight as planned.

### Does the map layout make the world feel immersive and real?

Answered: 5 Skipped: 0

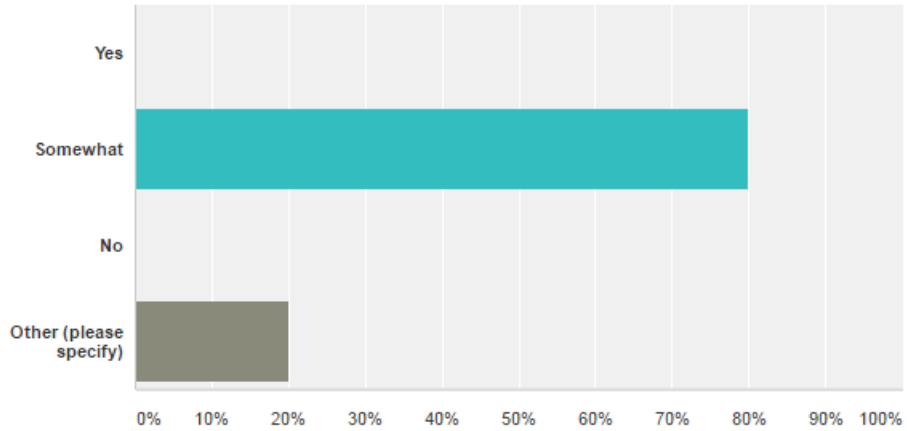


Figure 13: Survey Question 9

Most of the participants felt the world was somewhat immersive which makes sense as the world is mostly built but it still lacks many important immersion features like smooth animations and NPC's. One participant however, felt it was immersive excepting that swimming had not yet been added to the game stating "Yes except for the fact that you walk through water instead of swimming."

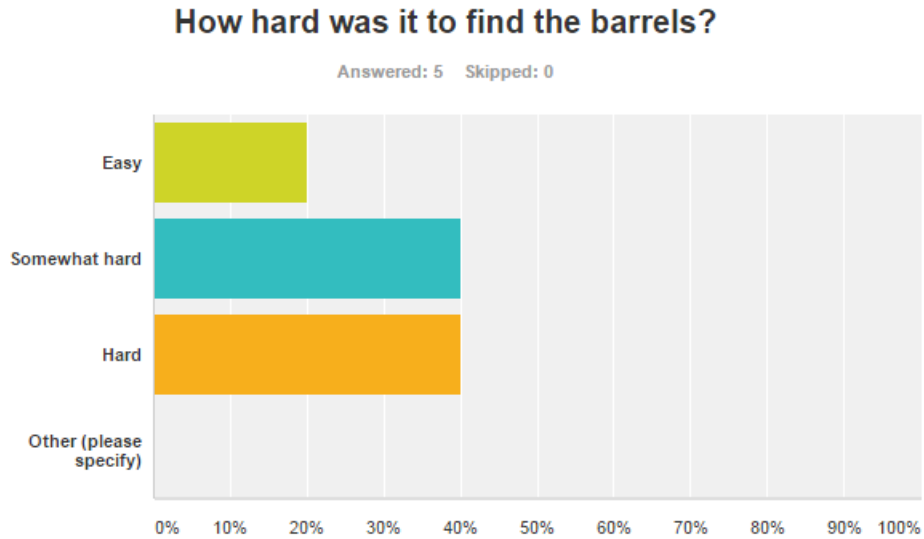


Figure 14: Survey Question 10

The participants found it to be mostly somewhat hard to find with one thinking it was easy. This tells me that the locations are close as difficult to find as I wanted, as some of the barrels are in hidden areas. However, some participants had difficulty finding barrels that were meant to be easy so some additional paths and roads may be called for.

### Did you get lost at any point? If so where?

Answered: 3 Skipped: 2

Figure 15: Survey Question 11

I received three responses to this question:

1. "Yes I had no clue I was looking for barrels"
2. "I fell off the map lol"
3. "No"



The first comment simply relates to the fact they did not read the instructions and further will be resolved when the questing system is added to the game. Of the other two comments one fell off the map, probably due to the lack of swimming and the water featured in the beginning of the map. While the other did not get lost at all.

### **How would you improve the controls for movement and interactions?**

Answered: 3 Skipped: 2

Figure 16: Survey Question 12

I received three responses to this question:

1. "Make camera shift a key and make movement with the mouse"
2. "Defiantly the camera needs to follow where the character is going as well as the motion of jumping which is sort of realistic but players will want to control where they go."
3. "Turning kind of just jumps to the new direction. That should me more fluid. There also isn't much control over the camera direction."

The comments mostly refer to the camera controls and the animations for turning walking and jumping. These are all areas I had already planned improvements for, and this confirmed that they need improvement.

### **Any other comments?**

Answered: 2 Skipped: 3

Figure 17: Survey Question 13

I received two responses to this question:

1. "Graphics were pretty sweet!"
2. "Looks Good"

## **5 Conclusions:**

This IQP advanced the development of Beyond Heaven and gathered valuable information on further development ideas and areas of the game that need improvement. I created the Ioian Province the first area you encounter in the game and Tonic the city it houses. Additionally, I gathered valuable information of future improvements for the game.

The survey gathered a few useful pieces of information both for confirming the market for an educational music video game and brought to light new ways to improve the game. Of the five survey participants all of them game to some degree, are at least somewhat interested in this genere of the game, and two have never learned music creation before. This bodes well for the game having a potential player base however, as the survey only consisted of five members these results are not entirely conclusive. The quality of the map is also reflected by the survey results. The participants mostly found the world reasonably sized, mostly immersive, and character speed to be about right. However, It also brought to light some areas the game defiantly needs improvement. The animations and camera controls both need dramatic improvement, many models need replacing as they are placeholders, and swimming needs to be added to make water interactions more realistic.

Overall the prototype level has a long way to go before the game is finalized, but it has also come a long way. My project has advanced the game and helped validate its purpose. It shows that there are people interested in this type of game and will have potential if it can be pulled off mechanically. Beyond Heaven is well on its way to being the solution we need to teach technologically minded people music production, and beyond that serve as a platform to share your music creations.

## **6 Recommendations:**

Moving forwards the game still has a long way to go. There is much to be done still in building new zones, refining the game controls, adding quests and objectives, adding the music creation and sharing system, and general refinement. What follows are the areas I feel need immediate attention the most.

- The questing system needs to be replaced with one that has more functionality, as the current system simply has one button interactions and writes text to the console which is only visible in the editor.
- New animations and camera controls to ease navigation
- The interface needs features like a mini-map and quest indicators.
- The map needs to be updated to include water in the riverbed that flows appropriately.
- The city needs more roads and paths to direct the player to prominent locations. The quests for the storyline need to be added to the world.
- The other zones of the world need to be built and added to the game.

- The buildings need to be replaced with more functional counterparts that are not placeholders.
- The music creation and sharing systems need to be created and added.

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