

**EXPLORING INDIGENOUS IGOROT CULTURE  
IN VIRTUAL REALITY**

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This Special Project titled **EXPLORING INDIGENOUS IGOROT CULTURE IN VIRTUAL REALITY** is hereby accepted by the Faculty of Information and Communication Studies in partial fulfillment of the requirements for the Bachelor of Arts in Multimedia Studies Program.



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***Dedicated to:***

Felino P. Chaluyan and the Barlig Community

## **ABSTRACT**

This practice-based research project explores the possibility and benefits of using virtual reality as a multimedia tool in cultural heritage education particularly that of indigenous Igorot culture. It aims to encourage appreciation of indigenous Igorot culture through immersive and interactive means in light of growing innovations in technology and the digitally evolving mindset of the 21<sup>st</sup> century person.

The challenge lies on how to effectively interpret tangible and intangible aspects of Igorot culture in the virtual world and entice its users to interact and learn through virtual exploration. 3D modeling, sounds, video and imagery, application of simple gamification techniques, and interactivity were used such that the ensuing product serves as an immersive snapshot of a period in time in the mountains of the Cordilleras.

The project reveals that in terms of showcasing cultural practices, context is very important such that the viewer needs to be placed in a position wherein he or she will be able to understand why these practices are done and why they are important. Further, in using virtual reality, it is important to note that different intricacies of culture can be explored simultaneously and that implementing a linear approach towards cultural heritage education within the medium means not utilizing the medium to its fullest potential. It also tackles the importance of making virtual reality products that are easy to use with little to no learning curve in order to maximize their effectivity.

Ultimately, this project aims to contribute its learnings and become a use case for virtual reality in the context of indigenous Igorot culture. It hopes to inspire and motivate the creation of more similar products to help the Igorot identity thrive in modern generations.

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## CHAPTER 1

### INTRODUCTION AND BACKGROUND

I am an Igorot, a member of the indigenous people of the Cordilleras. Growing up in Baguio, I had the privilege of watching *Cañaos* (a traditional ceremony with song and dance that includes feasting on pork or chicken sacrificed for the celebration) in weddings, eating *pinikpikan* (a traditional fare that uses smoke to flavor chicken and involves beating the chicken while alive to improve its meat for communal consumption) during birthdays, and having *watwat* (traditional boiled pork) on community festivities. However, the extent of my knowledge of my heritage relies mostly on these and the memory of my father's hometown in Barlig, Mountain Province, a small municipality around 430 kilometers north of the Philippine capital of Manila.

As much as I would like to experience more of the native traditions practiced in my heritage, they are largely forgotten or are rapidly vanishing. The people who hold this wealth of knowledge are either dead or are dying. And, unfortunately for my younger nieces and nephews, the only way they may encounter these native traditions is through small footnotes in their schools' respective history textbooks.

Thankfully, there is a strong drive within academic institutions, artists, and groups of Indigenous People to preserve indigenous Igorot culture. However, with the boom of interactive and immersive technologies, there is an apparent dearth in content that utilizes experience as the learning tool for teaching the ways, life, and beliefs of Igorots. These experiential and immersive technologies can help ignite the fire for the new generation Igorots to look back into their heritage and take pride in their identity. These experiential and immersive technologies can also help non-Igorots appreciate Igorot culture as part of the Filipino heritage.

For this project, I taught myself how to create a virtual world that mimics my memory of my father's hometown in a time before modern technology reached the place – a simple place that elevated earth, ancestry, and spirituality.

### **Statement of research question**

*How can I recreate an Igorot practice through virtual reality for the purpose of encouraging appreciation of Cordilleran cultural heritage within my family members and friends?*

By answering this question, the project aims to attest to the power of virtual reality to become a means to share knowledge and appreciation of cultural heritage especially within the context of the Igorot culture.



## CHAPTER 2

### REVIEW OF RELATED LITERATURE

What is cultural heritage? To simplify, it helps to look into the dictionary definition of the words “culture” and “heritage”. Merriam Webster defines culture as “the customary beliefs, social forms, and material traits of a racial, religious, or social group” while it defines “heritage” as “something transmitted by or acquired from a predecessor.” It is important to note how the dictionary puts the words ‘legacy’ and ‘inheritance’ as synonyms to heritage. Putting the two words together, ‘cultural heritage’ is the passing down of culture, material and immaterial, from one generation of a community to the next. With this sharing is the value exchange from what was, what is, and what can be. As a legacy, cultural heritage aims to preserve the values, beliefs, knowledge, and know-how and share them as inheritance to the future.

UNESCO categorizes cultural heritage into two: (1) tangible, and (2) intangible. Tangible cultural heritage includes both movable (*i.e.*, sculptures, pottery) and immovable objects (*i.e.*, buildings, archeological sites such as pyramids). Tangible cultural heritage covers everything found above and beneath the earth as well as underwater. Intangible cultural heritage, on the other hand, includes cultural traditions, practices, customs and rituals, dance, songs, folklore; those that have no physical embodiment and are best appreciated through experience.

Why is cultural heritage important? Cultural heritage is, in many ways, a social memory. It provides a community a glimpse of its past, an account of its origins. This account of the past sheds light on the identity of the present. With the knowledge of one’s history, life becomes more enriched and more meaningful within the individual. Within society, on the other hand, this memory presents the relationship which binds communities together with a sense of belongingness.

In today's nature of rapid change, globalization, historical revisionism, and fake news, preserving cultural heritage becomes more and more important.

Within the context of the Cordilleran culture, the diaspora of the Igorot people migrating from the mountains to the lowlands and even abroad has largely contributed to the loss of indigenous culture within the region. Without proper and concentrated preservation efforts, cultural heritage stands to lose a treasure trove of knowledge and even the identity of the indigenous people of the Cordilleras.

The Igorot culture has a wealth of intangible cultural heritage, and because these are best understood and appreciated when experienced, text and imagery alone may not fully showcase its command and significance within its peoples. Moreover, there is a growing digital divide between the Igorot elders and their offspring. The digital landscape has vastly changed in a matter of decades. It is not hard to imagine a third generation Igorot to readily recognize a skin from Mobile Legends, a multi-player online battle arena, than a native *bahag* or g-string.

Throughout the years, there have been several laudable efforts to preserve Igorot culture and heritage, with efforts from government and private sectors alike. Regional or community museums still hold a significant amount of historical knowledge and remain to be some of the key repositories of indigenous archives.

One of the most recent attempts to document and archive indigenous Igorot culture is the institution of Museo Kordilyera in the University of the Philippines Baguio. The newly founded museum is an "ethnographic museum dedicated to the preservation and enrichment of the indigenous cultures" within the Cordillera Administrative Region and nearby provinces.

Nowadays, there are also efforts to share and preserve Igorot culture in online platforms such as blog posts, social media, and online fora. There are videos available

in Youtube, an online video sharing and social media platform, regarding Igorot culture such as songs, dances, rituals, and food. When the word 'Igorot' is searched on social networking site Facebook, several groups appear and are open for membership. Even Tiktok, a short-form video-sharing application, has a #Igorot where the hashtag (#) is a symbol for tagging of multimedia for quick referencing in online platforms.

The creation of these contents and communities help conserve the Igorot culture in terms of keeping the identity alive. However, more work has to be done.

Across the world, cultural preservation efforts have started to utilize technologies such as Augmented Reality ("AR"), Virtual Reality ("VR"), computer vision, and Artificial Intelligence to encourage more participation and engagement from audiences. Countries are utilizing modern solutions not only to energize the field of cultural heritage but also to capture the attention and palate of the tech savvy generation.

In Europe, there has been a drive to digitize cultural heritage and make it more accessible to people. A mobile application called Cultural Gems was created to encourage locals and tourists alike to explore and share their experiences of the cultural treasures within the region.

There is also Google Arts and Culture, a free application that lets you visit museums and historical sites from across the globe right within your living room. With stunning 360° view images and commentary, it offers an immersive learning experience especially when viewed on a VR headset.

Further, in the National Museum of Singapore is an exhibit entitled "Story of the Forest" which allows the audience to interact with three-dimensional ("3D") animations based on the William Farquhar Collection of Natural History drawings using a camera

on a mobile phone, similar to Pokemon Go (a popular AR mobile game that combines gaming with tracking and mapping technology in the real world).

The foregoing efforts to go way beyond the traditional way of education in terms of history and cultural heritage is in line with the pulse of the times. The younger generations are born into the world as digital natives. Failure to adopt engaging, virtual, and immersive approaches in cultural preservation efforts could mean a big opportunity loss for some primitive, and even dying, cultures.

Apart from tapping into innovative technologies, integration of gamification and/or game-based techniques has become a recurring trend in the 21<sup>st</sup> century education that helps engage and boost experiential learning, as can be seen from the above cited examples.

Gamification is no longer a novel idea. In fact, the internet is full of scholarly papers attesting to the benefits of using technology and gamification in the study of cultural heritage (Arts and Culture in general) among other fields of education. However, the difference between 'gamification' and 'game-based' learning needs to be highlighted.

Gamification entails a system of rewards or 'motivational affordances'. It is mainly used to encourage or promote certain behaviors. Gamification does not equate to games *per se* but it utilizes certain aspects of gaming such as competition, awards, and skill-ups, among others, to simulate a similar experience. Game-based learning, on the other hand, comprises of game techniques utilized to promote play in education. As an online article succinctly puts it, it is "learning through games".

The reason why the distinction here is significant is because the decision to use either gamification or game-based techniques is highly important to the success of the learning experience when it comes to the context of cultural heritage.

In a paper entitled "Does Gamification Work?", two critical elements were deduced in determining the success of gamification. One is context and the other is the target audience or user. There were marked differences with the reception of gamification in learning based on different personality types. Some may be motivated by competition while others may find it intimidating. Hence, the process of implementing gamification or game-based learning must also look into the different motivations and generational preferences of its target users. Context, on the other hand, is the object of the gamification. Careful consideration is required to study the relationship between the context and the learning goals or objectives. This is in order to achieve the outcomes desired for the endeavor. Engagement and enjoyment are two popular aspects, but cognitive understanding and affective appreciation are other weighty considerations.

Within the context of showcasing Igorot culture, it is important to maintain the sincerity and reverence that the culture holds towards its traditions and practices. Integration of gamification or game-based techniques should be aligned with the goal of inculcating respect and understanding of the culture, else it runs the risk of misleading the audience and becoming exploitative of the culture's riches.

## **CHAPTER 3**

### **DESIGN PROCESS**

In constructing a virtual reality product through which an Igorot practice was recreated, the process involved the following:

#### I. Context Building/Pre-production Development/Preparatory Work

- VR platform – Some of the major considerations in choosing a suitable application are ease of use and accessibility. It was essential to decide on what application to use early on in the process as this will dictate what tutorials and other technical know-how needs to be learned prior to creating the VR content. The VR platform used for this project is Amazon Sumerian, which was primarily chosen because it allows for the creation and publishing of virtual reality products via internet browser. It is also relatively easier to learn than other virtual reality software and is highly portable.
- “How to” Tutorials – After having decided on the VR application to use, I had to ingest hours of Youtube tutorials, several blogs, and other fora to analyze what can and cannot be done in the chosen VR application. Most of the tutorials viewed were created by Amazon Web Services themselves.
- Experimentation – After going through the tutorials, I did hands-on experimentation to familiarize myself with the graphical user interface (GUI), tools, and techniques and decided on the best approach to the design process.
- Environment or setting – For this research, I looked into images of the Cordilleras during the early 1900s. Although I have an idea of how the

region looks in the present, I wanted to present the environment as how it was before modern technology reached the region. Some of the sources were Feasts of Merit, a publication by Museo Kordilyera, and Igorot: Traditional Ways of Life and Healing among Philippine Mountain Tribes published in 1986.

- Research on Igorot practices – This involves looking for practices that can be replicated in a virtual setting and foster understanding of both the material and immaterial aspects of culture.

## II. Prototyping

- Layout – For the layout of the setting, I took this from my memory of Barlig, Mountain Province. Our ancestral home in Barlig is situated at the side of a mountain, just above the river with a series of steps made of rocks going down to a flat area before reaching the water. Looking out our window provides a panoramic view of the surrounding houses, mountains, and *payew* (rice paddies).
- Design of artifacts – Based on my research on Igorot practices, I saw images of actual artifacts which served as my reference for modeling them in 3D. These images are that of traditional items such as *Bale*, *payew*, *Bu'lul*, *Kubi*, *Batawil*, *Luhong*, *Lebkhan* and *Bangkilay*.

## III. Implementation

- 3D modeling – For the 3D modeling, I used Thimble Sketchup (formerly Google Sketchup), since I had experience working on it before. I had to model the different artifacts from scratch. I also had to learn how to create the mountains using the Sandbox tool, a tool that allowed to extract or pull regions of forms in 3D, as my initial creation of mountains

lacked realism. For the animals, I got reusable objects in the 3D marketplace since my choice of 3D application is quite limited to architectural modeling.

- Sounds and Textures – I used publicly accessible videos or images to add another level of realism into the scene. For the river, I used a video texture of moving water. For the general ambience, I added the background sound of flowing water and signing birds to denote the open, green, landscape. I had to do some edits to some of the videos, sounds, and images used to reduce file size as well as to retain only the portions I needed. I had to be frugal on where and what textures to use as I was conscious of the overall project file size since this may affect the rendering and online viewership.
- Addition of interactions and animations – Interactions were generated into the project using state machines, actions, and behaviors available in Amazon Sumerian. For other actions not readily available, this requires coding using Javascript, a widely-used front end programming language.
- Gamification – The logic applied here presents the simple motivation of collecting sacrificial items as offering for the end goal of initiating a ritual. The prototype serves as a simple foundation of what other gamification or game logic can be applied in the future.

#### IV. Testing and Publishing

- Functional Testing – This involves playing the 3D scene live in the VR application to check for glitches on the interactive elements as well as lighting and rendering of the objects.



- Publishing – After every development session, I publish the scene to be able to view it in other devices such as mobile and VR headset. Publishing also allows the content to be shared to other users.

In testing whether the output encouraged appreciation of Cordilleran cultural heritage within my family members and friends, the following ensued:

#### V. User Feedback Session

- Once the prototype was published, it was shared with friends and family (the “Test Subjects”) by giving them the web link through which they can view and participate in the VR output.
- The Test Subjects were given the following base questions which they should answer after viewing and participating in the VR output:
  - (1) Did the VR prototype pique their curiosity?
  - (2) Did the VR prototype engage them and encourage them to interact and explore the environment?
  - (3) Did the VR prototype pique their curiosity about indigenous Igorot culture?

## CHAPTER 4

### RESULTS

The prototype can be accessed through the following web links:

- shortened link: <https://bit.ly/3zmsNUT>
- full link: <https://380228d53eac43d5ae88872d09e895a7.ap-southeast-1.sumerian.aws/>

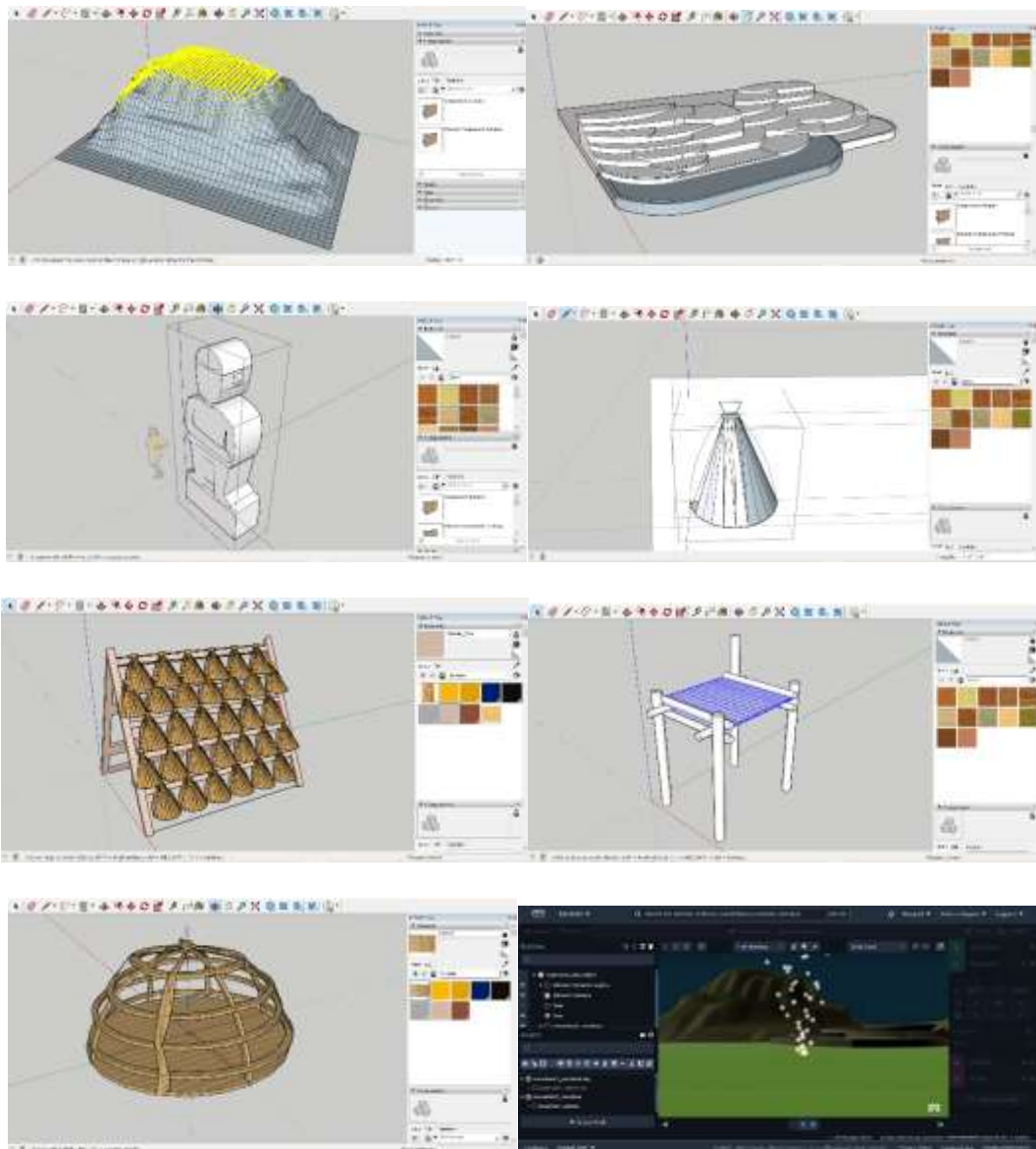
The prototype is a browser-based virtual reality application that is best viewed with Google Chrome or Firefox web browsers and an internet speed of at least 5 Mbps. It can be viewed online using a mobile phone, laptop, desktop, or VR headset.



To achieve the look and feel, I referred to images online and from books about Cordilleran heritage. The layout of the scene is based on my memory of Barlig, Mountain Province. I modeled the mountains, the *Bale* (traditional houses), *payew* (rice paddies), *Bu'lul* (wooden sculpture), *Kubi* (chicken coop), *Batawil* (frame for drying rice), *Luhong* (pestle), *Lebkhan* (long rice mortar), and the *Bangkilay* (wooden platform used for rituals) and added textures using a 3D modeling tool prior to exporting and importing them in Amazon Sumerian, the VR application used. One object I had to create directly in Amazon Sumerian was fire. Fire was very much a part

of the daily life in the mountains so much so that the old houses were blackened by soot.

To add another factor of realism, I added an ambient sound of a flowing river water and birds singing in a forest. I also added a 360° image for the sky sphere as backdrop.



I initially planned to incorporate a healing ritual that is practiced by the Igorots to showcase the meditative aspect to it. I planned to do this by getting the input of the elderly members of the Barlig community. However, due to travel restrictions brought about by the Coronavirus 2019 pandemic, I had to change plans. I opted not to present

an actual healing ritual and just focus on the concept of 'sacrifice'. The practice of using 'sacrifices' is a pervasive concept in Igorot culture and shows a crucial part of the Igorots' spirituality.



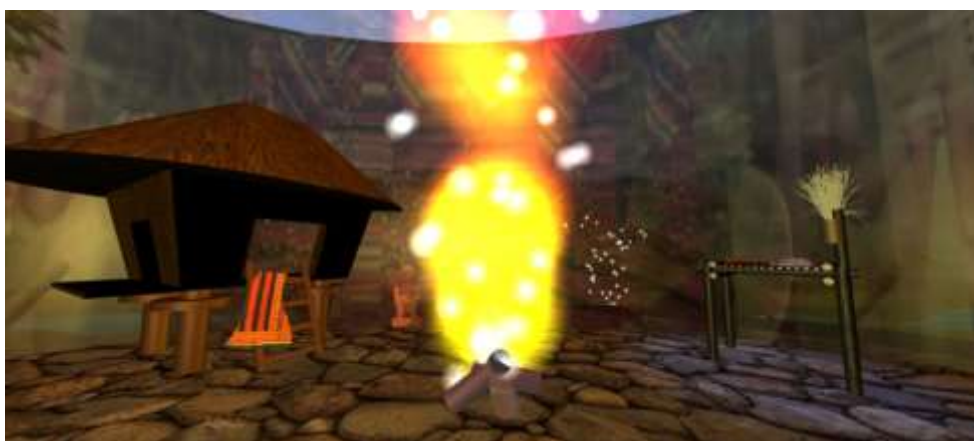
SCENE 1: Gather the Chicken



SCENE 2: Gather the Pig



SCENE 3: Gather Rice



FINAL SCENE: User places the offerings on the Bangkilay and a ritual starts

Due to the pandemic-imposed limitations in the availability of resources, the song and video used in the final scene were sourced from Youtube.

In total, the project took around one and a half months to develop in Amazon Sumerian with months more spent on learning how to use the tools and conceptualizing on the approach. I decided to settle on the prototype's current state given that a flow has been established for users to follow and that, from my point of view, I was able to capture my vision of the place. Afterwards, I published the VR output and shared the link to family and close friends to get their feedback.

## CHAPTER 5

### DISCUSSION

The project reaffirms the ability of virtual reality to provide an immersive and interactive experience for users to explore and learn more about cultural heritage.

Did the VR output of the project pique the curiosity of the target viewers? Yes. The responses received ranged from “cool”, “amazing”, “*maganda*” (beautiful), and that it looked like Minecraft, a video game in which players create and break apart various kinds of blocks in three-dimensional worlds.

Did the VR output of the project engage the test subjects? Yes, the testers were able to move around the scenes and look around the environment. However, a couple of responses were mixed due to playability issues especially on mobile phones.

Did the VR output of the project pique the curiosity of the target viewers about Igorot culture? The reaction here is also mixed. One of my nephews got scared of the “shouting” part of the ritual. This is my 7-year-old nephew who grew up in Chicago, U.S.A. and just recently migrated back to the Philippines. While my Australian brother-in-law, who is in his 40s and has never been to Mountain Province, got curious about my father’s hometown and heritage. While one of my non-tech savvy siblings was also in awe of the concept of explorational = “explore” + “educational” approach of the prototype as she encouraged my 14-year-old niece who was born in Hawaii, U.S.A. to get a glimpse my father’s heritage through the tool.

One of the key aspects realized, based on the responses received, is that having a stronger preface, a background story, or a jump-off point from where the user can position himself or herself prior to exploring the new environment would greatly help especially for children who are not, or have not been, exposed to other cultures as much as adults would have. This is particularly significant in presenting rituals and

practices (intangible culture in general) since basic visual context clues can only do so much in implying the purpose and context of these traditions. This is in contrast to tangible cultural artifacts where their simple placement as part of a bigger picture of reality already helps reinforce their purpose hence giving the audience a quick grasp of their significance.

Another aspect realized was that the viewers wanted more. This conclusion is gathered through a couple of questions received, such as whether there were items inside the houses that can be explored as well. Given that it is in VR and that everything is in 3D, it would have been more fun and engaging if there were more objects to see. This signifies that VR can offer a greater range and depth of features that can satisfy a spectrum of curiosities with regard to learning about the different facets of culture.

Further, there is also a lesson learned in terms of the product's ease of use. In order to ensure that objectives are met, usability needs to be polished and adopted to the most technologically challenged user. The inability to successfully navigate or understand how to navigate and explore the product discourages the users and, therefore, beats the purpose of learning through virtual exploration. Creators need to keep in mind that issues with the playability of the product will greatly affect its overall reception and effectivity such that issues with load time and navigation cannot just discourage but ultimately persuade users to totally abandon the concept.

If I would do the project again, I would allot more time into conceptualizing a story or storyline that would gently introduce the Igorot culture to the viewers instead of having it out there for them to explore on their own. I would also add in more artifacts, sights and sounds, and even more gamification or game-based techniques to indulge the viewers and allow them to learn on their own pace.

## CHAPTER 6

### CONCLUSION

Since Igorot culture is rich with oral lore and intangible traditions, the incorporation in VR of a journey or a story for the users to follow would help them empathetically explore the new environment, becoming a participant and not merely a distant viewer. It is essential for exploration to be done within the context of how and why cultural practices or artifacts were done or used before. This is to facilitate a longer-term cognitive understanding and not just a fleeting spark of curiosity.

The project exemplifies how VR and the breakthrough of browser-based VR can be leveraged in light of cultural heritage education. With the advancement of browser-based VR, virtual reality becomes available and more accessible to a bigger set of users, and not restricted only to those who own a VR headset. Although it comes with its own set of challenges and limitations, the fact that browser-based VR allows more people to appreciate VR products make it highly suitable for cultural heritage programs.

Having created a prototype that features some aspects of Igorot culture opens up the following questions: 1) What ethical standards do we adhere to in replicating and interpreting Igorot culture in the virtual realm? 2) How truthful and factual does the new 'reality' need to be? 3) What are the boundaries, if any, in the presentation and gamification of indigenous culture?

This prototype is a glimpse of how virtual reality can be used to teach and encourage appreciation of Filipino indigenous cultures. I am open to share this prototype in online platforms and relevant institutions to serve as a use case for VR in cultural heritage especially within the context of indigenous Igorot culture. The lessons gathered in this practice-based research project hopefully serve as guide for future



endeavors to virtualize cultural heritage and inspire those who have been meaning to utilize this technology but have not done so.

## BIBLIOGRAPHY

- Apaydin, V. (2020). *Critical Perspectives on Cultural Memory and Heritage: Construction, Transformation and Destruction*. UCL Press. Retrieved from [https://www.jstor.org/stable/j.ctv13xpsfp.6?refreqid=excelsior%3Ae237ab8b9ed6a230e128edce6ffb25ba&seq=2#metadata\\_info\\_tab\\_contents](https://www.jstor.org/stable/j.ctv13xpsfp.6?refreqid=excelsior%3Ae237ab8b9ed6a230e128edce6ffb25ba&seq=2#metadata_info_tab_contents)
- Barlig, A Province of Mountain Province. (n.d.) Retrieved from <https://www.philatlas.com/luzon/car/mountain-province/barlig.html>
- Barreiro Jr., V. (2019). A passion for virtual reality: VR Philippines and growing the niche. *Rappler*. Retrieved from <https://www.rappler.com/technology/features/passion-for-virtual-reality-technology>
- Botangen, K., Vodanovich, S., Yu, J. (2017). Preservation of Indigenous Culture among Indigenous Migrants through Social Media: the Igorot Peoples. Retrieved from <https://arxiv.org/ftp/arxiv/papers/1802/1802.09685.pdf>
- Bugeja M., Grech E.M. (2020) Using Technology and Gamification as a Means of Enhancing Users' Experience at Cultural Heritage Sites. Springer, Cham. Retrieved from [https://doi.org/10.1007/978-3-030-36107-5\\_4](https://doi.org/10.1007/978-3-030-36107-5_4)
- BurghRecords. (2020 October 27.) River Sound Effect (Royalty free Nature Sounds No Copyright Sound Effects) [Video]. Youtube. <https://www.youtube.com/watch?v=d69PTNsZ7zM>
- Cesaria F., Cucinelli A.M., De Prezzo G., Spada I. (2020). Gamification in Cultural Heritage: A Tangible User Interface Game for Learning About Local Heritage. In: Kremers H. (eds) *Digital Cultural Heritage*. Springer, Cham. Retrieved from [https://doi.org/10.1007/978-3-030-15200-0\\_28](https://doi.org/10.1007/978-3-030-15200-0_28)
- Coates, C. (2021). How Museums are using Augmented Reality. *Museum Next*. Retrieved from <https://www.museumnext.com/article/how-museums-are-using-augmented-reality/>
- Concept of Digital Heritage. (n.d.). Retrieved from <https://en.unesco.org/themes/information-preservation/digital-heritage/concept-digital-heritage>
- Cosovic, M., Ramic-Brkic, B. (2019). Game-Based Learning in Museums—Cultural Heritage Applications. Retrieved from [https://www.researchgate.net/publication/338250291\\_Game-Based\\_Learning\\_in\\_Museums-Cultural\\_Heritage\\_Applications/citation/download](https://www.researchgate.net/publication/338250291_Game-Based_Learning_in_Museums-Cultural_Heritage_Applications/citation/download)

- Defreitas, S. (2013). What can gamification add to cultural heritage? Retrieved from [https://www.digitalmeetsculture.net/wp-content/uploads/2013/07/Sara de Freitas What-can-Gamification-add-to-cultural-heritage.pdf](https://www.digitalmeetsculture.net/wp-content/uploads/2013/07/Sara_de_Freitas_What-can-Gamification-add-to-cultural-heritage.pdf)
- Diez, M. (2021). Virtual Reality Will Be A Part Of The Post-Pandemic Built World. Forbes. Retrieved from <https://www.forbes.com/sites/forbesrealestatecouncil/2021/02/01/virtual-reality-will-be-a-part-of-the-post-pandemic-built-world/?sh=5b87ef3848de>
- Eleftheria, C., Charikleia, P., Iason, C., Athanasios, T., Dimitrios, T. (2013). "An innovative augmented reality educational platform using Gamification to enhance lifelong learning and cultural education. Retrieved from <https://ieeexplore.ieee.org/abstract/document/6623724>
- Franchi, E. (n.d.). What is Cultural Heritage?. Khan Academy. Retrieved from <https://www.khanacademy.org/humanities/special-topics-art-history/arches-at-risk-cultural-heritage-education-series/arches-beginners-guide/a/what-is-cultural-heritage>
- Gamification and game-based learning. (n.d.) Centre for Teaching Excellence, University of Waterloo. Retrieved from <https://uwaterloo.ca/centre-for-teaching-excellence/teaching-resources/teaching-tips/educational-technologies/all/gamification-and-game-based-learning>
- Hamari, J., Koivisto, J., Sarsa, H. (2014). Does Gamification Work? -- A Literature Review of Empirical Studies on Gamification. Retrieved from <https://ieeexplore.ieee.org/abstract/document/6758978>
- Ifugao Houses: keeping ancestral heritage alive. (n.d.). Ruritage. Retrieved from <https://www.ruritage.eu/additional-replicators/ifugao-houses-philippines/>
- Kohnen, N., Kohnen, P. (1986). Igorot: Traditional Ways of Life and Healing among Philippine Mountain Tribes. West Germany. SDK Systemdruck Köln GmbH. Retrieved from [https://www.senhalsen-hoefe.de/wp-content/uploads/2016/05/Igorot-eng\\_003.pdf](https://www.senhalsen-hoefe.de/wp-content/uploads/2016/05/Igorot-eng_003.pdf)
- Manavis, S. (2021). How the pandemic made virtual reality mainstream. New Statesman. Retrieved from <https://www.newstatesman.com/science-tech/coronavirus/2021/02/how-pandemic-made-virtual-reality-mainstream>
- Museo Kordilyera. (n.d.). Retrieved from <https://museumfoundationph.org/project/museo-kordilyera/>
- Ronquillo, W. (1992). COMMUNITY MUSEUMS IN THE PHILIPPINES: THEIR POTENTIAL IN ENHANCING THE NATURAL AND CULTURAL HERITAGE

OF THE COUNTRY. University of San Carlos Publications. Retrieved from <https://www.jstor.org/stable/29792103>

Roy, S., Singh, P., Padun, A. (2021). Game-Based Learning for the Awareness of Culture & Tradition: An Exploratory Case Study on the Indigenous Naga Tribe. Springer Singapore. Retrieved from <https://www.springerprofessional.de/en/game-based-learning-for-the-awareness-of-culture-tradition-an-ex/19107936>

Ruben, L. (2018). What a visit to a museum can mean for children. Retrieved from <https://www.schooleducationgateway.eu/en/pub/viewpoints/experts/what-a-visit-to-a-museum-can-m.htm>

Smiderle, R., Rigo, S.J., Marques, L.B. *et al.* (2020). The impact of gamification on students' learning, engagement and behavior based on their personality traits. Retrieved from <https://doi.org/10.1186/s40561-019-0098-x>

The Difference Between Gamification and Game-Based Learning. (n.d.) Retrieved from <https://www.teachthought.com/learning/difference-gamification-game-based-learning/>

Tolentino, D., Jr. (2018). Feasts of Merit: wealth, status and feasting in the Luzon Cordillera. Baguio City. Museo Kordilyera.

Umali, T. (2018). Virtual reality to preserve Aboriginal culture. OpenGov Asia. <https://opengovasia.com/virtual-reality-to-preserve-aboriginal-culture/>

Varbova, V., Zhechkov, R. (2018). Digital solutions in the field of cultural heritage. Retrieved from [https://www.interregeurope.eu/fileadmin/user\\_upload/plp\\_uploads/policy\\_briefs/2018-08-06\\_Policy\\_brief\\_on\\_digital\\_technologies.pdf](https://www.interregeurope.eu/fileadmin/user_upload/plp_uploads/policy_briefs/2018-08-06_Policy_brief_on_digital_technologies.pdf)

Villanueva, C. (2013). Preserving Cordillera culture and history through the University of the Philippines Baguio Cordillera Studies Collection Library and UP Baguio Cordillera/Northern Luzon Historical Archives. Retrieved from <http://library.ifla.org/58/1/095-villanueva-en.pdf>

What is Cultural Heritage. (n.d.). Retrieved from [http://www.cultureindevelopment.nl/cultural\\_heritage/what\\_is\\_cultural\\_heritage](http://www.cultureindevelopment.nl/cultural_heritage/what_is_cultural_heritage)

What is meant by "cultural heritage"?. (n.d.). Retrieved from <http://www.unesco.org/new/en/culture/themes/illicit-trafficking-of-cultural-property/unesco-database-of-national-cultural-heritage-laws/frequently-asked-questions/definition-of-the-cultural-heritage/>

Weseman, A. (2021). Virtual reality could help put the empathy back in pandemic life. University of Oregon. Retrieved from <https://around.uoregon.edu/content/virtual-reality-could-help-put-empathy-back-pandemic-life>

Victory Liner Inc. (2017 February 24). Know Your North Season 1 Episode 9 Cañao [Video]. YouTube. <https://www.youtube.com/watch?v=2dnJuOHlqBU>