Incorporating Augmented Reality Technology into Humanities Courses - An Action Research on The Moon World Tour-Guide Training

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ABSTRACT

Augmented Reality, AR technology has advanced over the past few decades and is widely used in games, education, and medicine, which shows that AR technology is one of the most valued technologies. Mature AR technology is very suitable as a medium for cultural preservation and reproduction, but so far there has been few applications of AR technology for local cultures. For this reason, this action research attempted to incorporate AR technology, 3D modelling, 360-degree panoramic photography and other digital technologies to the digital cultural tour, using "Moon World Tour" as an example. This action research integrated AR technology with 3600 panoramic imaging, 3D model-building, videos, slides, e-books and interactive quizzes into the "Moon World Tour" cultural tour. By introducing AR technology to the humanities students taking the course of "Tourism Culture and Tourism Resources", the course not only provided the traditional humanities education, but also added in-depth local Taiwanese history to help students gain a better understanding of the culture of Badlands in the Moon World, and then AR technology was introduced to complete "Moon World" tour-guide training. The application of AR to promoting local culture tourism not only adds interest, knowledge, and interaction to the tour online and off-line, but also became an important medium for cultural preservation and promotion.

Keywords: Augmented Reality, Tour-Guide Training, Moon World, Humanities, Badlands Culture

I. INTRODUCTION

The use of Internet technology to disseminate knowledge has been practiced for years. At the height of the epidemic, the blended teaching approach, which replaced the physical classroom with a virtual classroom, has become a trend, illustrating that the dissemination of knowledge is enhanced by Internet technology. Those who have a lot of knowledge and experience but do not know how to use the Internet technology, you will eventually be phased out over time.

In Talent Cultivation Project for Digital Humanities, sponsored by the Ministry of Education, MOE, courses such as "Time Traveler" and "Walking Reading Literature and History" used AR extensively with great success. As new AR technology advanced at an unprecedented rate, this action research continued the trend of AR combining with humanities courses, with the hope of broadening the scope by using 3D model-building to create a sense of reality, aerial photography to introduce topography and landscapes from an aerial perspective, e-book application to create books that can be read on the go, videos and interviews filmed on the spot, and interactive games and activities. It is hoped that the incorporation of humanities and AR can appeal to more users and potential travelers. Furthermore, it will help to achieve the multiple goals of sharing knowledge, improving blended teaching, continuing and further upgrading the integration of humanities and technology, and producing new interdisciplinary and interdisciplinary courses.

Taiwan's tourism has faced a dilemma: people are forbidden to travel overseas, which pushes the new tourism to market online and offline. Another dilemmas is that domestic tour demand has multiplied while the islandwide destinations are limited. In a nutshell, virtual tours and virtual marketing are full of potential, which can be achieved by exploring more-in-depth local tours and discovering the hidden gems with interactive AR technology. This action research featured the Moon World badlands, covering Zuozhen, Tianliao, Longqi, and Neimen, all of which have great potentials as tour destinations. Other characteristics of this area nicknamed ZuoTianLongNei include badlands, fossils, history of Zhu Yigui, the emperor of ducks, religious culture of "ancestors' spirits" and "Kettle-worshipping," etc. In this action research, students were expected to use new augmented reality interactive technology by using a 3600 panoramic view, compiling e-books to tell stories, designing witty questions and answers to interact with users, building 3D model images to create an immersive experience and exciting videos.

This research paper was created based on the action research, which has brought together the expertise of tourism teacher and AR professor, in the hope to cultivate the future tour guides who are good at humanities subjects

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and AR technology. To help students create their semester-end projects, an array of learning activities were conducted: instruction and demonstration in the classroom, multiple field-trips, experts' consultation, and hands-on practice. Students got to learn from the professional in humanities, AR technology, Taiwan history, local culture, tourism industry and produce their projects, which displayed and marketed old local culture with the AR technology.

It took hours of AR technology, tourism instruction, three field trips, hours of project discussion and consultation, as well as a retired Taiwan historian, local culture experts, experienced tour guides, a translation-major graduate student TA, a doctoral student TA, and a travel manager to complete the 18-week-long course. Every one has a role to play, for example, the historian providing in-depth knowledge on Taiwan history, local culture experts extensive local history and anecdotes, tour guides their on-the-job experience, TAs their constant and much-needed interaction with students. To discover the hidden gems scattered in ZuoTianLongNei, it took more than in-classroom instruction, which, in return, helped translation-major students to create their first-ever AR-based tour projects.

In this paper, the author and coordinator of "Local Cultures X AR=Unlimited Tourism," the project sponsored by the MOE Talent Cultivation Project for Digital Humanities, attempted to walk readers through the whole project, hoping to share our idea of incorporation of AR technology into a tour-guide training course with a goal to create an interdisciplinary, applicable digital humanities course. The remaining of this paper is organized as follows: Section II describing Badlands Culture of the Moon World, Section III describing the implementation of AR technology into a tour-guide training course, Section IV displaying the students' projects, and Section V presenting a brief discussion and conclusion.

II. BADLANDS CULTURE

In recent years, Taiwan has seen a boom in domestic tourism. Taiwan is rich in natural scenery of mountains and seas, as well as a variety of local humanities and cultures. Since many tourists are seeking for an informative and educational way to travel, the government and the tourism industry have started to develop eco-tourism and cultural tourism, with increasing emphasis on the ecological and natural resources as well as the social history and culture. Zuozhen, Neimen, Longqi, and Tianliao are districts on the border of Tainan and Kaohsiung cities. Located in the mountainous area, rather than in the city center, the four districts are rich in the natural scenery of the "Moon World" and the aboriginal history of the "Siraya people." The following is a brief description of the characteristics, which is intended to establish readers' basic background knowledge and awareness, so as to understand the uniqueness of the various scenic spots more comprehensively.

2.1. The "Moon World" and the Siraya

2.1.1 Badlands "Moon World"

Badlands are dry terrain where loose sedimentary rocks and clay-rich soils have been extensively eroded by wind and water (as shown in Figure 1(a)). The terrain is characterized by steep slopes, very sparse vegetation, high density of drainage and lack of substantial weathering layers. Rough terrain such as canyons, gullies, and erosion ditches are common in the badlands, and they are generally difficult for people to travel on foot.

(a)Badlands Terrain **(b)Mudstone**

Figure 1. Badlands

The Moon World is mainly composed of mudstone, sandstone, siltstone and shale, which are chalky and greenish. The mudstone layer is poorly resistant to erosion and is easily eroded by rain or river water. The surface of the ground is often eroded into many gullies and rain gullies, forming gullies and ditches everywhere and a delicate network of water systems. Due to the high salinity and high pH value of the soil, it is difficult for grasses and trees to grow, and only silver acacia and spiny bamboo groves grow in the sedimentary layer on the mudstone layer [1]. The ground is bare as far as the eye can see, and with the presence of luminous minerals on the surface, it resembles the surface of the moon, hence the name "Moon World" (as shown in Figure 1(b)).

In Taiwan, there are many scenic spots that are famous for their moon-like terrain, mainly in the low hills of the southern Taiwan, for example, the Niupu Moon World in Longqi, Tainan City, the Tianliao Moon World, Kaohsiung City, the Yanchao Moon World, Kaohsiung City, the Caoshan Moon World at the border of Tainan's Zuozhen District and Neimen District of Kaohsiung City, as well as the Liji Moon World, Beinan Township, Taitung County. Such a magnificent and magical natural landscape is called the miniature of " the Grand Canyon of Taiwan".

2.1.2 The Siraya Pingpu Aboriginal Culture

Taiwan aborigines are divided into aborigines living in the mountains and on the plains. The Siraya people are the Pingpu people residing in the Chianan Plains. The Siraya people had a typically matriarchal society, so women are responsible for the important affairs of the family and are the heirs to the family property. In the 19th century, the pressure from the Han Chinese forced them to migrate eastward. Although influenced by the Han Chinese culture, the traditional rituals and a small part of their language still exist today. The "Gongxie, communal house" is the core of the Pingpu settlement and is the place where the Siraya men conduct their business (as shown in Figure 2(a)) and where the religious ritual of Aritt or Alid, the ancestral spirit,

is worshiped. In the early days, most of the houses were made of bamboo trunks, thatches, and sugar cane leaves, and were dedicated to the ancestral spirit Aritt or Alid. The ancestral spirits were housed in a ritual pot (as shown in Figure 2(b)), which was wrapped in red cloth to symbolize its sacredness, and water was replaced on the first and fifteenth days of each lunar month. Common sacrificial offerings include betel nuts, rice wine, tea, and cigarettes.

(a)Gongxie, communal house (b)Aritt Altar

Figure 2. Tourist Sites regarding Siraya People

2.2 Tourist Spots in the Zuozhen Badlands

2.2.1 Aritt Altar in Zuozhen Dist.

The altar is located in Zhongzheng Village's Kousheliao, Zuozhen District (as shown in Figure 3(a)), and is worshipped by the Siraya people. Every year, on the 15th day of the first, sixth, and tenth lunar months, the sacrificial offerings are displayed, including betel nut, cigarettes, rice wine, sweet rice cakes, and savory sticky rice, with no incense being held or paper money burned (as shown in Figure 3(b)). The jiao, a pair of half-moon-shaped blocks for praying is made of taro root, cut into two half-moon shapes, unlike the wooden blocks used by the Han Chinese. The rare surnames of the residents in Zuozhen, such as Du(poison), Bing (soldier), Mai (buying), Ai (sadness), Li (power), Luo(net), Biao (standard), Pang (hugeness), Zhuo (outstanding), and Mu, etc., are one of the characteristics that distinguish the Zuochen Siraya from the other people [2].

(a) Aritt Altar (b)Sacrificial offerings

Figure 3. Aritt Altar, a Religious Spot in the Zuozhen

2.2.2 Zuozhen Fossil Park

The Cailiao River is a tributary of the Zengwen River in southwestern Taiwan (as shown in Figure 4(a)). The riverbed is abundant in fossils, and after heavy rains, fossils are often washed out of the riverbed. After being investigated, this area was found to be rich in fossils; therefore, the Zuozhen Dist. has become important fossil excavation site in Taiwan ever since. (as shown in Figure 4(b)). In 1981, the Tainan City Government established the Cailliao Fossil Museum. Chen Chunmu, known as "Grandfather of Fossils", who made a significant contribution to Taiwan's fossil education, was appointed as the curator to collect and display the fossils excavated from this area.

In 2017, the Cailiao Fossil Museum was rebuilt as the Tainan Zuozhen Fossil Park (as shown in Figure 4(c)), expanding from the original two buildings to five buildings, including the Natural History Education Building, Story Building, Life Evolution Building, Fossil Display Building and Exploration Building (as shown in Figure 4(d)), making it the first and only fossil-themed educational park in Taiwan [3].

(a) The Cailiao River (b)Screening for fossils

(c)The Cailiao Fossil Park (d)Fossil Display

Figure 4. Tourist Sites in Zuozhen Dist.

2.3 Tourist Sites in the Tianliao Badlands

Tianliao District is under the jurisdiction of Kaohsiung City, and is located in the vicinity of Alian, Yanchao, Qishan, Neimen Districts of Kaohsiung, Guanmiao, and Longqi Districts of Tainan City. Tianliao is surrounded by mountains and has a vast and magnificent badland terrain, with tributaries of the Erren River intertwining all over the area. Due to the topography, soil quality and rainfall, agriculture, bamboo and animal husbandry are the main industries.

2.3.1 The Moon World Geopark

The special geomorphology of the Tianliao Moon World Badlands is a unique landscape. Walking along the Badlands Trail and the Lakeside Trail (as shown in Figure 5(a)), you can get a close look at the rough and dry texture of the badlands mudstone and feel the magic of nature. With the Moon Pond in the center, surrounded by the badland terrains, this geopark reminds visitors of the scene of the Flaming Mountain in the story Journey to the West (as shown in Figure 5(b)). Climbing up the stairway in the park, you can overlook the vastness of the badlands from up high. Moreover, you can see Mt. Dagangshan and Mt. Xiaogangshan from a distance.

(a) The Moon World Geopark (b)Badland terrain

Figure 5. Tourist Sites in the Moon World Geopark

2.3.2 One-line Sky in Jiuyan

The One-line sky, a narrow passage between huge uplifted coral reefs, is located in Nan'an Village, Tianliao District, and can be accessed from the trail by the Jiuyan Chaoyuan Temple. The limestone layer of the uplifted coral reefs has been separated. As a result of weathering, erosion, and gravitation sliding, the passage between the uplifted coral reefs has been gradually enlarged [4]. When viewers look up from inside the passage, the sky becomes a line, hence the name "One-Line Sky" (as shown in Figure 6(a)). The limestone terrain is susceptible to erosion, forming erosion ditches and erosion caves, and the stalactites along the walls are of strange and amazing shapes. The stalactite terrain at the entrance is named after its resemblance to a sow's teat, which was later renamed as "Shirumu, Stone Sow" (as shown in Figure 6(b)). There are several caves at the foot of the hill, a few of them are natural, but most of them are air raid caves dug by hand during the Japanese period, commonly known as air-raid caves. According to Taiwanese veterans, when the Pacific War broke out in 1945, the Japanese army helped the navy to dig caves and passageways in Dagangshan and Xiaogangshan to hide airplanes from the Okayama Air Force base.


(a)Jiuyan One-line Sky (b) Shirumu stalactite

Figure 6. Tourist Sites in Jiuyan

2.3.3 Gouyunyin-Yiminye Pavilion

The area around Xide Village and Chongde Village in Tianliao District was formerly known as "Gouyunyin", named after the high terrain, which looked like a dog sleeping on the ground from a distance. During the Qing Dynasty, the local residents formed their own militia to help the government and soldiers maintain law and order, and they supported each other to form a group to station in this area. On one occasion, the militia was attacked by bandits and killed. In remembrance of their martyrdom, the villagers buried them together and built a tomb (as shown in Figure 7(a)), and built the "Yiminye Pavilion" (as shown in Figure 7(b)) at the garrison site to pay respects. The local people called the place "Yingpanlun". There is also a pond next to the pavilion called "Mapubei", which means the place where the war horses drank water and rested [5].

(a) Mass grave for martyrs (b) Yiminye Pavilion

Figure 7. Gouyunyin Tourist Sites

2.3.4 Moon World Mudstone Volcano

There are more than 20 mud craters in the area of Tianliao, Yanchao, and Qishan. The mudstone area is rich in natural gas and groundwater. As a result, the mud and natural gas are intermittently ejected from the ground due to the accumulated pressure, resembling a small volcanic eruption, emitting flammable gas. The scale of the eruption depends on the accumulated pressure of the natural gas and mud. The landform is eroded by rainfall, creating some special terrain.

Located in low-lying terrain, the Moon World Mudstone Crater (as shown in Figure 8(a)), emits mud that forms a mud field of several meters in diameter; (as shown in Figure 8(b)) According to the local elderly, once a cow approached the crater and accidentally fell into it and disappeared, which shows the width and depth of the mud crater.


(a) Moon World Mud Crater (b) Crater Erupting

Figure 8. The Moon World Mud Craters

2.3.5 The Stone Temple (Cixuanshengtian Temple)

Cixuanshengtian Temple is also known as "Stone Temple" because of its unique architectural appearance (as shown in Figure 9(a)). In 1994, nearly 500 Thai migrant workers came to Taiwan for the construction of Formosa Highway; however, they were left jobless and had no money to return to their home country due to the bankruptcy of the construction company. The migrant workers were then taken in by Abbot Shih Tien Wah, who provided them with food and lodging, and raised money to help them return to Thailand. To repay his kindness, the migrant workers collected many sea rocks and seashells and build the temple over a period of 12 years (as shown in Figure 9(b)) [5].


(a)The Stone Temple (b)The Interior of the Temple

Figure 9. The Stone Temple

2.4 Tourist Sites in Longqi

Located in the southeastern part of Tainan City, Longqi Dist. is a hilly area with an altitude of 80-350 meters above sea level. Because of its mudstone terrain, it is not suitable for agriculture. On top of that, its proximity to city center of Tainan makes it the least populous district in Tainan City.

The Niupu Mudstone Soil and Water Conservation Park is in the catchment area of the Pizhaigou Creek, a tributary of the upper Erren River (as shown in Figure 10(a)). This area has a layer of mudstone of an average thickness of 1500 meters and is abandant in fossils [6]. The surface erosion and stream erosion over the years have created the unique landscape of the Moon World.

In the chalky mudstone terrain where plants do not easily grow, soil and water conservation is extremely difficult, and the slopes tend to slide easily. Heavy rains can cause mudslides on a large scale. In 1998, the Bureau of Soil and Water Conservation of the Council of Agriculture, Executive Yuan, introduced the concept of integrated catchment management, constructing ecological methods such as vegetation strips, ecological walls, and tile stacking. In addition, the Department of Agriculture and Forestry built a man-made dam for irrigation and water storage in Niupu Village and it could regulate river flow (as shown in Figure 10(b)). It is an educational park serving multiple purposes: soil and water conservation, ecological restoration, and environmental education.

(a)Soil and Water Conservation Park (b)Niupu Lake
Figure 10. Niupu Mudstone Education Park

2.5 Tourist Sites in Neimen Badlands

2.5.1 Lohanmen Processions and Songjiangzhen Martial Art Culture

The Songjiangzhen martial art culture originated from Shi Nai'an's "*Shuihu Zhuan*" or *The Outlaws of the Marsh*, in which 108 characters were loyal and righteous in helping the poor. They were immortalized and believed to protect the people and drive away evil spirits. During the Qing Dynasty, Taiwan's rural areas were not safe, so each community formed their own groups to learn martial arts to protect their own families. In the traditional agricultural society, such martial art groups not only had significance in religious belief, leisure and entertainment, but also had the social function of social association, sports and fitness, and togetherness in community.

Every year, on the 19th day of the second lunar month, Zizhu Temple in Neimen (as shown in Figure 11(a)) celebrates the birthdays of Avalokiteshvara, Guanyin, or Goddess of Mercy by holding a religious parade and inviting folk art groups to perform. In 2015, the Tourism Bureau of the Ministry of Transportation and Communications listed it in the "Twelve Major Local Festivals in Taiwan - Kaohsiung Neimen Songjiangzhen Carnival" [7]. With a total population of only 15,000, Neimen District has fifty-four folk art troupes, of which 18 are Songjiangzhen martial art groups (as shown in Figure 11(b)). Neimen prides itself in preserving traditional martial art culture.


(a)Neimen ZizhuTemple (b)Songjiangzhen Martial
Figure 11. Tourist Sites in Neimen Dist.

2.5.2 Catering Service Culture

Catering chefs are the cooking masters in charge of catering service (as shown in Figure 12(a)). Traditionally. They have been respected as masters for their craftsmanship in Taiwan. During the Qing Dynasty, the rich Han Chinese would invite catering chefs to their homes to cook for them (as shown in Figure 12(b)). For large and important banquets or festivals, the chefs were mobilized as a group, with the master taking charge of the overall process and cuisine.

During the Japanese period, a different kind of commoner banqueting culture emerged in the rural areas, where villagers who were not professionally-trained but good cooks provided cooking service to those holding banquets. While hosts provided ingredients, pots and pans, bowls, ladles, pots, stoves, firewood, and tables and chairs, farmer-cooks cooked and guests served the food themselves. The rise of modern banqueting culture is thought to have originated in the Neimen, where a banqueting chef named Tang Zhujiao actively trained his apprentices and then encourage them to set up shops to train more cooks, spreading the banqueting culture throughout Taiwan. Since 2001, the Tourism Bureau of the Ministry of Transportation and Communications has listed Neimen's banqueting culture as one of the "12 major local events in Taiwan" [8].


(a) Neimen Caterers (b)Banquet Delicacies
Figure 12. Neimen Catering Culture

2.5.3 Zhu Yigui, Emperor of Ducks

"Zhu Yigui Incident" was the first large-scale civil unrest in Taiwan during the Qing Dynasty, and the largest of Taiwan's three major civil unrests. In 1721, Zhu Yigui, nicknamed Emperor of ducks, and others, dissatisfied with the government's excessive taxation and improper extortion of the people, called for a mass revolt against the Qing government. After taking over the administrative center of then-capital Tainan, the Qing officials boarded boats and fled, and he was crowned by the rebels as " Zhongxing Emperor". The Qing government then sent troops to Taiwan to suppress the rebellion and successfully captured Zhu Yigui.

Legend has it that Zhu Yigui started his career as a duck farmer and was good at training ducks as if he was commanding an army, and hence the nickname “Emperor of ducks.” Years after the incident, local people built a shrine to commemorate this "hero" of Neimen at the site of Zhu Yigui's uprising (as shown in Figure 13(a)). On the front side of the monument is the inscription "Emperor of Taiwan, Hero of the People, King of Revival, Emperor of Ducks", while on the side is a poem circulated by the local people: "Wearing a Ming Dynasty hat, wearing Qing Dynasty clothes; building Yonghe in May, returned to Kangxi in June" (as shown in Figure 13(b)). The poem tells the story of Zhu Yigui's resistance to the Qing Dynasty.

(a)Zhu Yigui Park **(b) Zhi Yigui Statue**

Figure 13. Zhu Yigui, the Emperor of Ducks

III. APPLY AR INTO HUMANITIES

In this paper, we present an example of incorporating Augmented Reality Technology into a Tour Guide Training course, focusing on the cultural tour of the Badlands mentioned in Chapter 2.

The 18-week course was divided into five segments, with Segment 1 (weeks 1-6) providing students background knowledge of tourism culture and tourism resources in Taiwan; Segment 2 (weeks 7-12) targeting at AR-related technology; Segment 3 (weeks 13-15) field trips to build a sense of “been there; done that” so as to promote the badland culture; Segment 4 (weeks 16&17) focusing on integrating humanities with AR technology to create group projects; and Segment 5 in which students present their projects in front of a travel manger, who is also a tourism lecturer and the whole class, so as to demonstrate the course results.

Augmented Reality, AR, is usually used to obtain spatial orientation through the use of image recognition technology in real-world scenes taken by cameras. This action research paper uses the AR APP framework of [9] to design an AR APP for "Tianliao Moon World" as a model to guide non-IT-major students to learn and apply AR technology for tourism applications. During weeks 13 to 15, the humanities-major students were led by professionally-trained tour guides, historians, local culture experts, instructors, and TAs to explore the various tourist sites of history and culture mentioned in Chapter 2, and through the data collection and design of various innovative digital media, such as panoramic video and video shooting, slide show and e-book production, 3D modelling, and interactive quiz design, the 2D and non-interactive media designed by the students were revitalized by AR technology to become an interactive presentation through this AR APP template.

This paper uses the six photos in Figure 14 as the trigger for AR and the AR APP to expand the "Tianliao Moon World" with panoramic images, videos, slides, e-books, 3D model construction, and interactive quiz design.

Figure 14. Six "Moon World" photos

In recent years, due to the development of multimedia hardware and software technology, the AR effect production has been supported by relevant software, so the application of AR is not difficult; therefore, this paper is focused on the planning and application of AR APP into the Moon World tour-guide training as well as the integrating process. The flowchart of augmented reality APP planning and application is shown in Figure 15.

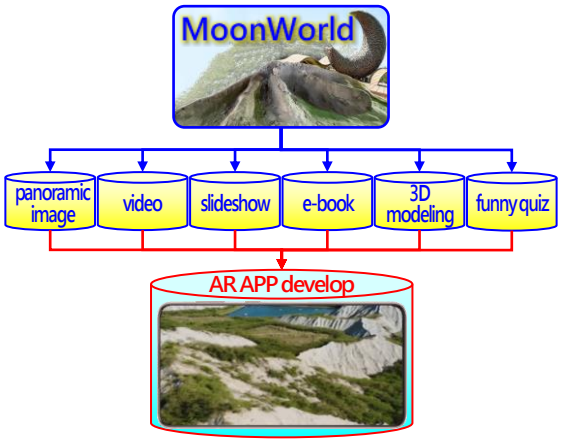

Figure 15. The flowchart of AR APP application

Figure 16. Vuforia-Unity AR Development Framework

The Vuforia-Unity AR development and application framework is shown in Figure 16. The Vuforia package [10] was used to introduce the AR technology into the Unity 3D [11] game engine and combined with the 360-degree panoramic photography VR scene creation, 3D modelling, recording and editing of photos, texts, and audio-visual presentations, introduction to the production of slides, e-books and fun quizzes for the "Tianliao Moon World" tour. The "Tianliao Moon World" tour guide training is designed to teach non-IT-major students to use AR technology for tourism applications. The following section explains the new digital multimedia technologies such as panoramic images, aerial photography, 3D modeling, and AR virtual tours.

3.1 Panoramic Image Creation

Thanks to the rapid advances in digital technology, software and hardware, today's panoramic images can be captured in real time with a single click, as shown in Figure 17. The panoramic image can be displayed in the webpage by switching the user's view angle with the mouse, and through Cardboard, the user's head can be tracked by the cell phone to interactively present the user's view angle in real time, making the user experience more intuitive and immersive.

Figure 17. Panoramic Image

3.2 Aerial Photography

An aerial image is an image of the earth's landscape taken from the air. In recent years, due to the rapid advancement of software and hardware technology for unmanned aerial vehicles, or UAVs, the application of UAVs is rapidly emerging. Due to the stable hovering technology of consumer UAVs, a non-professionally -trained person can easily control the UAV. In addition, most of the consumer air cameras in the market provide the function of one-click video shooting, which also allows the general public to quickly obtain special shooting skills of the video. The DJI Mavic Air, a commonly-used air camera used in this paper, has as many as six built-in one-touch fully automatic video shooting functions. Figure 18: One-click video of DJI Mavic Air - aerial shot of Tianliao Moon World.

Figure 18. Aerial Photography

3.3 3D Modelling

3D modeling is commonly done by modeling software, 3D Scanner modeling, and transforming 2D image to 3D image (as shown in Figure 19). The new generation of iPhone 12 Pro, which was released in 2020, has a built-in LiDar optical radar scanner and can be used for 3D modeling in real time. Figure 19 shows the 3D model of the stone lion at Zizhu Temple in Neimen Nanhai Zizhu temple with the iPhone 12 Pro.

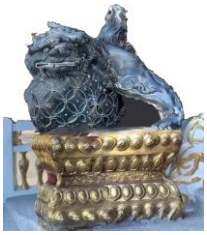

Figure 19. 3Dmodelling

3.4 AR Touring

In this paper, the Tianliao Moon World is featured, and the AR technology is integrated with "panoramic image", "video", "slide show", "e-book", "3D modeling" and "interactive quiz" to guide the non-IT-major students to use AR technology in the tourism application. The Vuforia-Unity AR development and application framework, shown in Figure 16, was used to build a panoramic image, an aerial video, a slide show of scenic spots, a night view e-book, a 3D modeling and a related interactive quiz media. As a result, AR tourism application is created by incorporating the Vuforia package in the Unity3D game engine. The six photos sown in Figure 14, accompanied by the AR APP, can easily achieve the purpose of tour promotion, through which non-IT-major students can integrate AR technology to tourism application. The six photos are expanded with six types of digital multimedia, including "panoramic image," "video, ""slide show," "e-book," "3D modeling," and "interactive quizzes." By using the AR APP of the Tianliao Moon World to activate the 2D, non-interactive photos, touring the Moon World has become three-dimensional, interactive, intuitive, and immersive.

IV. COURSE IMPLEMENTATION & STUDENTS' PROJECTS

In order to teach non-IT-major students to quickly build AR tourism application, in which they are expected to implement the AR technology into their humanities specialty and to become a capable tour- guide in the digital era, the tourism teacher Tsaiti Chen applied for the MOE Talent Cultivation Project for Digital Humanities, which is designed to encourage such an undertaking of implementing digital technology in humanities courses. With the MOE's approval, a team comprised of a tourism teacher, an IT professor, a Taiwan history PhD student TA, a translation-major graduate student TA, a retired historian, several local culture experts, and a travel manager took was organized to began to cooperate.

The key to a successful digital humanity project takes careful planning, step-by-step implementation, trial and error, as well as communication and cooperation. In this action research paper, the implementing process of incorporating AR technology with tourism course with a focus on the Tianliao Moon World is recorded, analyzed, and critiqued. Moreover, this paper will conclude with more discussions and recommendation for future research.

In a nutshell, for the first six weeks, students gained background knowledge on tourism culture and Taiwan's tourism resources taught by a tourism instructor, followed by AR technology training provided by an IT-professor for six weeks. From weeks 13-15, students took three whole-day trips to the Moon Worlds for learning from the historian and local culture experts, collecting material, and brainstorming their digital humanities projects. As shown in Figure 20(a), Tsaiti Chen, the tourism instructor and author taught the basic content of tourism culture and Taiwan's tourism resources, while explaining how to use AR technology to promote the tourism industry. Then, Chieh-Ling Huang, the IT professor and co-author, taught AR technology, related applications, and the integration with "panoramic image", "video", "slide show", "e-book", "3D modeling" and "interactive Q&A" into the "Tianliao Moon World" tour, as shown in Figure 20(b). After the students had a preliminary understanding of the badland culture and the AR APP, the students took three trips the badlands tourist sites where the retired historian Chen-Hua Wen, local culture experts taught students about the history and culture as shown in Figure 20(c). Upon completing their material collecting and brainstorming for their projects, the students used the material collected from the field trips to the tourist sites in the badlands to create an AR APP, **which implemented the AP technology to tourism.**

(a) Tsai-Ti Chen teaching tourism culture

(a) Chieh-Ling Huang teaching AR APP

(a) Chen-Hua Wen teaching local history and culture

Figure 20. Snapshots from classroom and field trips

The modularization are characterized by the following:

- **Importance**: Humanities learning and information technology learning have been regarded two parallel lines by most students. Humanities majors have always regarded information technology as intimidating, resulting in resistance to interdisciplinary learning. Thanks to the MOE Talent Cultivation Project, this digital humanities course, or "Local X AR=unlimited/online tourism" get to materialize. In this action research, we get to observe first-hand how students learn and apply what they have learned to produce AR tourism projects. This course/project is the first time for translation-major students to be immersed in AR interactive technology, to be motivated and inspired and taught by an IT-professor, who made every effort to bring out the students' potential in AR learning. As stated in the objectives of the course, students are expected to appreciate, understand, learn, and apply the AR interactive technology to produce tourism projects, most of them achieved their goals. What we expect from the students, they have delivered: they created their Moon World projects by integrating culture tourism, AR technology, local history and culture. From feeling anxious and uncertain about their projects to their completed projects, this group of humanities-major students were excited about and appreciative of and learned from the digital humanities project, which brought them much closer to the AR technology and digital technology as a whole.

- **Continuity**: This course/project focuses on the local history, culture, and tourism resources of Zuozhen, Tianliao, Longqi, and Neimen, which are in close proximity to Chang Jung Christian University. In the future, it is hoped that students can discover more hidden gem locally while using their foreign language expertise (mostly English and Japanese) to produce projects in foreign languages, which can be used to promote local culture to foreign travelers.

- **Innovation**: This course/project integrates humanities lectures, information technology lectures, especially AR related technology, fieldwork exploration, projects, , so that students can learn from professional teachers, experts, and practitioners in different fields. The required semester-end projects allowed students to create their own tourism projects which are AR-based and interactive. In the age of digital technology, marketing local tourism resources requires more cross-disciplinary learning like this course/project, which demonstrated the digital humanities course is doable, practical, and will be the trend in the near future.

- **Interdisciplinary Cooperation**: Such an innovative course/project requires a team of interdisciplinary faculty members (co-teaching partners) and interdisciplinary resources, and we firmly believe that more interdisciplinary courses like this would benefit more humanities-major students.

- **Humanities-major Students' Digital Literacy**: Simply put, such a course enables students to learn about basic tourism culture and Taiwan's tourism resources, as well as the extensive use of AR technology and digital tools in the field of tourism. To promote such integration, our team also post-produced course recordings and uploaded them on the Chinese Open education platform so as to provide learning resources for self-learning.

Due to the rapid progress of digital technology hardware and software in recent years, there are many useful digital hardware and software tools in the market, while most of the students in Taiwan have been exposed to the digital environment and have certain amount of experience in using these digital tools. However, to learn to making good use of digital tools and apply the tools into projects, students often need to spend quite some time on mastering them, especially for non-IT-major students. This course/project attempted to open the interdisciplinary door to usher in more possibilities of digital humanities courses and projects.

To reach the goal while taking into consideration of the psychological and technological faced the humanities students, this course/project not only focuses on the introduction of digital tools, but also provides a ready-to-use AR tool kit so that students can use digital tools to develop their tourism projects with the confidence of "following the professor's guidance; success is guaranteed." This course/project is aimed to motivate students, demonstrate the digital tools, teach them how and where to employ the digital tools so that students can benefit from the whole learning process with the minimum frustration. What this course/projects attempted to do was to stimulate their interest in using digital tools and have fun creating their first-ever AR tourism projects, not to train future IT professionals. As the old Chinese saying goes, we give student the fishing rod, so they will be able to fish wherever and whenever they want. In the future, students will use these digital tools wherever they see fit.

➢ **Students' Projects**

Project created by: Tingshan Zhang, Yongni Song, Jiayu Zhuang, Mingying Wu, Yuxuan Jiang, and Lingzhi Wung: https://youtu.be/C5D8YzJvPLU (Figure 21)

Teachers' comments: This group project is characterized by outstanding team work, skillfully integrating local tours with AR technology, and creativity. This group created a film introducing the tourist sites in depth and detail, incorporating the interactive AR technology which allows viewers to engage in quizzes, and get additional information, so as to enjoy themselves more in the interactive way.

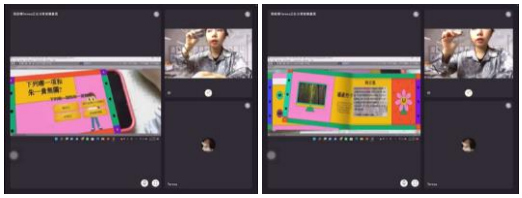

Figure 21. Students' Projects I.

Project created by Zonglin Wu : https://youtu.be/czhoxedK01M (Figure 22)

Teachers' comments: this project is created single-handed by Zonglin Wu, who demonstrated his skill of making good use of the digital tools he learned from this class. As he said in this project, AR technology creates layer upon layer of information and fun, which awaits viewers to discover.

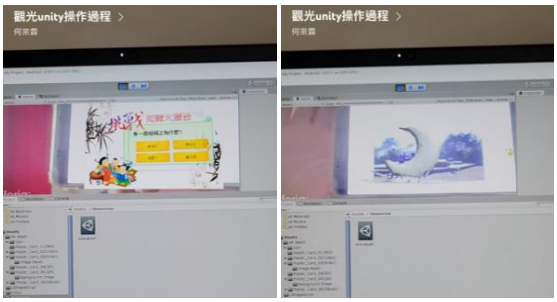

Figure 22. Students' Projects II.

From students' projects, we can see the students' progress from entering the unknown digital territory with apprehension, following IT professor's step-by-step instruction and guidance, to struggling in the project-creating sessions. To our surprise, students are able to present the local culture tourism with the application of AR technology.

IT professor's step-by-step guidance and fool-proof ready-to-use tool kit is the key to students' rewarding learning experience.

V. DISCUSSIONS & FUTURE ACTION RESEARCHES

At the initial stage, some students were apprehensive in taking this course for fear of becoming a guinea pig of such a digital humanities project and several even opted out of the course. However, more students expressed their regrets of not being able to be part of such an innovative project as the fine words of mouth spread. Such projects can undoubtedly benefit humanities students through the interdisciplinary co-teaching, field trips, and hands-on projects. Our digital humanities project of "Local x AR=unlimited/online tourism" motivates more students and show them that AR technology is something for them to use, not to fear.

For teachers involved in this action research, we get to create a new and innovative syllabus which can bring together teachers from different fields and create synergy which can benefit both humanities students as well as IT students. Thanks to the success and potential of this course/project, Chang Jung Christian University secures another MOE Xplorer Higher-Education Competence Project, which aims to integrate the faculty and resources of the College of Humanities and Social Sciences and the College of Information and Design, in the hope to innovate proposed courses through implementation of IT and AR technology in humanities courses.

It is our hope to continue such digital humanities undertaking and to improve students' IT literacy in the digital era.

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