

THE CHINESE UNIVERSITY OF HONG KONG
Courseware Development Grant (2018-19)

Final Report

Report due 31 May 2019
Please return by email to CUHK cdgs@cuhk.edu.hk

PART I

Project title: **Using Virtual Reality (VR) Technology to Create Virtual Site Visit**

Principal supervisor: **Dr. Cynthia Hou**

Co-supervisor(s): **N/A**

Department / Unit: **School of Hotel and Tourism Management**

Project duration: From September 2018 to May 2019

Date report submitted: **May 31st 2019**

1. Project objectives

Is the project on track to meet its objectives?

Yes.

1. Two VR videos as well as 360-degree photos are produced: (1) Zero Carbon Building; (2) A heritage site: the Former Explosives Magazine of the British old Victoria Barracks.
2. Students can access the videos through a web platform as well as an app version. The VR videos were used in classroom teaching. VR videos can be viewed from the following links:

Zero Carbon Building VR video can be viewed from the following link:

<https://s3-ap-southeast-1.amazonaws.com/zcb/zcb.htm>

A mobile app can be installed in the smart phone to view the VR version (with VR glasses). The installation of the app for viewing ZCB is listed in the following link:

<https://s3-ap-southeast-1.amazonaws.com/zcb/index.htm>

The Asia Society VR video can be viewed from the following link:

<https://s3-ap-southeast-1.amazonaws.com/ashk/index.htm>

A mobile app can be installed in the smart phone to view the VR version (with VR glasses). The installation of the app for viewing Asia Society is listed in the following link:

<https://s3-ap-southeast-1.amazonaws.com/ashk/index.htm>

Have the objectives been changed as a result of the experience of working on your CDG project?

The proposed project objectives remain unchanged and are achieved within the proposed project period.

2. Process, outcomes or deliverables

Please specify the number of different types of deliverables produced, and the course(s) (with course codes and titles) that have used the deliverables in Part IV, and provide more detailed descriptions here.

Has the nature of the deliverables been changed?

Have you adjusted your timeline?

Overall, was the project completed satisfactorily?

1. HTMG 4600B Facilities Development and Management for Real Estate and Hospitality Industry, Term 2, 2018-2019

45 undergraduate students participated in the virtual site visit class and viewed the VR video of Zero Carbon Building to learn green building features and design. Students were asked to complete a pre-view test, a post-view test and a questionnaire survey during the VR video viewing process.

2. HTMG 5022H Revitalization of Historic Buildings, Term 3, 2018-2019

33 post-graduate students from the program of Real Estate and Hospitality Asset Management participated in the virtual site visit and viewed the VR video of Asia Society to learn heritage adaptive reuse a revitalization. The students complete a test and a questionnaire survey after the VR video viewing process.

3. HTMG 4536 Heritage Tourism, Term 1, 2018-2019

60 undergraduate students used the 360-degree cameras to take photos to complete the course assignment and present the assignment with the photos taken by themselves.

Has the nature of the deliverables been changed?

The nature of the deliverables has remained unchanged.

Have you adjusted your timeline?

No, the project was delivered within the proposed timeline.

Overall, was the project completed satisfactorily?

Yes. The project was completed on time with proposed deliverables in a satisfactory manner. The technical part of the project was successfully completed within the proposed timeline and the proposed VR videos were produced with a high level of quality. As an instructor, I have spent a considerable of time in designing the content for the videos, including liaising with the administrators of the site organizations, proposing the shooting timeline, investigating the proposed sites, designing the shooting sequence, writing the audio files content, and editing with the VR video vendor. The production is a time consuming process with some degree of unexpected situation. I am very satisfied with the production outcome as I have overcome the difficulties and complete the VR video production on time. Further, students were very interested in the VR site visit and provided many useful feedbacks. Based on their comments, I believe that the project is completed satisfactorily.

3. Evaluation Plan

Have you altered your evaluation plans?

What monitoring data did you collect?

Does your evaluation indicate that you have achieved your objectives?

Have you altered your evaluation plans? What monitoring data did you collect?

Yes. I proposed to evaluate the outcome with three approaches: survey, test and focus group discussion among students. I have altered the evaluation plans in order to obtain more accurate results on evaluating the effectiveness of the VR videos. I have adopted different evaluation plans in three courses where the VR videos were applied in.

For HTMG 4600B, students viewed the Zero Carbon Building video to learn green building development and design. The students were required to conduct four tasks: 1. Pre-view test, VR video viewing, post-view test and a questionnaire survey. In the pre-view test, photos of the zero carbon building were shown to students and they are required to identify green features or sustainable features in the site of zero carbon building. After viewing the VR video, students were given another set of photos of zero carbon building and they are required to identify the green features or sustainable features based on the content they learn from VR video. A questionnaire was given to each student to complete. The survey is to measure the motivation level of the courseware. The comparison of the answers of pre-test and post-test enables the instructor to understand the effectiveness of the VR video and the survey results show

students' motivation and satisfaction level regarding learning with VR video.

For HTMG 5022H, students viewed the Asia Society video to learn heritage adaptive reuse a revitalization. The students were designed into two groups. One group of the students viewed the video directly and complete a test based on the content of the video. Another group of students attended a 15-minute lecture regarding heritage revitalization of the Asia Society. They were required to complete the same set of test after the lecture and view the VR video later. Both groups of students completed a questionnaire survey after the VR viewing. The comparison of the test results of the two groups of students enables the instructor to know the effectiveness of VR video comparing to traditional classroom teaching.

For HTMG 4356 Heritage Tourism, students were required to fill in a questionnaire-based survey. The survey result has been transformed in data for statistical analysis.

Does your evaluation indicate that you have achieved your objectives?

For HTMG 4600B, the post-view test scores is better than the pre-view test score. Further statistical analysis will be conducted to investigate the significance of the effectiveness of the VR video in facilitating student learning.

For HTMG 5022H, the test score for the classroom teaching group is slightly better than that for the VR video viewing group. I assume that the reason is that the instructor emphasized the knowledge that is covered by the test so the students were able to provide correct answers in the test.

Overall, the evaluation indicate that VR videos are interesting teaching material and effective in facilitating student learning.

4. Dissemination, diffusion and impact

Please provide examples of dissemination: website, presentations in workshops or conferences, or publications.

Please provide examples of diffusion: how the project results/process/outcomes/deliverables have been used in your unit and other parts of CUHK or other institutions?

Please provide examples of impact: how the project results can be adapted to other disciplines.

Please provide examples of dissemination: website, presentations in workshops or conferences, or publications.

The project was completed within 9 months, from September 2018 to May 2019. Within the short period of project time and the high level of difficulties in producing the VR videos, I was not able to present the project result in any conference / seminars in the past 9 months. However, I plan to present the project outcome in a few international conferences and internal workshops in CUHK.

The project results will be presented in an international conference – Asia Real Estate Society Annual Conference (Real Estate Education Session) in July 2019. The topic of the paper is *Virtual Reality for Sustainable Environment Education*.

A poster describing the project will be presented at the CUHK Teaching and Learning Innovation Expo in 2019.

Please provide examples of diffusion: how the project results/process/outcomes/deliverables have been used in your unit and other parts of CUHK or other institutions?

We plan to use the VR videos in our School's new student orientation workshops.

Please provide examples of impact: how the project results can be adapted to other disciplines.

The VR videos will be presented in other student activities: inter-university students exchange programs and workshops.

PART II

Financial data

Funds available:

Funds awarded from CDG	\$ 75044HKD
Funds secured from other sources	\$ _____
(please specify _____)	

Total: \$ 75044HKD

Expenditure:

Item	Budget as per application	Expenditure	Balance
VR videos production and 360-degree photos shooting and editing	HKD 63244	HKD 63,000	HKD 244
SK fourth generation VR BOX high definition virtual 3D glasses	HKD 4,020	HKD 4,016	HKD 4
Amazon Web Services (AWS) Educate https://aws.amazon.com/education/awseducate/	HKD 0	HKD 0	HKD 0
360° Video Camera - RICOH THETA V CAMERA	HKD 7,780	HKD 6,958.50	HKD 821.5
Total:	HKD 75,044	HKD 73,974.5	HKD 1069.5

PART III

Lessons learnt from the project

Please describe your way forward.

Please describe any of the following item(s) accordingly:

- *Key success factors, if any*
- *Difficulties encountered and remedial actions taken, if any*
- *The role of other units in providing support, if any*
- *Suggestions to CUHK, if any*
 - *Example: what should be done differently?*

The way forward:

The VR videos will be used in research projects and Knowledge Transfer Project. I plan to apply for teaching related funding to conduct two experiments based on the two VR videos to measure the effectiveness of using VR material in tertiary education. One is designed to compare students' knowledge regarding green building or green features before and after viewing the VR video; for this experiment, the ZCB building VR video will be used. The second experiment is to compare the effectiveness of

traditional classroom teaching and using VR material as an education tool; for this experiment, the Asia Society VR material will be used. I plan to present the findings from the two experiment at international conferences that either in the field of real estate education or hospitality management.

The Asia Society VR video will be further adopted in Knowledge Transfer Project entitled *Using Virtual Reality (VR) Technology to Enhance Students' Understanding of Colonial Architecture in Hong Kong*. For this project, I propose to capture the architectural design and historic knowledge through VR videos and organize workshops in selected high schools and primary schools to facilitate education of colonial architecture and colonial history in Hong Kong. I have collaborated with Asia Society to organize workshops to use the VR video to introduce Asia Society and Colonial Architecture in Hong Kong.

The VR videos will be embedded into flipped classroom teaching.

In the near future, I plan to integrate the VR videos in flipped classroom teaching as students can view the web version of the VR videos at home.

Difficulties encountered and remedial actions taken:

I proposed to shoot VR video at one of the major heritage compounds in Hong Kong (hereafter: HC in short) in the proposal. However, HC was not very positive regarding my call for collaboration. The liaising and negotiation with HC was very time consuming and led to no positive response from HC. Instead of waiting for HC's pending confirmation, I decided to alter the plan and shoot a VR video at Asia Society. Asia Society was converted from the former Explosive Magazine of Old British Victoria Barracks. It houses four graded historic buildings. As Asia Society also meets my requirements in teaching heritage buildings, I decided to contact Asia Society for VR video shooting. Asia Society was very welcomed by my proposed collaboration activity and allowed me to shoot VR videos at the heritage site.

The role of other units in providing support

I specifically want to thank Professor Johnson (Chung-shing) Chan from Department of Geography Resource Management for his advice and support. He shared with me his experience in producing VR videos and organizing VR viewing activities. He also referred important resources to me. Without his support, I was not able to complete the project successfully.

I also need to thank Mr. Lancelot Yu from the Zero Carbon Building in Hong Kong for applying for the permit and arranging for me to conduct the VR video shooting at ZCB. Same gratitude also goes to Ms. Vicky Lam from Asia Society. She spent a considerable amount of effort in conveying my collaboration proposal to the management organization of Asia Society. Without the support from Mr. Yu and Ms. Lam, I could not deliver the VR videos on time.

PART IV

Information for public access

Summary information and brief write-ups of individual projects will be uploaded to a publicly accessible CUHK CDG website. Please extract from Part I the relevant information to facilitate the compilation of the publicly accessible website and reports.

1. Keywords

Please provide five keywords (in the order of relevance to your project) to describe your project.

(Most relevant) Keyword 1: Virtual Reality

Keyword 2: VR in tertiary education

Keyword 3: Real estate education

Keyword 4: Heritage education

(Least relevant) Keyword 5: Tourism education

2. Summary statistics

Please provide information, if any, in the following tables, and provide the details in Part I.

Table 1: Publicly accessible online resources (if any)

(a) Project website:

If a publicly accessible project website has been constructed, please provide the URL

(b) Webpage(s):

If information of your project is summarized in a webpage (say a page in the department's or faculty's website), please provide the URL(s) in here

(c) Others (please specify):

Table 2: Resource accessible to a target group of students (if any)			
<i>Students from School of Hotel and Management are given access to the VR videos. In the past year, 93 students (60 students from HTMG 4536 and 33 students from HTMG 5022H) used the VR cameras to shoot VR photos to complete the course assignments. 78 students accessed the VR videos (45 students from HTMG 4600B and 33 students from HTMG 5022H) in the lectures with the VR glasses.</i>			
<u>Course Code/ Target Students</u>	<u>Term & Year of offering</u>	<u>Approximate No. of students</u>	<u>Platform</u>
<i>HTMG4536 (elective course)</i>	<i>Year 2 – year 4 students</i>	<i>60</i>	Amazon Web Services (AWS) Educate
<i>HTMG4600B (required course)</i>	<i>Year 4 students</i>	<i>45</i>	Amazon Web Services (AWS) Educate
<i>HTMG5022H (elective course)</i>	<i>Post-graduate students</i>	<i>33</i>	Amazon Web Services (AWS) Educate

Table 3: Presentation (if any)	
<i>Please classify each of the (oral/poster) presentations into one and only one of the following categories</i>	Number
(a) In workshop/retreat within your unit (e.g. department, faculty)	<i>Please insert no</i>
(b) In workshop/retreat organized for CUHK teachers (e.g. CLEAR workshop, workshop organized by other CUHK units)	<i>Please insert no</i>
(c) In CUHK ExPo jointly organized by CLEAR and ITSC	<i>1</i>
(d) In any other event held in HK (e.g. UGC symposium, talks delivered to units of other institutions)	<i>Please insert no</i>
(e) In international conference	<i>1</i>

(f) Others (please specify)	<i>Please insert no</i>
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Table 4: Publication (if any)	
<i>Please classify each piece of publications into one and only one of the following categories</i>	Number
(a) Project CD/DVD	<i>Please insert no</i>
(b) Project leaflet	<i>Please insert no</i>
(c) Project booklet	<i>Please insert no</i>
(d) A section/chapter in a booklet/book distributed to a limited group of audience	<i>Please insert no</i>
(e) Conference proceeding	<i>Please insert no</i>
(f) A chapter in a book accessible internationally	<i>Please insert no</i>
(g) A paper in refereed journal	<i>Please insert no</i>
(h) Others (please specify)	<i>Please insert no</i>

3. A one-page brief write up

Please provide a one-page brief write-up of no more than 500 words for posting on the CDG website.

Project initiative and aims

Virtual reality (VR) is widely adopted in classroom teaching and it has been proved to be effective in delivering knowledge to university students. 360-degree photos and videos are closely resembling a real world. With the support of virtual glasses, students are able to “visit” the architecture virtually through viewing the photos and videos. Each “visit” would save the school a considerable amount of financial expenditure and avoid potential risks on organizing on-site visits. Further, students can focus on specific architectural design features and observe the details of the architecture closely and vividly. This project aims to contribute in enhancing students’ understanding of green buildings and heritage architecture by using virtual reality technology to create virtual site visit.

Project deliverables

This project produces two VR videos – Zero Carbon Building and Asia Society (the Former Explosives Magazines of the Old British Barracks of Victoria) for students to experience the virtual site visit. For the first video, students can embark a tour at the Zero Carbon Building virtually by reading the pop-up texts and listening the narration that introduces the development background, development process, green

architectural design and active green technologies, etc. For the second video, students are able to learn the history of the British Colonial Hong Kong, the former use of historic buildings of the former Victoria Barracks, the conservation approaches and revitalization strategies of heritage in Hong Kong through the “virtual site visit”. The videos allow students to access the architecture flexibly and explore the details of the architecture at their own pace and preference. The project enables students to develop a comprehensive understanding of green buildings and heritage architecture in the classroom without paying an actual visit at the architecture.

Project implementation

The VR materials were used in three courses I teach: Facilities Development and Management for Real Estate and Hospitality Industry; Heritage Tourism; and Revitalization of Historic Buildings. The courses are divided into two parts: (1) theory and principle; (2) practical cases and site visit. The virtual site visits were organized in the second part of the course after students were taught basic knowledge, such as architecture development and design, heritage conservation strategies and methods. Students were asked to participate in the virtual site visit in the classroom. Since not all the students can adjust to viewing videos with VR glasses, students can choose the view the web version or view with the VR glasses. They can insert their own headphones to listen to the narrations without being disturbed by other students. An exclusive site visit was created for every student. Students were asked to complete a test (or tests for viewing the Zero Carbon Building) to evaluate the effectiveness of the VR videos. The result of the tests show that the VR videos are effective in facilitate student learning.

Student feedback

Overall, students provide very positive feedback regarding the virtual site visit arrangement. They suggest that more VR videos or innovative methods should be used in designing the curriculum and course teaching.