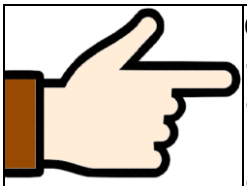
Using EduVenture VR & VR 360° Panoramic Photographs to Conduct Virtual Fieldwork in Geography - Data Collection in a Virtual Field Trip to Ng Tung River in Hong Kong

Appendix 2

[Student Worksheets]

[Mr KWONG Siu-wah, Geography Teacher of Po Leung Kuk Lo Kit Sing (1983) College]

Name: _____ Class: _____



Objectives:

- **To equip** students with skills on field observation, note taking and field sketching.
- **To draw** field sketches based on photographs and extract important field information.
- **To prepare** students to apply what they've learnt in fieldwork to answer fieldwork-based questions.

A. Background of the Virtual Geographical Issue Enquiry

During the pre-trip (see Appendix 1), you have already developed some geographical enquiry topics. It would be great if you can go to the site to take measurement and make observations to collect data for your topic.

However, due to unforeseeable circumstances (such as social gathering restrictions and bad weather), the planned on-site / authentic fieldwork may not be conducted as schedule. A virtual fieldwork may be an alternative to learn relevant fieldwork skills. With the use of 360° panoramic photographs and videos, a virtual fieldwork can provide some data for your geographical enquiry. It **saves time** and is suitable for **all-weather conditions.** It also **saves cost and administrative work** related to authentic fieldwork.

However, virtual fieldwork has some limitations when compared with an on-site fieldwork. For example, it is rather difficult to collect data on channel characteristics or sediments of a river in virtual fieldwork. Therefore, it **limits the choice of topics for geographical enquiry**. Also, the data collected in virtual fieldwork is **secondary data**. An on-site fieldwork for **cross-referencing** is still preferred to raise the **validity and reliability** of the field data collected.

B. Geographical Problem Scenario for this Virtual Field Study

River flooding occurs when channel capacity cannot hold more discharge from a river. River discharge overflows the river bank and leads to economic loss and loss of lives.

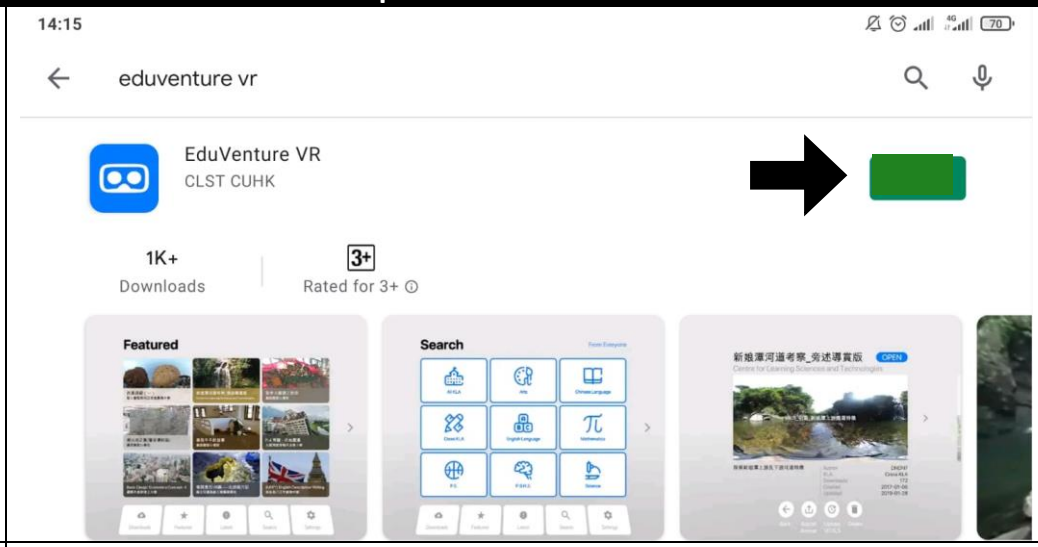
Flooding occasionally leads to huge economic loss in rural areas of Hong Kong. In general, risks of flooding increases downstream as there are more discharge, distributaries, urban land uses and economic activities.

Your geography teacher had taken some 360° panoramic photographs to evaluate the risk of flooding along a local river – **Ng Tung River**. Participate in the virtual fieldwork prepared by your teacher via the EduVenture VR platform and complete the fieldwork tasks below to self-learn various fieldwork skills.

C. Steps to Use the EduVenture VR Virtual Fieldwork Materials to conduct Data Collection in Fieldwork

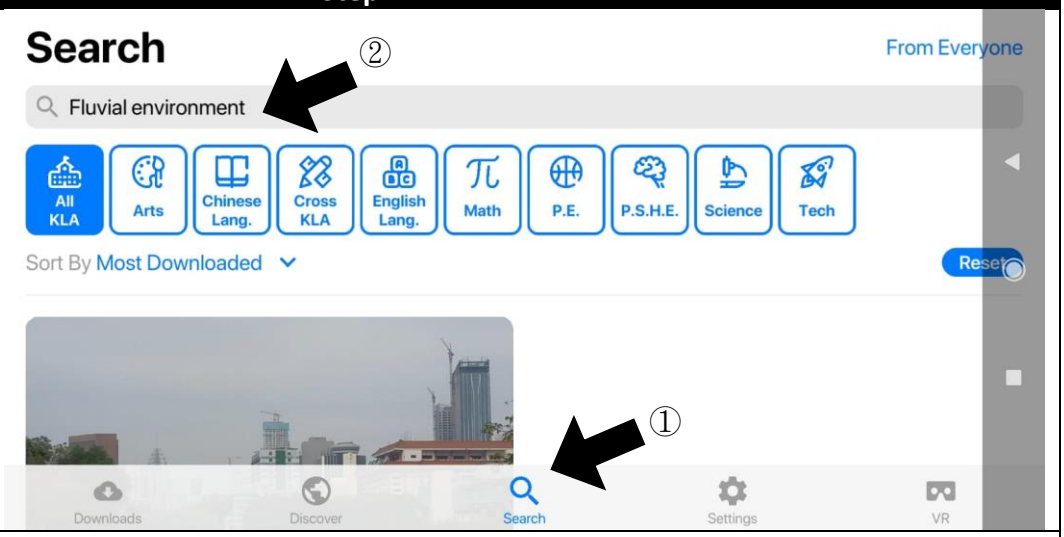
Step 1

Download & Open EduVenture VR in the APP Store / Play Store



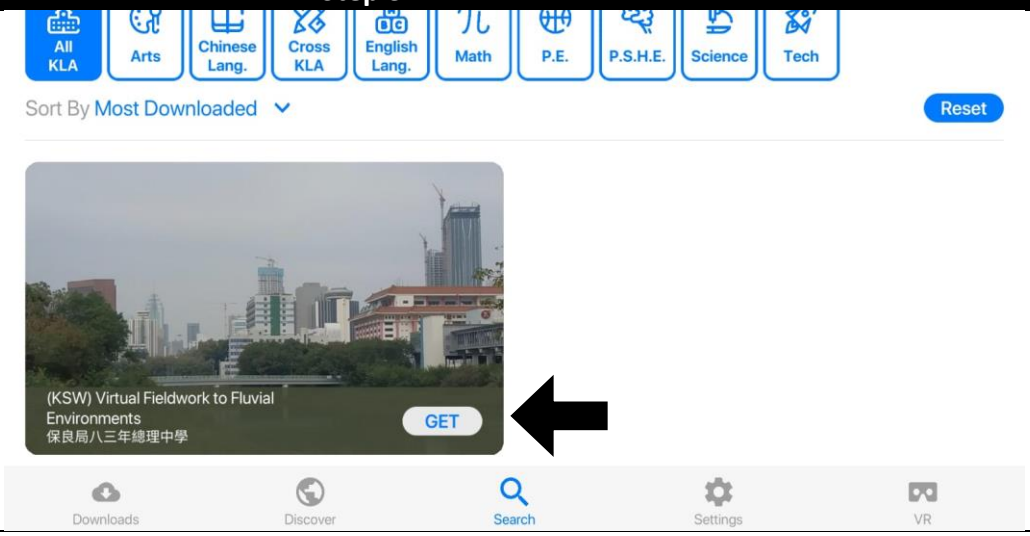
Step 2

In Search Tab, type "Fluvial Environment" to locate the fieldwork materials

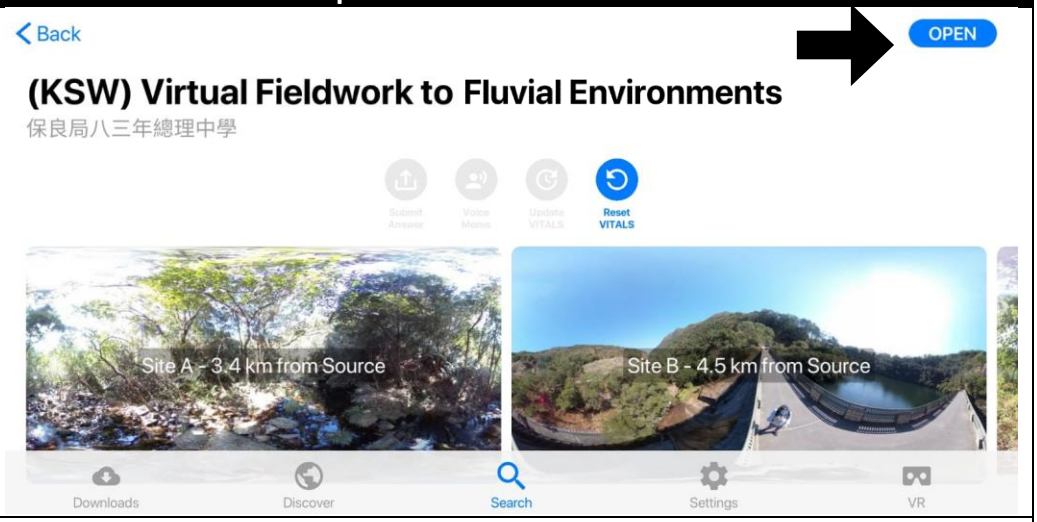
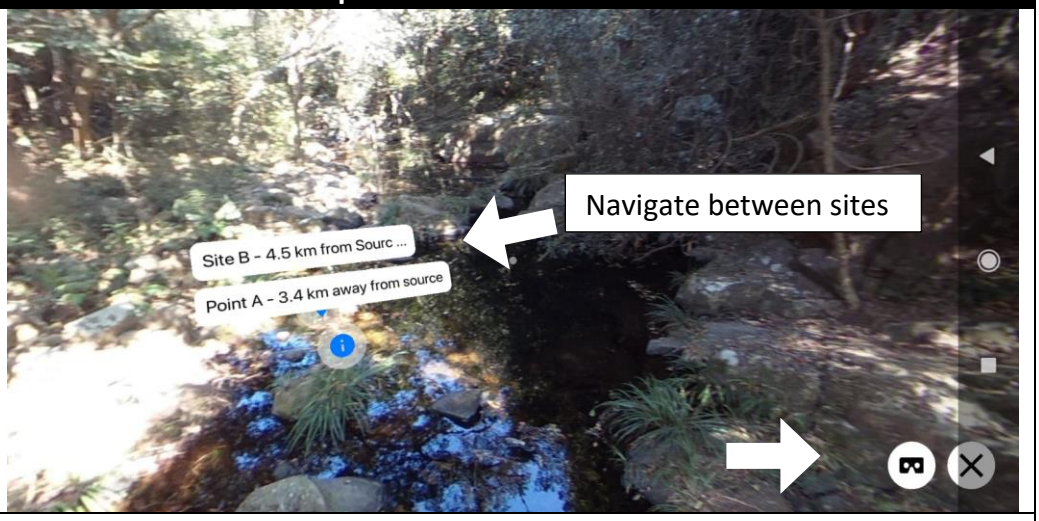
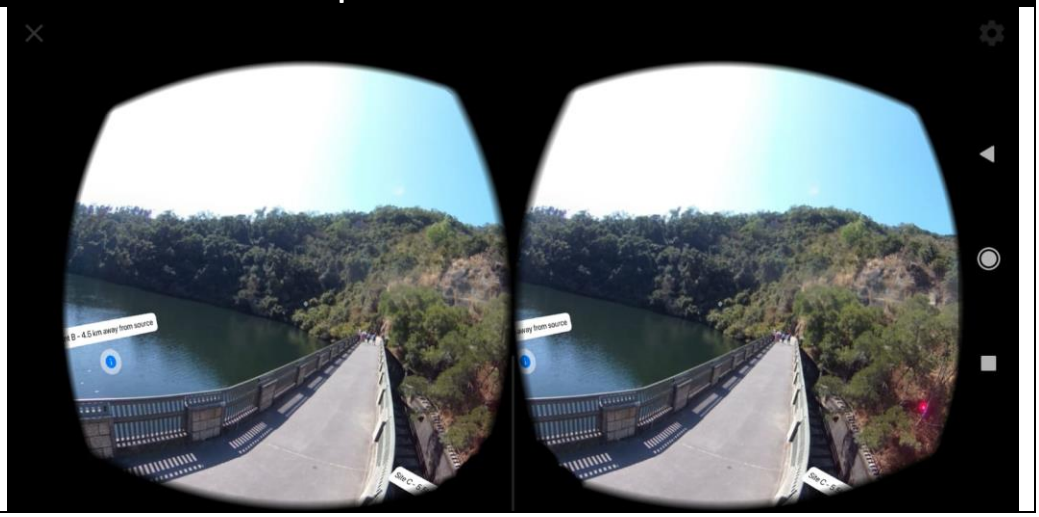


Step 3

Press "Get" to download the fieldwork materials



EduVenture-VR is designed, developed and managed by the Centre for Learning Sciences and Technologies (CLST), The Chinese University of Hong Kong (CUHK).

Step 4	
Open the fieldwork materials and press "Open" to start the virtual fieldwork	
Step 5	
Browse the 360º panoramic photographs **Move the mobile phone to navigate and observe the river landscapes from different angles** If you have a VR Cardboard / VR Google, you may choose to use the VR Mode	
Step 6	
VR View for the virtual fieldwork	

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Now, you are working on Stage 2: Data Collection for the fieldwork enquiry.

D. Data Collection

Before collecting suitable fieldwork data for further analysis via the EduVenture VR virtual fieldwork materials, the following background information of virtual fieldwork is provided.

Date of fieldwork	29 January 2021 (Friday)
Checkpoints	13 (with about 1.2km interval)
Sampling method	Systematic point sampling
Fieldwork personnel on that day	1 Geography teacher
Tools / Instruments used for data collection	1. 360° panoramic camera 2. Camera 3. GPS & Digital map
Hypothesis	Risk of flooding increases downstream from Checkpoint A to Checkpoint K

Please complete the fieldwork activities below:

1. Drawing sketch diagrams for selected field sites

"What is the intensity of economic activities of the checkpoint(s)?" Solely browsing 360° photographs in the materials and give a short description / score are rather **subjective** and **qualitative**. It is usually **not a reliable** data because different people give their comments and scores differently.

Drawing field sketches is an alternative way to collect data (especially when you're sketching, you can spot out more data or useful information). It helps highlight key features of a checkpoint. Field sketches provide more **accurate and objective data** and make **comparison** across changes of a river more easily.

Now, study the 360° panoramic photographs carefully and draw annotated field sketches (facing yourself downstream, e.g. if you are locating at Checkpoint (Site) D, find the view that shows the teleport to Checkpoint (Site) E) to note down relevant information to the geographical hypothesis, key features, processes and changes of the river in the spaces provided.

For Example: At Site D – 6.6km from Source

Checkpoint: A **Location: _____**

Checkpoint: F **Location: _____**

Checkpoint: K **Location: _____**

2. Collect Field Data from the Virtual Fieldwork Materials

Conduct a detailed observation of the 360° panoramic photographs in the EduVenture VR materials, you can observe some factors that may help conclude whether risks of flooding increase downstream.

Analyse the factors that affect risks of flooding below and determine whether the data can be collected in the virtual fieldwork materials.

Factors leading to river flooding		Is the data available from the virtual fieldwork above?
Channel characteristics	Drainage density / stream order	×
	Channel shape	
	Channel depth	
	Channel sinuosity	
	Amount of sediments	
	Channel gradient	
River characteristics	Discharge	
	Mean velocity	
Vegetation	Density / Coverage	
Land characteristics	Relief / Gradient	
	Rock Type	
	Land surface permeability	
Weather & Climate	Rainfall	
Human factors	Flood prevention work done	
	Land use	
	Amount/types of economic activities	
Other factors		

3. Organising Field Data Systematically for Easier Interpretation

After extracting the observable factors of flooding, you can collect such data by browsing the 360° photographs on EduVenture VR again.

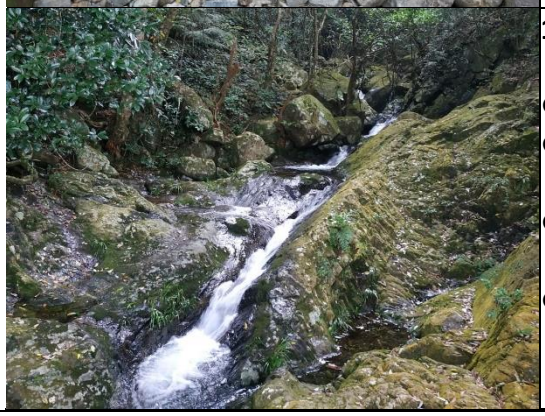
To help analyse the fieldwork data in the later stage, your collected data should be

1. **Well-organised**, means that it is easy to read, interpret and comparable;
2. **Reliable**, means that the criteria for scoring should be the same across checkpoints;
3. **Coded**, means that similar characteristics can be grouped into the same category and it is easier to do a quantitative analysis later.

Coding

Take the factor **"Flood prevention work done"** as an example.

You can translate information from sketch diagrams or 360° photographs into coded scores by different means. The table below shows some examples on how to collect and record data into quantitative scores (ordinal / ratio data). Each approach has its advantages and disadvantages. However, you have to record data in the same approach to make it **fair and comparable** across checkpoints.

<table>
<tr><td>1</td><td>Dichotomous scoring</td><td>Any observable human flood prevention work 1
No observable human flood prevention work 0</td></tr>
<tr><td>2</td><td>Scaled scoring</td><td>Channelised river 5
Gabions / dams / weirs 3
Sand bags 1
Fully natural river 0</td></tr>
<tr><td>3</td><td>Photo referencing scoring</td><td>Score between 0 to 5, based on some rubrics / descriptions set from some samples below
 
5
● Straight river
● Embanked
● Regular river bank
● Weed removed
● Higher river efficiency
 
3
● Embanked
● Slightly silted river
● Natural looking river
● Moderate river efficiency
 
1
● No channelisation
● Mostly natural river course
● No clear sign of weed removal
● Lower river efficiency</td></tr>
</table>

4. Record Coded Data on the Field Data Collection Form

The field data collection table on the next page is one of the ways that help you to record field data with the EduVenture VR fieldwork materials and field sketches systematically. It helps you to gather **essential field data** to answer the enquiry question about flooding and its surrounding environments later.

Steps:

1. Write down those observable factors from the virtual fieldwork materials in Part D2 (P.6) on the first column of the field data collection form on the next two pages.
2. Think carefully on how to **summarise / categorise** data of each factor.
3. Start your data recording from Checkpoints A to K.
4. Jot down any additional information observed onto “Remarks”.

Field Data Collection Form for Virtual Fieldwork on Ng Tung River (29 January 2021) – Page 1

Name of the observer: _____

Weather condition: _____ Location characteristics: _____ Sampling method: _____

	A	B	C	D	E	F
Distance from the source (km)						
Channel characteristics (Refer to the Table in Section D2)						
River characteristics						
Vegetation – more vegetation reduces peak discharge and then reduces the risk of flooding						
Human influence – more properties along the river may lead to a higher loss during flooding						
Assessment on the overall risk of flooding						

Field Data Collection Form for Virtual Fieldwork on Ng Tung River (29 January 2021) – Page 2

Name of the observer: _____

Weather condition: _____ Location characteristics: _____ Sampling method: _____

	G	H	I	J	K	Remarks
Distance from the source (km)						
Channel characteristics (Refer to the Table in Section D2)						
River characteristics						
Vegetation – more vegetation reduces peak discharge and then reduces the risk of flooding						
Human influence – more properties along the river may lead to a higher loss during flooding						
Assessment on the overall risk of flooding						

5. **Brief Hypothesis Testing from the Organised Data Collected in the Virtual Fieldwork Materials**

Assume each factor that leads to flooding of Ng Tung River above are equally important, the scores can be added up to form a composite score. With reference to the composite score, can you conclude that the "Risk of flooding increases downstream from Checkpoint A to Checkpoint K" as stated in the hypothesis? Why? What can be done to improve the data collection process of the fieldwork?

E. Fieldwork-based Questions

A group of geography students used Virtual Reality (VR) technology to conduct a virtual fieldwork to study river problems along Ng Tung River at the northeastern part of Hong Kong. Figure 1a provides the guidelines of this field study. Figure 1b shows the screen capture of a field photograph in the virtual fieldwork. Table 1c shows the data collected during the fieldwork.

Figure 1a

Field study topic:	To study the risks of flooding along Ng Tung River
Data collection method:	(1) Select 13 checkpoints which is separated by about 1.2 km each. (2) Carry out an assessment at each checkpoint according to a field data collection form.

Risk of Flooding along Ng Tung River - Data Collection Form	
Risk Factors that leads to flooding	**Scores (High: 5 / Medium: 3 / Low: 1)**
River discharge	
Vegetation Cover	
Intensity of economic activities	

Figure 1b

Table 1c

Checkpoints	**A**	**C**	**E**	**G**	**I**	**K**
Intensity of economic activities (Score)	1	1			5	4

(Lowest score: 0, Highest score: 5; Scoring by observation only)

(a) Refer to Figure 1a

(i) Name the sampling method used in the research design. (1 mark)

(ii) Discuss the advantages of using the sampling method in (a)(i) in data collection for the field study topic. (3 marks)

(iii) Evaluate whether the number of sampling checkpoints should decrease from 11 to 3. (3 marks)

(iv) Name a type of secondary data in the fieldwork. Describe the procedures in collecting the data. (5 marks)

(b) Refer to Figure 1a and Figure 1b. Explain the difficulties encountered in collecting data on river discharge during the virtual fieldwork. (3 marks)

Extended Questions for other Stages of Fieldwork

Stage 3. Processing, Analysing and Presenting Data

(c) (i) Refer to Table 1c and the virtual fieldwork materials. Suggest the scores for intensity of economic activities of Checkpoints E and G. Explain your rationale of scoring. (5 marks)

(ii) Your classmate gave different scores in (c) (i) for Checkpoints E and G. Suggest and explain a way to narrow the differences of the scores. (3 marks)

Stage 4. Conclusion

(d) "Flooding risks increase downstream in Ng Tung River". Justify the statement based on your processed virtual fieldwork data. (4 marks)

Stage 5. Evaluating the fieldwork

(e) Suggest **another** field study topic that can be carried out along the checkpoints (A to K) with the same set of virtual fieldwork materials. Suggest the procedures to collect suitable field data for the study topic. (6 marks)

F. [Extended Activities] Collecting Data from an Authentic On-site Fieldwork

You find that some **first-hand, primary data** of channel characteristics (e.g. river depth) cannot be observed and recorded from the virtual fieldwork materials. The drawback of insufficient valid data to study the enquiry question reduces the **validity of the conclusion.**

Conducting an authentic fieldwork by including more **measurement and observations** can help raise the validity of the data collected. List the factors that causes flooding and write down the tools or equipment that can be used to collect such data in an on-site fieldwork below.

Factor	Tools / Equipment
Discharge	Flow meter / Float and a stopwatch
Channel gradient	

Acknowledgements:

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✧ The Centre for Learning Sciences and Technologies, The Chinese University of Hong Kong

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