Developing and Using Virtual Fieldwork Materials

Ng Tung River

For developing students’ fieldwork skills
Self-Introduction

Po Leung Kuk Lo Kit Sing (1983) College

- DSE / AL / CE Geography Teacher
- Conducted >30 fieldworks
- Facilitator of e-learning (SS)

Experiential educator

- Field Works / Trips
- Overseas Geography field trips
- Gaming in Learning
For today's sharing of the fieldwork and applying VFW of the VFW

01 PLANNING of the fieldwork
02 ADVANTAGES and applying VFW
03 WORKSHEETS of the VFW
04 DISCUSSION
PLANNING OF VIRTUAL FIELDWORK
FROM THE EYES OF TEACHERS
Rationale for Virtual Fieldwork

Before CCA Restrictions

- Teachers led field-work / visits
- Field Centre Programs
- External Services

After CCA Restrictions

- Insufficient resources / days to conduct real fieldwork.
- Shortening of usable teaching time.
- Curriculum needs: FBQ / Fieldwork skills

Fieldwork skills are learnt in the field, in the wild and in everyday life...
Fieldwork Based Assessment (2022)

There is still a genuine need for learning fieldwork skills on the basis of

- effective learning & cognitive development
- generic skills learning
- handling public assessment

Managing River Environment
Opportunities & Risks
Disappearing Green Canopy
Why there is a need to use Virtual Fieldwork / Fieldtrip

SHOCKINGLY

Majority of students NEVER visit a REAL natural river in real life.

Some believe water comes from TAPs.
What should students learn about local rivers / drainage basin?

- Many tributaries
- Mostly short / transacted rivers
- Flow through urban areas
- Large seasonal variation in discharge
- Sharp change in altitude

**River and our environments**

**Conclusion**
Where?

• There are so many rivers in Hong Kong.
• Many urban / concealed / dammed channels.

• **Question:**
  • What is the enquiry topic / issue for fieldwork research in **fluvial environment**?

• Pre-trip preliminary data analysis
  • Safety
  • Available tools / equipment
  • Accessibility
  • Feasibility
  • Data quality
The hardship...

From the perspective of geographical concepts

• Source of river?
• Mainstream of river?
What issues / topics are suitable?

1. **Fluvial processes**
   Testify the changes of discharge / velocity / erosion / deposition / transportation rate etc.

2. **Fluvial landform / morphology**
   Validate whether Hong Kong has various erosional / depositional landforms along river courses.

3. **Rivers and Living Environment**
   Interview residents / users on the perception of a good / useable river.

4. **Flood Management**
   Decide whether the existing flood management is appropriate / needs for extra flood management.
How to take field records?

• **Ng Tung River** is chosen
  • Its large catchment, long river (13km)
  • Relatively natural
  • Relatively accessible by public transport

• Then, the following are considered:
Sampling method

• **Approx. equal distance**
  • Systematic point sampling
  • Each point is about 1.2 km in distance
  • Capture *represented* fluvial characteristics & changes along river sections
When I was planning the fieldwork…..

- Upper course
  - Which stream should we record?
  - How can we reach the river?
  - Is it safe / legal to walk in the river?
  - How to deal with pests / weeds?
When I was planning the fieldwork…..

• **Lower course**
  • How to position the accurate point / ensure data validity?
  • How to log more useable data from the channel?
  • How to take best photo to represent the point?
How to prepare for the virtual fieldwork materials?

- **Using bicycle to travel to field sites in a day.**
  - Accurate fluvial characteristics of the day.
  - Some sites are inaccessible by vehicles.
  - Reduce biases.

- **Safety concerns**
  - Dogs
  - Slopes
  - Pests / Mosquitoes
  - Exposed location
  - Rocky / slippery channel
  - Trespassing private land
  - Lack of mobile signal
  - **Exhaustion**
Is it safe to conduct a field collection here?
Is it safe to conduct a field collection here?
When?

- Pre-trip of using 360° camera
- Autumn Photo & Data Taking
- Summer Photo & Data Taking
- Research on suitable rivers for fieldwork
- 1st draft of worksheet
- Finalized worksheet
- Sharing now
- FUTURE
APPLICATION & ADVANTAGES
OF USING VIRTUAL FIELDWORK
APPs / Software used in this Teaching Sampler

- GeoInfo Map
  - Map Reading
  - Pre-trip Planning

- Google Earth (Presentation)
  - 3D Authentic
  - Virtual Pre-trip

- EduVenture VR
  - 360º panoramic photos
  - Virtual fieldwork (data collection)
Reasons for using 2 different APP / Software

**Google Earth (Presentation)**
- Can show terrain / map
- Clear understanding of environment
- Easy to navigate
- Less details / blurred view
- Service may be suspended

- Best for
  - Understanding the field sites
  - Pre-Trip

**EduVenture VR**
- Authentic view
- Can show videos / audios
  - Guess the velocity, noise level etc
- Can set questions / tasks
- More details (add data set)
- Need to install APP / download much data
- Need specific tools
  - e.g. VR Google / VR Headset

- Best for
  - Observing and recording
Using Virtual fieldwork....

**From the Fieldwork Perspective**

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• All weather</td>
<td>• Objective</td>
</tr>
<tr>
<td>• Easy to monitor discipline</td>
<td>• Little training on using authentic field tools / equipment</td>
</tr>
<tr>
<td>• Safer</td>
<td>• Man-induced errors</td>
</tr>
<tr>
<td>• Lower costs</td>
<td>• Lower validity of data collected</td>
</tr>
<tr>
<td>• Time-saving</td>
<td>• Mostly second-hand data</td>
</tr>
<tr>
<td>• Easier to cater SENs / diversity</td>
<td>• Less flexible research design</td>
</tr>
<tr>
<td>• Reliable (data won't change)</td>
<td>• Fixed route / tasks</td>
</tr>
<tr>
<td></td>
<td>• Restricted to data collected</td>
</tr>
</tbody>
</table>
Adolescent loves to play and curious about new environment.

- During authentic fieldwork, it provides space for **cultivating creativity, problem-solving** and **effective communications** with other classmates.
- Cannot control & give **instant feedback**.

From the **Students' Development Perspective**

**Disadvantages of virtual fieldwork**

1. Less social / peer learning
2. Lower degree of students engagement
3. Hard to conceptualize abstract concepts
4. Fewer physical development
From the **Fieldwork Skills Perspective**

- Measurement
- Observation
- Sketching
- Interview / surveys

**Comparison**

1. **Authentic fieldwork**
   - Observation
   - Sketching
   - Interview / surveys

2. **Virtual fieldwork**
   - Observation
   - Sketching
   - Counting
   - Summarizing
### Field Data Collection Form for Fieldwork on Ng Tung River (3.Labels):

<table>
<thead>
<tr>
<th>Name:</th>
<th>Weather conditions:</th>
<th>Location characteristics:</th>
<th>Sampling method:</th>
<th>Remarks:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distance from the river (m)</th>
<th>Channel characteristics:</th>
<th>Channel width &amp; depth (m)</th>
<th>Channel curvature</th>
<th>Slope of the channel (°)</th>
<th>Others:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>River characteristics:</th>
<th>Discharge:</th>
<th>Others:</th>
<th>Land Use &amp; Surrounding:</th>
<th>Topography:</th>
<th>Assessment for the spatial risk of flooding:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**WORKSHEETS**

of the Ng Tung River
Virtual Fieldwork

**03**
Stage 1: Planning

Virtual pre-trip on a river landscape
- Explore characteristics of field sites
- Identify safety risks
- Estimate costs & labour needed
- Initiate start a fieldwork topic

Stage 2: Data Collection

Virtual fieldwork on selected field sites & pre-set sampling
- Use observation, field sketching skills
- Collect secondary data
- Categorise meaningful data
Rationale of Using the Student Worksheet

• Going through **various stages of field work** that help students to develop **sound logical, critical and independent thinking** of fieldwork design.

1. **Planning**
   - Site selection
   - Safety
   - Threats
   - Select possible enquiry topic

2. **Data Collection**
   - Secondary data
   - Sampling method
   - Observation
   - Field sketches
   - Reliable & Validity

3. **Data Presentation**
   - Field sketches
   - Scoring rubrics / summarized tables
   - Compare others recorded data

Conclusion

- Validate hypothesis

Evaluation

- Reflect on alternative enquiry setting

**Using Google Earth Presentation Mode to Conduct Pre-trip for Geographical Fieldwork: Virtual Pre-trip to Ng Tung River Drainage Basin in Hong Kong**

(Student Worksheet)

<table>
<thead>
<tr>
<th>Objectives</th>
<th>1. Familiar with key features and environment of the Ng Tung River Drainage Basin.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Identify different data types: primary and secondary data.</td>
</tr>
<tr>
<td></td>
<td>3. Assess risks and potential danger of conducting fieldwork in fluvial environment.</td>
</tr>
<tr>
<td></td>
<td>4. Equip students' IT literacy especially in Geographical Information System.</td>
</tr>
</tbody>
</table>

1. Geography Issue Enquiry: River

River’s mainly received water from surface runoff and ground water in its drainage basin to form discharge. The size of drainage basin, drainage density, gradient, vegetation, land use, geology etc influenced the amount of discharge in a river.
Virtual Fieldwork Worksheet Design

**PRE-TRIP**

1. Assess the potential risks / difficulties to conduct fieldwork in the selected sites.
   - Developing / refining own field enquiry question based on the virtual pre-trip at the site.

**Virtual Fieldwork**

2. Collect field data of Ng Tung River to learn categorization / summarization / coding skills.
   - Justification of data collected and further improvements in future field enquiry.

**Extended Tasks**

3. To do a self-designed geographical issue inquiry on river (e.g. self-determined methodology / collection of data etc)
   - To compare the findings with repeated test at the sites in VFW.
Worksheet Demo (Appendix 2: Data Collection & Data Logging)

**Coding**

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

You can translate information from sketch diagram or 360° photographs into a coded score 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 field sites.

<table>
<thead>
<tr>
<th>1</th>
<th>Dichotomous scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any observable human flood prevention work</td>
<td>1</td>
</tr>
<tr>
<td>No observable human flood prevention work</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Scaled scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channelised river</td>
<td>5</td>
</tr>
<tr>
<td>Gabions / dams / weirs</td>
<td>3</td>
</tr>
<tr>
<td>Sand bags</td>
<td>1</td>
</tr>
<tr>
<td>Fully natural river</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3</th>
<th>Photo referencing scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score between 0 to 10, from some source</td>
<td></td>
</tr>
</tbody>
</table>

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Field Data Collection Form for virtual fieldwork on Ng Tung River

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance from the source (km)</td>
<td>Channel characteristics (Refer to the Table in Section D2)</td>
<td></td>
</tr>
</tbody>
</table>

**River characteristics**

- Straight river
- Embanked
- Regular river bank
- Vegetation - more vegetation reduces peak discharge that reduces the risk of flooding
- Weed removed
- Higher river efficiency
- Embanked
- Slightly silted river

**Human influence - more properties along the river may have a higher loss during flooding**

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Logical thinking & decision making
Logical thinking .. Scoring

• How can we score for risk of flooding according to the landscape of river photos?
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 photo in the virtual fieldwork. Table 1c shows the data collected during the fieldwork.

**Figure 1a**

<table>
<thead>
<tr>
<th>Field study topic: To study the risks of flooding along Ng Tung River</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data collection method:</td>
</tr>
<tr>
<td>(1) Select 13 field study sites which is separated by each.</td>
</tr>
<tr>
<td>(2) Carry out an assessment at each field data collection form.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk of Flooding along Ng Tung River</th>
<th>Scores (High: 5 / Medium: 3 / Low: 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Factors that leads to flooding</td>
<td></td>
</tr>
<tr>
<td>River discharge</td>
<td></td>
</tr>
<tr>
<td>Vegetation Cover</td>
<td></td>
</tr>
<tr>
<td>Intensity of economic activities</td>
<td></td>
</tr>
</tbody>
</table>

**Application of fieldwork knowledge learnt**

**Stage 3. Processing, Analysing and Presenting Data**

(iii) Refer to Table 1c and the virtual fieldwork materials. Suggest the scores for intensity of economic activities of sites E and G. Explain your rationale of scoring. (3 marks)

(iv) Your classmate gave different scores in (iii) for sites E and G. Explain a way to narrow the differences of the scores. (3 marks)

**Stage 4. Conclusion**

(d) “Flooding risks increase as river go 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 field sites (points A to K) with the same set of virtual fieldwork materials. Discuss the procedures to collect suitable field study topic. (5 marks)
Worksheet Pedagogical Design

- Differential learning (for different abilities)
- Progressive learning
- Problem based learning
- Scaffolding
- Scientific design thinking
- Scenario-based learning
Students Learning Outcomes of Fieldwork Skills

01
• Familiar with the river environment of Hong Kong
• Apply geographical concepts in attempt to design a geographical issue enquiry

02
• Fill in summarize table by repeatedly observe and count variables of the field sites.

03
• Summarize and validate the data provided with hypothetical geographical theories.

Comprehensive understanding and application of fieldwork skills in various geographical issues
Reflective Thinking for Fieldwork Design

- Students need to fully aware of the relationship between precipitation (rainfall) and discharge in Hong Kong.
- Only take a virtual fieldwork once may not understand the actual hydrological characteristics of Ng Tung River.

(SAMPLE) January

April

July

October

1.3% / 33.2mm
6.3% / 153 mm
16% / 386 mm
4.9% / 120.3mm

Reflective Questions for Students after VFW

1) Planning: Consider safety or data accuracy?
2) Collection: One-for-all or multiple collection?
3) Presentation: Data reliable?
4) Conclusion: Can we make a solid and sound conclusion?
5) Reflection: Room for improvement?

* Not to scale

Higher order thinking
Critical thinking
DISCUSSION
On the Using of Fieldwork Tools
Perceived Constraints for Virtual Fieldwork

- **Fixed route** and a **fixed screen**.
- Can only provide more verbal, imagery information of the site on a **particular day**.

**Planning**
- Biological threats?
- Restricted access?

**Data Collection**
- Site selection?
- Choice of sampling?
- Sufficient data collected?

**Data Presentation**
- Insufficient primary data to validate secondary data

**Conclusion**
- Accumulated biases & superficial interpretation may lead to **invalid conclusions**
Future Development for Virtual Fieldwork

Video for taking field data collection

01

02
Comparable VFW in other season

03
Drones tracking

04
Shared / Authentic data set
Resources for Conducting Fieldwork in Geography
Thanks

Feel free to exchange ideas about conducting virtual fieldwork 😊

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