Windows to Places: Using Virtual Reality (VR) in the Geography Classroom

(A collaboration with eduLab)
Flow of Presentation

1. Purpose of Project and Pedagogical Underpinnings
2. Lesson Implementation for Sec 2 Housing
3. Lesson Implementation for Sec 4 Tourism GI
4. VR beyond Geography
5. Hands-on
6. Q and A
Purpose of Project

Students struggle to imagine places, phenomena and processes, and have difficulty understanding abstract geographical concepts.

To explore the use of Virtual Reality (VR) in developing students’ understanding of abstract geographical concepts (i.e. place)
Pedagogical Value of VR

We are guided by the STP's tenet of Pedagogical Practices (encouraging learner engagement, arousing interest and providing clear explanation) in incorporating VR in the geography classroom.
Pedagogical Affordances of 360 Images

- Isolates user’s senses from the external world, increasing one’s sense of presence and immersion\(^1\)
- 3D view that enhances realism of visuals and facilitates understanding of perspective and depth\(^2\)

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Pedagogical Approach (Inquiry)

- Spacing Curiosity (Formulate hypotheses or guiding questions)
- Gathering Data (Identify & locate relevant data)
- Reflective Thinking (Evaluate reliability of data; improve on data collection and analysis)
- Exercising Reasoning (Interpret and analyse geographical data; present findings and analysis)
Pedagogical Approach (Inquiry)

Through the use of Inquiry-based Learning

Learners play an active role in the creation of meaning and knowledge through their individual experiences.

These experiences should be real and authentic for effective learning to take place.

The teacher facilitates the process by getting students to inquire into and to make sense of places on their own.

- Through assimilating, learners incorporate new experiences into the old experiences, which allows them to develop new outlooks.
- Through accommodation, learners reframe the world and new experiences into the mental capacity already present.
Study Question

“Does VR help in students’ understanding of place? If so, how?”
Unpacking the Concept of ‘Place’

<table>
<thead>
<tr>
<th>Scale</th>
<th>Place</th>
<th>Space</th>
<th>Environment</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>A place is a portion of the earth’s surface given meaning by the people who live in it and use it.</td>
<td>A variety of physical and human factors influence the location and interdependence of places and the making of regions and landscapes.</td>
<td>An environment is the result of interaction of physical and human features creating the conditions and resources on which life on earth depends.</td>
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<tr>
<td></td>
<td>Places result from the interaction of physical and human features in different ways.</td>
<td>The distributions and spatial patterns of physical and human features or phenomena have a significant impact on people’s lives.</td>
<td>Interactions within and between human societies and natural environments cause changes in other aspects of the environment which may beneficial or harmful to life.</td>
</tr>
<tr>
<td></td>
<td>The unique characteristics of places can be interpreted and represented in different ways.</td>
<td>The need to move across space (spatial interaction) is a main driver in economic, social and cultural development.</td>
<td>Students should understand that spatial patterns and distributions are influenced by and reflect socio-economic and natural processes in action.</td>
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<tr>
<td></td>
<td>Students should be aware of how people develop attachment to and form different mental images of different places. They should also appreciate how these images affect human behaviour.</td>
<td>Students should understand that spatial patterns and distributions are influenced by and reflect socio-economic and natural processes in action.</td>
<td>Students should understand that human action can result in environmental changes. They should be aware of the need to respect and understand environments.</td>
</tr>
<tr>
<td></td>
<td>An example in the syllabus is communal spaces in neighbourhoods.</td>
<td>An example in the syllabus is the impact of traffic congestion on people and the environment.</td>
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</tr>
</tbody>
</table>
Unpacking the Concept of ‘Place’

- A place can be interpreted in different ways.
- The **multiple interpretations** are the result of the different **interactions** people have and the different **mental images** people have of different places.
- The multiple interpretations affect **human behaviour** in different ways.
Important Considerations on Choice of Sites

**Learning Outcomes from Syllabus Documents**

- Key Question 4: What are some strategies used by cities to manage housing shortage and build inclusive housing?

**Content Coverage**

- Ensuring different housing estates captured the different features of inclusive housing

**Considerations**

- Logistical constraints of bringing students to three separate field sites (Clementi, Tiong Bahru and Ang Mo Kio)
Process

**Pre-test**  
- Worksheet to assess students’ prior knowledge

**Lesson (Control Group)**  
- Direct instruction, teacher-led discussions and group activity

**Lesson (Experiment Group)**  
- VR resources, group activity and student-led discussions

**Post-test**  
- Worksheet to assess students’ understanding of identified lesson objectives
# Details of Lesson Implementation

<table>
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<tr>
<th>Details of Lesson Implementation</th>
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<tbody>
<tr>
<td><strong>Experiment</strong></td>
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</table>
| **Introduction** | • The ‘Explore Japan’ video from National Geographic Channel was played on the main screen  
• Teacher-led discussion on what makes Japan special | • Teacher-led discussion on how Singapore has solved her housing shortage issue  
• Students to share about why they feel like they belong to Jurong West |
| **Body** | • Students experienced VR images with animations of 2 estates and asked to fill in question frames to lead them to understand sense of place | • Panoramic images of 2 estates were printed with guiding questions on A3 paper  
• Students were asked to walk round the class and pen down their thoughts. A gallery walk is later conducted for students to explore the opinions of others. |
| **Consolidation** | • Consolidation with students answering the key question “What makes a person’s sense of place?” | • Consolidation with main points on PowerPoint slides |
Ang Mo Kio
Hey! What do you think about cycling to one of the new cafes that is just round the corner?

The 1-hour wait for our prawn noodles at Tiong Bahru Market was so worth it!

It must be convenient for the residents here to have coffee shops at the base of their blocks.

I really enjoy our daily morning walks together! We have been doing this since we moved here almost 40 years ago!
Clementi
Impact on Students’ Learning
Pre- and Post-tests

Student could not interpret the meaning of ‘unique feature’ and how it could contribute to a person’s sense of place.

Student could identify a ‘unique feature’ and briefly explained how it contributes to his sense of place.
Pre- and Post-tests

Student provided brief explanations with little elaboration.

Student articulated a better understanding of how different elements in Queenstown contributed to a person’s sense of place.

- Clearer explanations
- Ability to identify a variety of elements
Quantitative Data: Comparison of Pre- and Post-tests Results

<table>
<thead>
<tr>
<th></th>
<th>Average Difference between pre and post test results</th>
<th>Effect Size</th>
<th>P (T&lt;=t) two-tail</th>
</tr>
</thead>
<tbody>
<tr>
<td>2E4 Experimental</td>
<td>+2.0</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>2E3 Comparison</td>
<td>+0.9</td>
<td>0.37</td>
<td>0.013</td>
</tr>
<tr>
<td>2N1 Experimental</td>
<td>+2.7</td>
<td>1.84</td>
<td>0</td>
</tr>
<tr>
<td>2N2 Comparison</td>
<td>+1.3</td>
<td>0.74</td>
<td>0.001</td>
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</tbody>
</table>

^Effect size: small ~0.2; medium ~0.5; large ~0.8

^Small p-values (<0.05): null hypothesis that VR has no impact on learning is rejected.

*Values were calculated in consideration of only Q1-3 of pre- & post- tests results as it would more accurately address the study question for addressing of conceptual understanding of ‘sense of place’.
Qualitative Data: Students’ Feedback

VR is very fun and interesting. It helps me to be able to visualise different places and imagine how it is like to be there.

VR helped me to understand the uniqueness of different housing estates. My friends and I were able to share our experiences. For example, I was able to describe Tiong Bahru to my friend who has never been there. It was more engaging than usual lessons with videos.
Qualitative Data (Teachers)

Students are better able to make connections to how different individuals can construct their sense of place differently by living in the same estate.

Students were engaged during the VR lessons. They also asked questions such as, “Why do different groups of people in a neighbourhood have different needs?” This showed that the VR was able to focus their scope of learning.
Challenges Faced in Phase 1
Technical
Students’ phones were not compatible with 360° videos and images.

Instructional
Students were not aware of how to utilise the Virtual Reality (VR) goggles for the first time.

Logistical
40 student VR headsets vs 1 teacher
Phase 2 of Project
Sec 4E VR for Pre-fieldwork Reconnaissance

Previous Situation

• Curriculum time only allows for **one-time/one-site experience** for the students.
• Hypothesis is given and not crafted by students as students are often unable to identify enough variables relevant to the context of study.
• Extra time is required onsite to orientate the students.
Topic 9: Geographical Investigations (Only for Section A of Paper 1)

Candidates should be familiar with the inquiry approach to fieldwork, namely (a) formulate aims and hypotheses/guiding questions, (b) inquiry skills and techniques to collect data, (c) make analyses of data, (d) presentation techniques to display data, and (e) form conclusions.
Important Considerations on Choice of Site

Learning Outcomes from Syllabus Document

● Key Question 2: Why has tourism become a global phenomenon?

Content Coverage

● Ensuring that fieldwork site showcased necessary content relevant to syllabus
Important Considerations on Choice of Site

Logistical concerns

• Handful of students had not visited Orchard Road
  ➢ Had to expose students to GI site to allow fieldwork to be more meaningful and purposeful
• Time constraints
• Safety briefing for students

Time-bound Elements

• Capture important features of Orchard Road during Christmas period → school holidays
Sec 4E VR for Pre-fieldwork Reconnaissance

- Pre-fieldwork VR immersion of site
- Provide information on site conditions both by sight and sound
- Taking 360° videos of Orchard along the streets for Geographical Investigation to gain the spatial awareness
- Hypothesis testing, Sensory Fieldwork (Site and sound) and application of primary data collection tools
Sec 4E VR for Pre-fieldwork Reconnaissance

Learning Experience

● Sparking **curiosity** on the fieldwork site
● Shift towards **student-directed inquiry**
● Allow students to better understand the site conditions to aid in process of pre-fieldwork preparation
Flow of Fieldwork Process

Pre-fieldwork
VR Experience
- Annotation of map
- Brainstorming relevant questions
- Constructing hypothesis and shortlisting fieldwork tools

During Fieldwork
- Gathering and recording data

Post-fieldwork
- Data representation and analysis
- Answering hypothesis and inquiry question
- Reflections

Making GI fieldwork experience more meaningful and purposeful
Using VR to Enhance GI Experience

<table>
<thead>
<tr>
<th>Activities involving VR</th>
<th>Intent</th>
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<tbody>
<tr>
<td>● Annotation of key features and amenities along Orchard Road</td>
<td>● Better interpretation of Orchard Road as a place</td>
</tr>
<tr>
<td>● Observations made on soundscapes</td>
<td>○ Destination factors relevant to Orchard Road</td>
</tr>
<tr>
<td>● Observations on profile of people along Orchard Road at different times</td>
<td>○ Idea of scale in terms of layout of features and amenities</td>
</tr>
<tr>
<td></td>
<td>● Self-directed Inquiry</td>
</tr>
<tr>
<td></td>
<td>○ Craft meaningful and purposeful hypotheses</td>
</tr>
<tr>
<td></td>
<td>○ Feasibility of research tools</td>
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</tbody>
</table>
Impact on Students’ Learning: Success Criteria

- Variety and quality of hypotheses crafted
- Ability to articulate features that contribute to Orchard Road being a tourist destination (concept of place)
Summary of Students’ Research Hypotheses

With a sample size of 14 groups, a variety of hypotheses was generated mainly in the areas listed below.

- **Destination factors**
  - Accessibility: two
  - Variety of shops available: four
  - Types of shops available: three
  - Events organised: one
  - Amenities: three
- **Profile of tourists**: one
- **Others**: one
Technicalities
Creating VR Resources from Scratch

**VR Images**
- Take pictures using Samsung Gear 360 camera
- Samsung Gear 360 app → laptop
- Upload panoramic images onto CoSpaces
- Add characters using app
- Add animations using Blockly

**VR Videos**
- Take videos using Samsung Gear 360 camera
- Samsung Gear 360 app → laptop
- Convert 360 video to VR video using YouTube metadata coder
- Upload processed files onto YouTube
VR Beyond Geography
VR in the English Classroom: 
Descriptive Writing

Run 2018

Whether you are alone, with friends, or with family members, you are bound to have a great time at Fun Run 2018, the eighth annual run brought to you by Sadiq Sportsware, which will be held on 30 October.

This year, the event will be held at 1 Chinese Garden Road.
Yes, you can run your hearts out.
Yes, you can admire the lush greenery.
Yes, you can listen to the calming waves.
Yes, you can enjoy the fresh air.
Yes, all of the above. At the same time. At the same place.

<table>
<thead>
<tr>
<th>Category</th>
<th>Age</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junior</td>
<td>7 - 12 years old</td>
<td>1.6 km</td>
</tr>
<tr>
<td>Senior</td>
<td>13 - 18 years old</td>
<td>2.4 km</td>
</tr>
<tr>
<td>Open</td>
<td>&gt; 19 years old</td>
<td>5 km</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Category</th>
<th>Age</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friends (up to 3 members)</td>
<td>7 - 30 years old</td>
<td>5.8 km</td>
</tr>
<tr>
<td>Family (up to 3 family members with at least 1 adult)</td>
<td>&gt; 7 years old</td>
<td></td>
</tr>
</tbody>
</table>

Register with your friends now and enjoy $2 off. This offer ends 30 September 2018.
Please download the registration form at FunRun.com if you wish to join and email your completed form to 2018@Funrun.com.
"The ride that I like most is the Jurassic Park Ride. It is a ride that we have to be seated on a water boat. While going through the ride, we get to see different species of dinosaurs. The ride is my favourite because of the realistic animation and it is fun."
Hands-on Experience
Hands-on VR Experience (360 Video)

1. Find our 360 video of Orchard Road at the following link:
   ○ https://tinyurl.com/hyss360orchard

2. Insert your smartphones into the VR goggles and connect the audio cable. You may adjust the focal knob on the right if the video appears blurred.

Enjoy the experience!
Hands-on VR Experience (360 Images)

- Download the **CoSpaces Edu Application** on your smartphones.
- Find our 360 image resources at the following links:
  - Image of Clementi: [https://cospac.es/fvos](https://cospac.es/fvos)
  - Image of Tiong Bahru: [https://cospac.es/vCNK](https://cospac.es/vCNK)
  - Image of Ang Mo Kio: [https://cospac.es/42PT](https://cospac.es/42PT)
- Insert your smartphones into the VR googles. You may adjust the focal knob on the right if the video appears blurred.

Enjoy the experience!
Any Questions?

Please feel free to approach any one of our team members if you have any further questions/feedback!

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