

The Sustainability Learning Lab: Enhancing Geographical Inquiry in the Field and Classrooms

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Signature Pedagogies (Shulman, 2005)

- “the types of teaching that organize the fundamental ways in which future practitioners are educated for their new professions” (p. 52).
- Movement away from generic teaching strategies towards a reconceptualization of *pedagogy as a means to understand and practise disciplinary ways of thinking.*



Signature Pedagogies (Shulman, 2005)



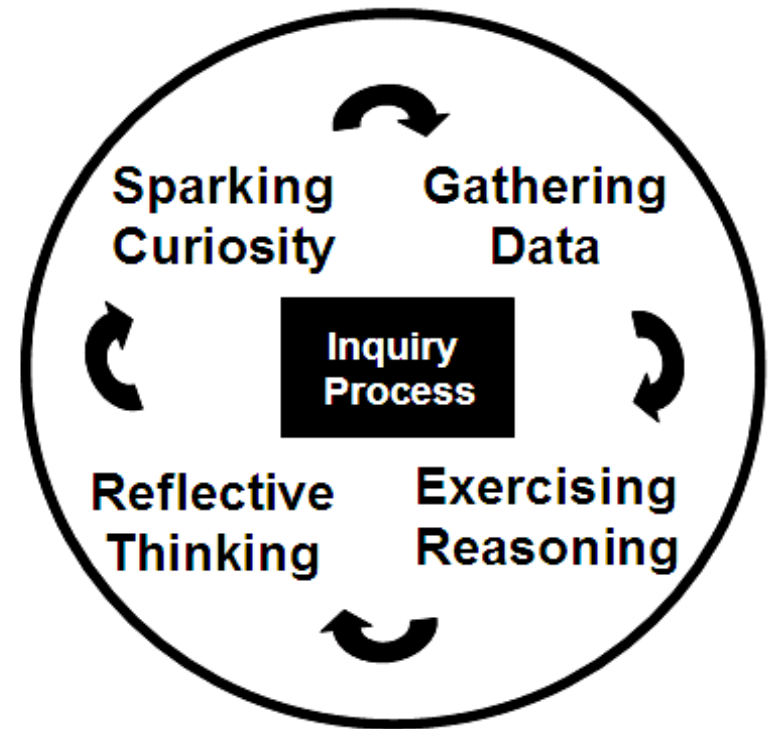
Surface Structure:
concrete operational practices

Implicit Structure:
professional dispositions,
beliefs, and attitudes

Deep Structure:
understandings about
knowledge

Situating the Study: The Singapore Context

- In Singapore the inquiry approach is privileged as a “signature pedagogy” to construct geographical knowledge in the classroom and **in the field**.
- Geographical Investigation skills are tested as a component of the GCE O-level and A-level examinations



Adapted from Roberts, M. (2003)
Learning through Enquiry.
Geographical Assoc: UK

Sustainability Learning Lab (SLL)

Sets the foundation for a more focused approach to supporting the signature pedagogies for geographical disciplinary teaching and learning.



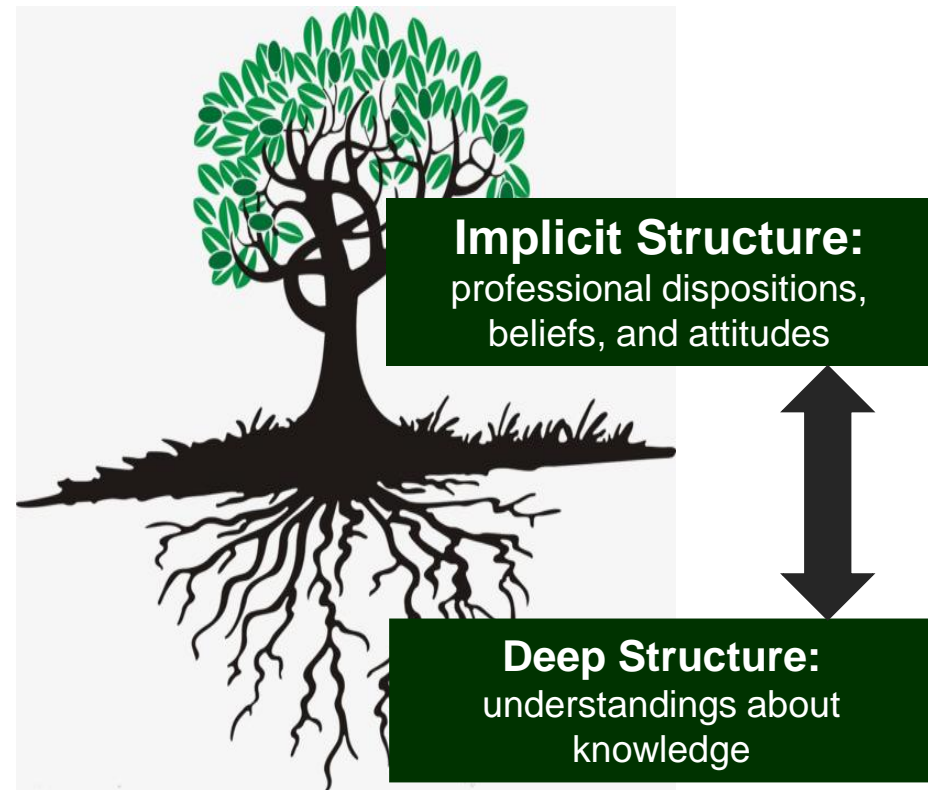
What kind of intervention is required?

Findings

Teachers expressed varying beliefs about the purpose and importance of inquiry in geography.

- Scientific inquiry methods
- Disciplinary concepts
- Applied learning
- Values: environmental stewardship

Believed that carrying out the GI helps students better understand the ways that geographers construct knowledge of the world.

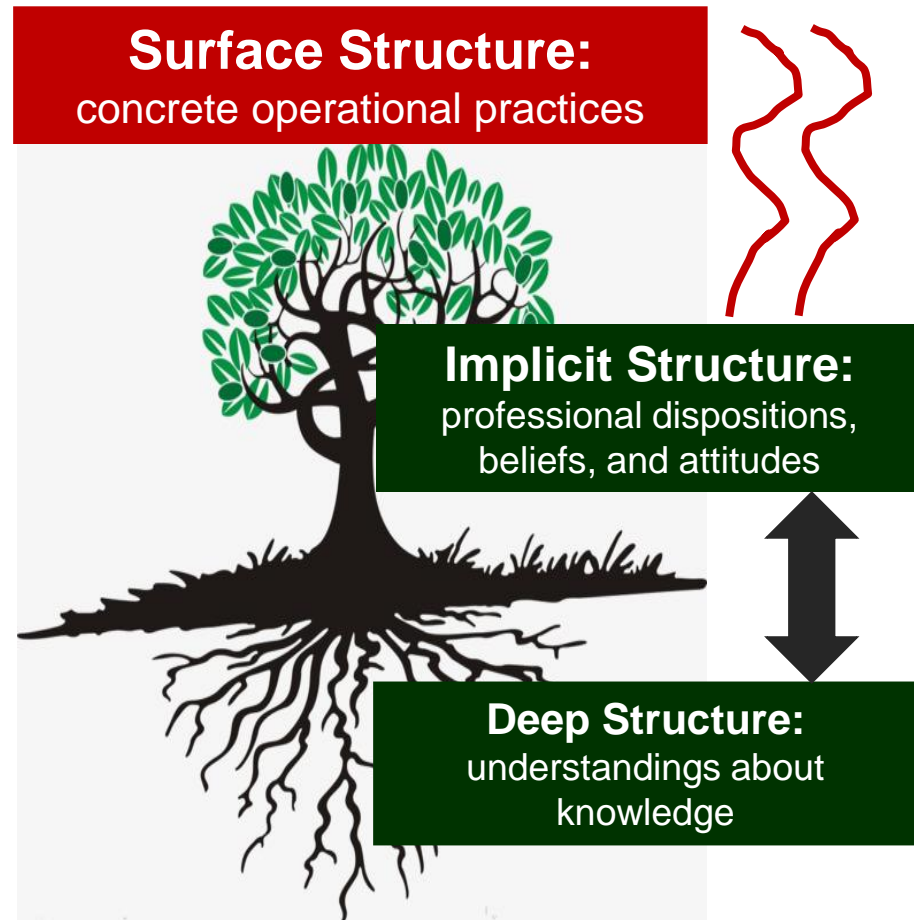


Findings

Strongly teacher-directed due to time and manpower constraints.

- E.g. teachers developed the inquiry questions and chose the sample sites; no time to take students to the site more than once

But teachers expressed the desire to move away from this towards more student-directed inquiry.



Findings: Knowledge-related

1. Needed support about the *specific content* related to water quality:
 - different water quality indicators (DO, pH, temp, turbidity, nitrate, phosphate)
 - how these indicators *interacted* to affect water quality.
 - how the water quality indicators *fluctuated over time*.
2. Needed information about the place characteristics the *fieldwork site as a water catchment area* which affected:
 - inquiry questions/ hypotheses
 - selection of sampling sites

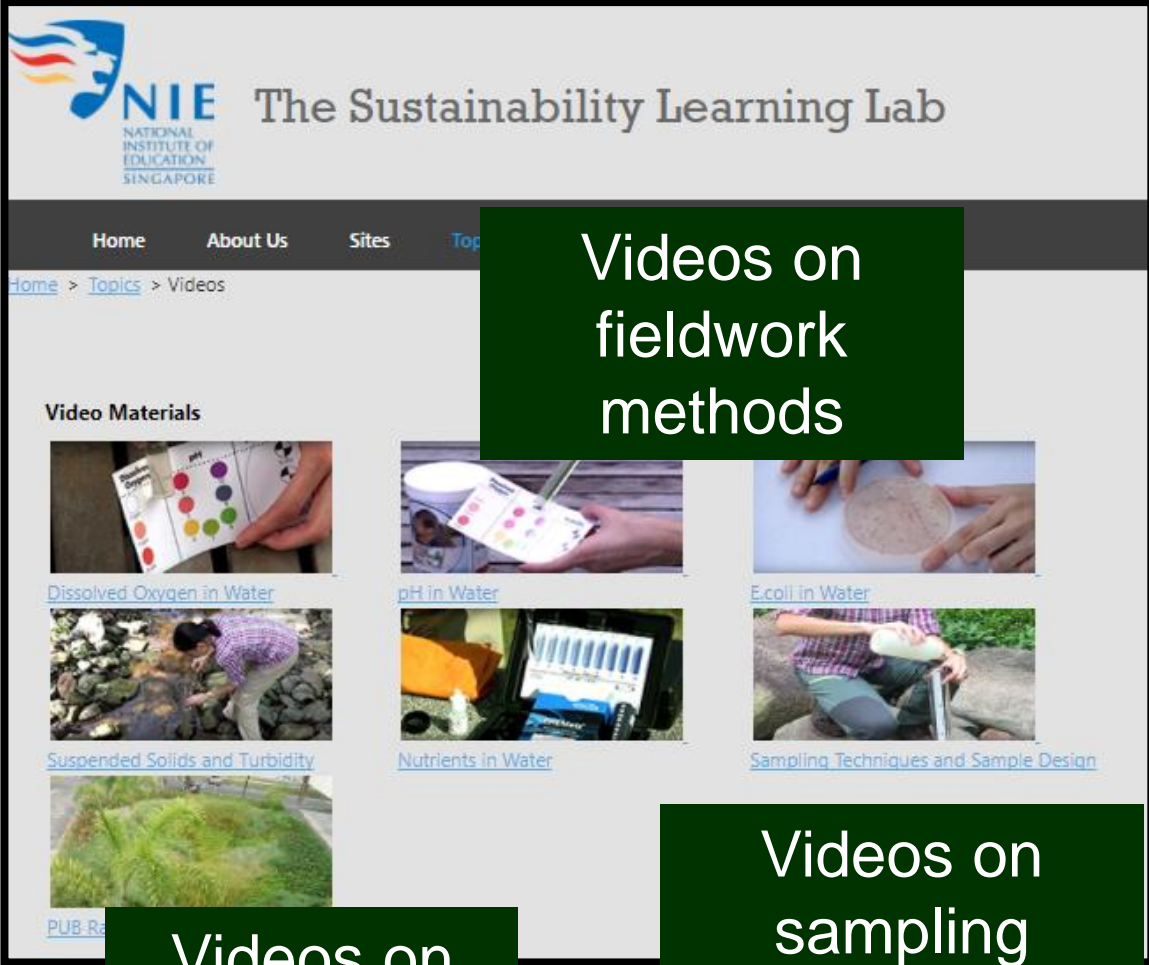
Sustainability Learning Lab (SLL)

- Fieldwork site(s) equipped with water quality and meteorological sensors
- Accompanying website with content developed in partnership with schools.



Videos that enable students to:

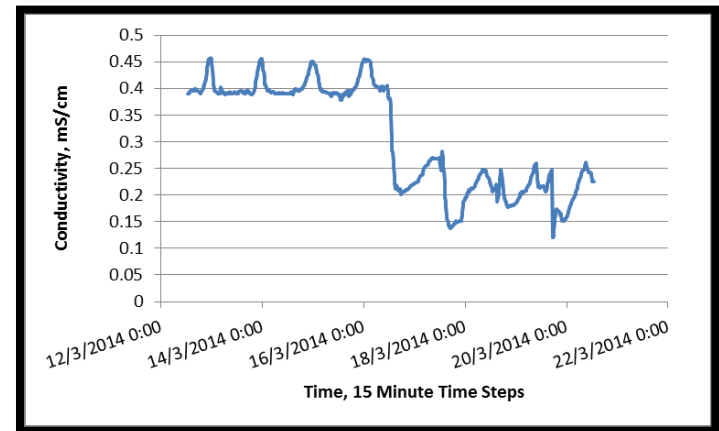
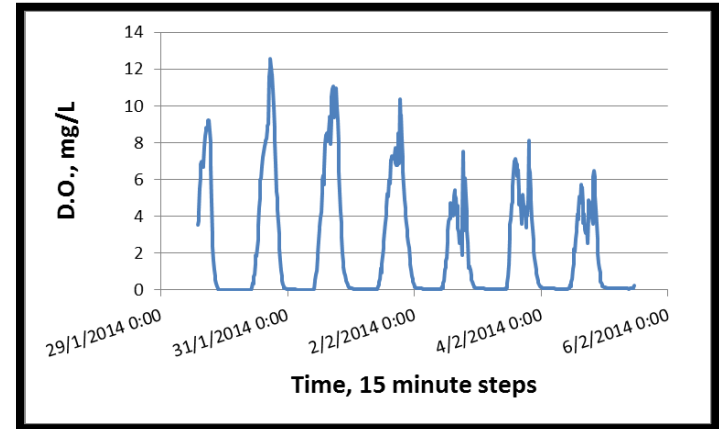
- Prepare more independently for the fieldwork;
- Make their own decisions about the inquiry question and sampling sites.



The screenshot displays the NIE Sustainability Learning Lab website. At the top left is the NIE logo (National Institute of Education, Singapore) and the text 'The Sustainability Learning Lab'. Below this is a navigation bar with 'Home', 'About Us', 'Sites', and 'Topics'. A breadcrumb trail shows 'Home > Topics > Videos'. The main content area is titled 'Video Materials' and features a grid of video thumbnails with captions: 'Dissolved Oxygen in Water', 'pH in Water', 'E.coli in Water', 'Suspended Solids and Turbidity', 'Nutrients in Water', and 'Sampling Techniques and Sample Design'. A partial caption 'PUB R...' is visible at the bottom left. Three dark green callout boxes are overlaid on the image: 'Videos on fieldwork methods' (top right), 'Videos on fieldwork site' (bottom center), and 'Videos on sampling methods' (bottom right).

Data portal: Long term high quality data provision

The screenshot shows a web-based data portal interface. At the top, there are three tabs: "1. Times Series Data", "2. Jurong Eco Garden", and "3. Rain Garden". Below the tabs, there are two dropdown menus for site selection, currently showing "Jurong Eco Garden" and "Rain Garden". There are also input fields for "Date From:" and "Date To:". Below these are options for "Interval" and "Type of Graph" (Line, Bar, Scatter, Pie). A "Parameters" section contains a grid of checkboxes for various environmental metrics such as Atmospheric pressure, Chlorophyll a, Conductivity, Daily rainfall depth, Depth of sampling, Dissolved Oxygen, Nitrate, pH, Phosphate, Rain Fall, Rainfall intensity, Relative Humidity, Solar Radiation, Temperature, Turbidity, Wind direct, and Wind speed. At the bottom of the interface are buttons for "Show Graph", "Export CSV", and "Reset". The footer includes the logo for HSSE (Humanities and Social Studies Education) and the text "Do you have anything to share with us or ask us? Please email to: SLL@nie.edu.sg".



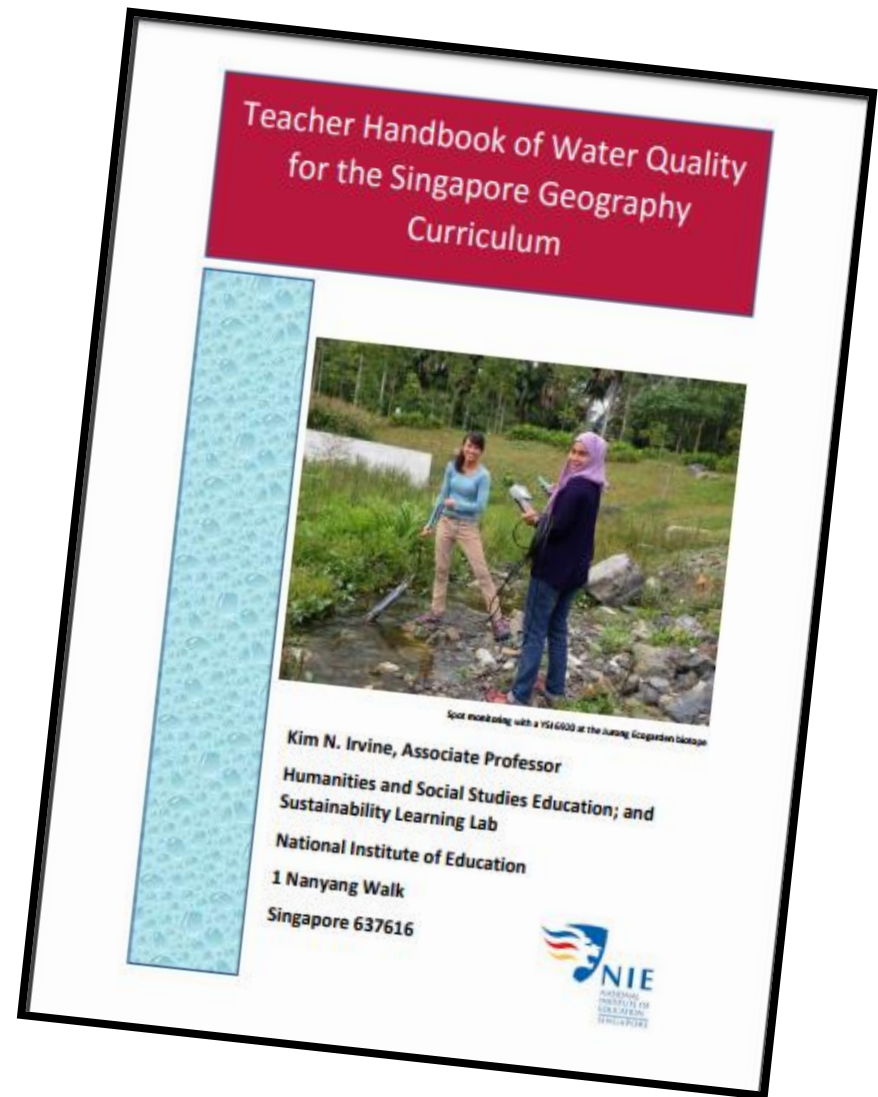
Time-series data that can be downloaded and/ or graphed at various time intervals; Secondary source of data to support data analysis.

	A	B	C	D	E	F	G	H	I	J	K
	Date	Time	Temp	SpCond	DOSat	DO	DOchrg	Depth	pH	Turbid	Battery
	m/d/y	hh:mm:ss	C	mS/cm	%	mg/L		meters		NTU	volts
4	12/4/2013	11:00:40	30.02	0.539	110.6	8.35	53.9	0.256	7.26	8.2	12.4
5	12/4/2013	11:15:40	28.13	0.526	79.2	6.18	52.1	0.68	7.29	13	12.3
6	12/4/2013	11:30:40	28.15	0.526	76.8	5.99	51	0.679	7.33	9.8	12.4
7	12/4/2013	11:45:40	28.26	0.525	84.1	6.55	51	0.676	7.36	8.6	12.4
8	12/4/2013	12:00:40	28.31	0.525	82.1	6.38	49.8	0.673	7.37	7.5	12.4
9	12/4/2013	12:15:40	28.35	0.525	79.8	6.2	51	0.67	7.37	7.5	12.3
10	12/4/2013	12:30:40	28.43	0.525	88.7	6.88	51	0.667	7.38	5.8	12.4
11	12/4/2013	12:45:40	28.47	0.525	85.5	6.63	51	0.666	7.37	6	12.3
12	12/4/2013	13:00:40	28.56	0.525	87.4	6.76	51	0.663	7.38	6.7	12.4
13	12/4/2013	13:15:40	28.6	0.525	100.8	7.8	52.1	0.661	7.41	4.8	12.4
14	12/4/2013	13:30:40	28.66	0.524	104.1	8.05	52.1	0.659	7.42	4.7	12.3
15	12/4/2013	13:45:40	28.75	0.525	103.1	7.96	52.1	0.657	7.41	5.8	12.4
16	12/4/2013	14:00:40	28.84	0.524	116.6	8.96	53.9	0.656	7.45	4.7	12.3
17	12/4/2013	14:15:40	28.93	0.523	115.8	8.9	53.9	0.654	7.44	6	12.4
18	12/4/2013	14:30:40	29.01	0.523	117.8	9.05	55.1	0.651	7.44	4	12.3

Lesson resources and accompanying videos on the different stages of the inquiry cycle to help teachers in planning for and carrying out the GI for **the site**.



Provision of quality, teacher-friendly information on the different water quality indicators that are pitched appropriately for the water quality GI.



What's next?

- Development of Water Quality App to provide **geo-tagged, spatial mapping capabilities** to support GI (in progress).
- Collaboration with colleagues from LST, NIE on testing **alternative, cost-effective water sampling equipment** that can provide **time series data across a range of sites**.
- Collaboration with ELIS on refining **Talk Moves** framework around **multimodal data in geography**, with accompanying videos and curriculum materials.
- Development of two additional modules (if funding permits)
 - Weather and climate
 - Urban liveability



Thank you!

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