

## Is there a Learning Progression for Learning the Climate Change Topic in Geography?

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### KEY IMPLICATIONS

The Learning Progression (LP) developed can:

- inform Geography Syllabus development;
- be used to design instruction; and
- be used for learning analytics.

### BACKGROUND

While climate change is taught explicitly as a topic in the Singapore school geography curriculum, students' understanding of the topic is made up of inaccurate and incomplete conceptualisations (Chang & Pascua, 2016). Scholars have warned of the negative consequences of the perpetuation of false understanding of the phenomenon (McCaffrey & Buhr, 2008) and introducing policies targeted at changing attitudes and behaviour may only prove to be futile and counterproductive (McCaffrey & Buhr, 2008).

### FOCUS OF STUDY

With the new syllabus for Upper Secondary implemented in 2013, a deeper and more comprehensive coverage of climate change is offered; it discusses the full spectrum of causes, impact and management strategies (SEAB, 2014). The study builds on previous research in mapping climate change education in Singapore on how students develop sophisticated geographical understanding through LP.

### KEY FINDINGS

This study sought to validate the hypothetical LP (HLP) and an empirical LP (ELP). There is a clear indication that most of the LPs discussed in this study have been validated. The learning described by LP is not developmentally inevitable; rather, it requires targeted instruction and curriculum. This work will be advanced through our collaboration with colleagues from Ministry of Education, Curriculum Planning & Development Division (MOE, CPDD).

### SIGNIFICANCE OF FINDINGS

The following are the significant aspects of the findings.

#### Implications for practice

Curriculum design as well as instruction may be informed by the ELP developed.

#### Implications for policy and research

The school geography syllabus development process could refer to this work.

#### Proposed follow-up activities

One of the collaborators (a senior specialist from MOE CPDD) will be working with the PI to explore the use of the LPs developed to craft a learning activity on the Singapore Student Learning Space (SLS) and to design the accompanying learning analytics.

## PARTICIPANTS

A total of 1789 participants were from the following levels: i) Primary 5; ii) Secondary 3; iii) Junior College year 1; iv) university students. Of these, 8 teachers were involved in focus group discussion (FGD) to gather further information about the validity of the initial HLP.

## RESEARCH DESIGN

### Phase 1

#### *Development of HLP (ver. 1)*

HLP1 involved the analysis of educational artefacts that undergird the form, content and teaching of the topic, climate change through analysing curricular materials and a review of relevant literature. This the preliminary upper and lower anchors, as well as inform the design of progress levels and examples of assessment tasks.

### Phase 2

#### *Development and validation of HLP (ver. 2)*

HLP1 was identified by patterns in the literature, through subjecting the HLP to diagnostic assessment. An exemplar LP was created, stipulating the anchors, levels of achievement vis-à-vis the progress variables.

A diagnostic test was developed based on the patterns identified in the exemplar LP. We used a modified version of the Climate Change Diagnostic Test (CCDT), a two-tiered test aimed at investigating learners' domain and content understanding of a

topic (Chang & Pascua, 2016). Pilot studies were conducted in a cross-sectional data collection involving participants from the identified school levels before the instrument was used to derive the Earn and Learn Programme (ELP) (Stevens, Delgado, & Krajcik, 2010).

FGDs were conducted with teachers to ask how they teach climate change, how they transition from one topic to another, and issues on classroom management, the curriculum and the subject that deters and/or assists them in teaching the topic in particular, and Geography in general. The aim of such conversations was to corroborate findings, as well as fine tune the assessment items to better fit the test-takers' age and school levels.

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This brief was based on the project OER 08/16 CCH: Developing A Learning Progression for Climate Change in Geography Education.

## How to cite this publication

Chang, C. H., Tan, I., Tan, J., & Kwek, C. H. (2020). *Is there a Learning Progression for Learning the Climate Change topic in Geography?* (NIE Research Brief Series No. 20-015). Singapore: National Institute of Education.

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