

Effective Climate Change Education: Factors Affecting Students' Learning and Teachers' Self-Efficacy



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Background

The issue of climate change is huge, complex and value-laden in nature and thus raises a variety of barriers to education and communication. According to America's and American Teens' Knowledge of Climate Change report¹, 54% American teens received a failing grade. More than 70% of respondents were to varying degrees concerned about climate change and want to know more about climate change¹. There is a great need to promote American teens' climate change literacy.

The Next Generation Science Standards (NGSS) (2013)² recommend climate change needs to be incorporated in science classes starting as early as elementary school. There are significant pressures associated with teaching about climate change, which has been missing in many science classrooms.

However, there is lack of empirical studies to justify the relationship between cognitive, affective, and normative factors on students' learning performance in the context of climate change education. While many resources have been developed for K-12 education, few studies have been conducted to understand the characteristics of effective educative resources to build teachers' self-efficacy in climate change education. Hence, another objective of present study aims at overcoming this gap in the literature by exploring the characteristics of educative resources identified by secondary science teachers to build their confidence in teaching about climate change.



Purpose Statement

In order to promote effective climate change education in secondary education, the study aims to:

1. Explore and examine the cognitive, affective, and normative factors that affect students' learning in climate change education;
2. Investigate characteristics identified by teachers of educative curriculum that builds their self-efficacy in teaching climate change.



Research Questions

- RQ 1: When controlling for GPA and prior knowledge in climate change, do 11th and 12th grade students who participated in 4 climate change and forest management activities have greater systems thinking skill than their peers?
- RQ 2: When controlling for attitude toward climate change, do rural 11th and 12th grade students gain greater hopefulness than urban 11th and 12th grade students regarding to climate change after participating in the forest management related activities?
- RQ 3: When controlling for social influence from parents and peers on pro-environmental behavior, do life cycle assessment related activities promote 11th and 12th grade students' environmentally responsible consumer intention than their peers?
- RQ 4: What characteristics do teachers identify to improve educative curriculum materials and build their self-efficacy in climate change education?

Key Variables

Systems Thinking Skill

Systems thinking is a school of thought that focuses on recognizing the interconnections between the parts of a system and then synthesizes these parts into a unified view of the whole³.

Hope Concerning Climate Change

Hope is a positive feeling about the future; it is a kind of a conviction about the unproven and includes strong cognitive and emotional dimensions⁴

Environmentally Responsible Consumer Intention

Consumers with stronger environmental responsible consumer intention tend to make decisions consistent with environmentally sustainable consumption⁵.

Life Cycle Assessment (LCA)

LCA is a technique to assess the environmental aspects and potential impacts associated with a produce, process, or service⁶.

Educative Curriculum Materials

This study uses the definition from Davis and Krajcik (2005)⁷ as "Educative curriculum materials for grades K-12 are the materials that are intended to promote teacher learning in addition to student learning as an outcome."

Teachers' Self-Efficacy

Teachers' self-efficacy is defined as teachers' beliefs in their abilities to instruct and evidence suggests that teachers' self-efficacy might account for students' differences in effectiveness⁸.



Methodology

Research Design

To answer RQs 1, 2, and 3, the study will involve a quantitative experimental pretest-posttest control group design⁹. In this study, the treatment group for each question will receive 4 activities and a control group will receive 4 different activities from *PINEMAP-PLT Secondary Module: Climate Change and Southeastern Forest*.

To answer RQ 4, the pre-experiment design will be employed, where the teachers will receive an interview as post-test after they use the secondary module.

Participants

For RQ 1, 2 and 3, participants of treatment and control group will include 24 classes of students, approximately 400 to 600 high school students (11-12th grade) from AP Environmental Science, regular Environmental Science, or AP Biology courses across Southeast of the United States. For RQ 4, participants will include 40 secondary high school science teachers across Southeast of the United States who will be involved with an online training in the Summer 2013 and pilot testing the activities for the secondary module during Fall 2013.

Instruments

For students data, a pre-test and post-test survey will be developed specifically for this study, using existing scales where possible. For teachers data, a "semi-structured" interview format will be used as a qualitative research method in order to achieve some in-depth information about characteristics of educative curriculum materials.

References

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