

Chapter 3

Examining the Alignment of Student Explanations With the System Model in Climate Education Using Systems Thinking


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EXECUTIVE SUMMARY

The climate crisis poses a major threat to sustainability, highlighting the need for climate education that develops students' systems thinking skills regarding dynamic environmental issues. For this reason, this project, funded by the United Nations Development Programme (UNDP), was developed by a research university, a non-governmental organization, and a middle school partnership. As part of the project, this study investigated a ten-week after-school climate education program for 8th-grade students that aimed to improve their understanding of the climate system through simulation and policymaking. Semi-structured interviews were analyzed to assess the program's model alignment with students' explanations. The most frequently mentioned category was the economy, followed by the carbon cycle; population and the greenhouse effect were the least common. The study offers valuable insights into using a systems approach in climate education to comprehend climate complexity and dynamics by considering the importance of economy and population in understanding human-caused climate change.

INTRODUCTION

Most current socio-environmental problems have a complex scientific background and a controversial social structure (Lombardi, 2022). To interpret complex systems, it is essential to consider problems holistically (Riess & Mischo, 2010). However, individuals often struggle to understand and evaluate the complexity of systems (Sweeney & Sterman, 2000). Using a systems thinking approach in teaching is crucial for developing students' scientific thinking and problem-solving skills in dynamic environmental issues (Porter, 2009). Furthermore, it is important to generate 'system citizens' who can effectively deal with complex problems (Assaraf & Orion, 2005; Sweeney & Sterman, 2007).

Systems thinking is crucial for understanding climate science (Shepardson et al., 2014; Sterman, 2001). It requires an understanding of complex and dynamic systems (Liu, 2023). To comprehend how climate systems operate and their complexity, it is necessary to analyze the stock and flow structures of the system, various feedback processes, linear and non-linear relationships between components, and the resulting delays. Therefore, integrating the systems thinking approach into climate change education is crucial (Blatti et al., 2019). The climate crisis is widely regarded as the most significant threat to ecological balance today (Pörtner et al., 2022). It is essential to raise students' awareness of global issues, including the climate crisis, and empower them to propose solutions.

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