

Teaching risks of global warming in a continually changing global climate

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1. Introduction

In the commentary of the new course study for senior high schools (2018, Ministry of Education, Culture, Sports, Science, and Technology - Japan), it is stated in “Basic Earth Science” that “based on the hypothesis that global warming is actually progressing, presentation of the data that confirms it is necessary. Students are encouraged to forecast global warming influences”. Nevertheless, as many people are aware, skepticism regarding global warming persists today. Politicians particularly point this out aggressively.

From a neutral standpoint, Masuda (2006) (Scientists in Japan (41(9))) summarized skepticism related to global warming while also giving some regard to the scientific consensus by IPCC. It is pointed out in his paper that some skepticism lacks scientific evidence. However, as long as the research about the global climate system is progressing, it is natural that this issue involves uncertainty. Of course, other phenomena researched in geosciences certainly involve such uncertainty. “Global warming” is specific in that the degree of public attention is high and its authenticity is discussed frequently. However, this presentation is not intended to argue the truth or falsity of global warming. Given those circumstances, the author intends to report what is important at the senior high school educational level.

2. Descriptions of “global warming” in current Basic Earth Science textbooks

The author compared textbooks from five publishers. Figures displaying rising temperature data over the past century and increases in CO₂ concentrations during the past decades are shown in every textbook. On the other hand, regarding factors of global warming and future forecasts, every textbook uses careful expressions such as “it is considered that …, it is common to consider that …”. Some textbooks describe past climate and urge careful consideration, whereas other textbooks present the uncertainty while pointing out other phenomena such as the heat island effects. Two textbooks present future forecasts of IPCC, whereas one of them presents more details related to measures against global warming. Although each publisher devotes some consideration to the uncertainty related to global warming, their nuances differ.

3. Considerations for education

Through instruction about global warming, the author is aware of the cultivation of an “attitude of recognizing the uncertainty of science and not being confused by the reports”. At Komazawa University Senior High school, Basic Earth Science is taught two hours per week as a necessary course for first-year students. In this course, “Global warming” is taught during the third term related to “earth history”. In this connection, importance is attached to the understanding of climate feedback. During the history of the earth, sudden climate changes occurred several times, followed by the total extinction of many species and the eventual evolution of life as we know it. This indicates positive feedback on the global climate system triggered by some contributory factors such as volcanic eruption or collision with a meteorite. In the class, the possibility of a drastic change to the global climate by several factors is

emphasized. Furthermore, the fact that research of this system is still developing is also taught. In the study of geoscience, new observation data such as remote sensing data from satellites and earth excavation data are obtained through daily technological innovations. This data might in some cases cast doubt on the present dominant theory. It is natural that the meaning of the data is investigated carefully every time it emerges and that discussions are made to narrow and resolve the uncertainty. Regarding climate feedback, positive feedback system (changes are accelerated) and negative feedback system (changes are suppressed) are still on the research stage. It is a good topic for teaching that science involves uncertainty.

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