

# **From Earth Science to Earth System Science: A High School Science Curriculum Reform in Taiwan**

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## **Abstract**

During past decades, the earth science was undergoing a revolution, that is, many scientists have discovered that the earth is a “complex system” with some properties that cannot be explained through understanding its components separately. Meanwhile, calls for science education reform have prevailed for last two decades. One of the major themes is the integration of different disciplines of science curricula. To meet these trends, Ministry of Education in Taiwan proposed new guidelines for Earth Science in high school science curricula.

The major shift is the inclusion of Earth System concept, and there are three new components in the curriculum standard. They are “The Dynamic Earth”, “Climate Change” and “Human Dimension”. There is not merely content knowledge of traditional earth science disciplines in the first component, and it has put much more emphasis on the interactions between the traditional subsystems, geology, meteorology and oceanography. Thus it foster a holistic view, in which disciplinary processes and feedback mechanisms lead to synergistic interdisciplinary relevance, to form a physical basis for Earth System Science. In “Climate Change” part, the short-term and long-term global temperature variations have been introduced in earth history. By way of this introduction, students might be aware of the differences between natural and anthropogenically induced variability in the climate system. The last component, Human Dimension, help students note that Humans initiate some changes in earth system, but Human development may, in turn, be affected and constrained by the changes in the bio-physical systems.

Two folds of consideration should be involved in implementing the new curriculum standard. First, there should be staff developments like seminars and workshops for in-service teachers about some new topics, climate change especially, for they might not have sufficient content knowledge in teaching practice. The following would be the uncertainty in the interactions between subsystems, especial in the climate system. To understand this uncertainty needs re-conceptualizations of the nature of science for both students and teachers.