SACE Stage 2 Earth and Environmental Science

Science as a Human Endeavour Investigation:

The Development of the theory of Plate Tectonics

A NOTE FOR TEACHERS:

This SHE Investigation would be best conducted following some initial teaching and learning in the **Climate Change** topic.

In this task, students are asked to investigate criticism of the motives, methods and reliability of data collection and analysis methods used by climate scientists, and their defensive reactions to that criticism.

This ‘two-way’ interaction between science and society is complex but worth investigating because (arguably) it is one of the most important interactions of our time.

Following initial teaching and clear explanation of the task, it is suggested that students be given a period of two weeks to investigate and prepare notes.

This might include some programmed lesson time. Individually prepared notes could then be used by students to write their reports, during 90 minutes of lesson time and under direct teacher supervision or in the students own time.

SACE Stage 2 Earth and Environmental Science

Science as a Human Endeavour Investigation:

**Debate about Climate Science**

**Interaction between science and society** can be illustrated by investigating the ‘debate’ about *anthropogenic climate change*. This ongoing debate has prompted public criticism of data collection methods and even accusations of deliberate data manipulation by the *National Oceanic and Atmospheric Administration* (NOAA) (<http://www.noaa.gov/> ). (NOAA is an American scientific agency within the United States Department of Commerce.) This criticism has been described as an ‘attack on science’, (more generally), and has resulted in a vocal defence by some climate scientists in the hope of maintaining the credibility and influence of their work, both on society and on government decision makers.

You might use the links that follow, to articles that could provide the starting point of your investigation and discussion of ***one or more*** of the following **key concepts**:

*Development of complex scientific models and/or theories often requires a wide range of evidence from many sources and across disciplines.*

*New technologies improve the efficiency of scientific procedures and data collection and analysis. This can reveal new evidence that may modify or replace models, theories, and processes.*

*The acceptance and use of scientific knowledge can be influenced by social, economic, cultural, and ethical considerations.*

*Science informs public debate and is in turn influenced by public debate; at times, there may be complex, unanticipated variables or insufficient data that may limit possible conclusions.*

[*http://www.dailymail.co.uk/sciencetech/article-4192182/World-leaders-duped-manipulated-global-warming-data.html*](http://www.dailymail.co.uk/sciencetech/article-4192182/World-leaders-duped-manipulated-global-warming-data.html)

[*https://www.carbonbrief.org/factcheck-mail-sundays-astonishing-evidence-global-temperature-rise*](https://www.carbonbrief.org/factcheck-mail-sundays-astonishing-evidence-global-temperature-rise)

**REPORT**

Based on your investigation you should prepare a scientific report of no more than 1500 words in length, or the equivalent in multimodal form)

Your report must include:

 the use of appropriate *scientific terminology*,

 an *introduction* that clearly identifies the *focus* of the investigation and the *key concept(s)* of science as a human endeavour that it links to,

 an *explanation* of how the focus of the investigation illustrates the interaction between science and society

 relevant earth and environmental science *concepts* or *background*

 a *discussion* of potential *impact* or *significance* of the focus of your investigation, e.g. the effect on quality of life, environmental implications, economic impact,

 a *conclusion,* and

 citations and referencing (Harvard system preferred)

Your report could take the form of, for example:

 an article for a scientific publication

 a letter to the editor

 a talk.

**ASSESSMENT**

This is one of seven required school assessment tasks.

Your work will be assessed using the performance standards for Stage 2 Earth and Environmental Science on the next page:

|  | Investigation, Analysis, and Evaluation | Knowledge and Application |
| --- | --- | --- |
| **A** | Designs a logical, coherent, and detailed earth and environmental science investigation.  Obtains, records, and represents data, using appropriate conventions and formats accurately and highly effectively.  Systematically analyses and interprets data and evidence to formulate logical conclusions with detailed justification.  Critically and logically evaluates procedures and their effect on data. | Demonstrates deep and broad knowledge and understanding of a range of earth and environmental science concepts.  Develops and applies earth and environmental science concepts highly effectively in new and familiar contexts.  Critically explores and understands in depth the interaction between science and society.  Communicates knowledge and understanding of earth and environmental science coherently, with highly effective use of appropriate terms, conventions, and representations. |
| **B** | Designs a well-considered and clear earth and environmental science investigation.  Obtains, records, and represents data, using appropriate conventions and formats mostly accurately and effectively.  Logically analyses and interprets data and evidence to formulate suitable conclusions with reasonable justification.  Logically evaluates procedures and their effect on data. | Demonstrates some depth and breadth of knowledge and understanding of a range of earth and environmental science concepts.  Develops and applies earth and environmental science concepts mostly effectively in new and familiar contexts.  Logically explores and understands in some depth the interaction between science and society.  Communicates knowledge and understanding of earth and environmental science mostly coherently, with effective use of appropriate terms, conventions, and representations. |
| **C** | Designs a considered and generally clear earth and environmental science investigation.  Obtains, records, and represents data, using generally appropriate conventions and formats with some errors, but generally accurately and effectively.  Undertakes some analysis and interpretation of data and evidence to formulate generally appropriate conclusions with some justification.  Evaluates procedures and some of their effect on data. | Demonstrates knowledge and understanding of a general range of earth and environmental science concepts.  Develops and applies earth and environmental science concepts generally effectively in new or familiar contexts.  Explores and understands aspects of the interaction between science and society.  Communicates knowledge and understanding of earth and environmental science generally effectively, using some appropriate terms, conventions, and representations. |
| **D** | Prepares the outline of an earth and environmental science investigation.  Obtains, records, and represents data, using conventions and formats inconsistently, with occasional accuracy and effectiveness.  Describes data and undertakes some basic interpretation to formulate a basic conclusion.  Attempts to evaluate procedures or suggest an effect on data. | Demonstrates some basic knowledge and partial understanding of earth and environmental science concepts.  Develops and applies some earth and environmental science concepts in familiar contexts.  Partially explores and recognises aspects of the interaction between science and society.  Communicates basic earth and environmental science information, using some appropriate terms, conventions, and/or representations. |
| **E** | Identifies a simple procedure for an earth and environmental science investigation.  Attempts to record and represent some data, with limited accuracy or effectiveness.  Attempts to describe results and/or interpret data to formulate a basic conclusion.  Acknowledges that procedures affect data. | Demonstrates limited recognition and awareness of earth and environmental science concepts.  Attempts to develop and apply earth and environmental science concepts in familiar contexts.  Attempts to explore and identify an aspect of the interaction between science and society.  Attempts to communicate information about earth and environmental science. |