

CASE STUDY: Global Warming - the forest from the trees

NSW curriculum links for the “Global Warming” Case Study

1. Introduction:

This case study examines

“one aspect of the science of meteorology; the measurement of day-to-day local air temperature, the way in which temperature data is compiled and the way it is presented in order for inferences to be drawn about long term trends in climate. The emphasis is on the skills of graphical presentation applied particularly to data sets derived from select meteorological stations in eastern Australia.”

The case study was written for high school students within the NSW curriculum. Each individual page within the body of the text is designed to be a stand-alone page usually centred on an activity or set of questions.

Although the case study primarily addresses the **NSW Stage 6 Advanced Mathematics Draft Syllabus** and specifically the content of the Preliminary Year topic **PMA6 Data Analysis**, many of its activity pages can be used in other areas of the NSW curriculum, namely in **Stage 5 Science**, **Stage 5 Geography** and **Stage 6 Earth and Environmental Science**.

The Case Study is organised in three parts:

1. **Global warming – the forest from the trees (pdf file)** accessed from http://www.blueplanet.nsw.edu.au/templates/blue_content.aspx?pageID=543
2. **Appendices (pdf file)** accessed from http://www.blueplanet.nsw.edu.au/templates/blue_content.aspx?pageID=543
3. **Data Spreadsheets (Excel® Files)** downloadable from http://www.blueplanet.nsw.edu.au/templates/blue_content.aspx?pageID=542

It is possible to complete the main Activities and Questions within this document without reference to the supporting Appendices and the Excel® spreadsheets; these addenda are given to enable completion of the Extension Activities and Questions, and a deeper exploration of the techniques referred to in the case study.

In this guideline, the connections of individual pages of the case study to areas of the curriculum are listed in two tables:

- Guidelines for use of the case study within the Stage 6 Advanced Mathematics Draft Syllabus Topic PMA6 - Data Analysis (**see page 2**)
- Guidelines for use of the case study in other areas of the NSW curriculum; Stage 5 Science, Stage 5 Geography and Stage 6 Earth and Environmental Science. (**see page 3**)

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Guidelines for use of the case study within the Stage 6 Advanced Mathematics Draft Syllabus Topic PMA6 - Data Analysis

Case Study		NSW Stage 6 Advanced Mathematics Draft Syllabus	
Page No.	Page title	Page No.	Statement
1-2	"Global Warming -the forest from the trees"	6	<p>2. Rationale Mathematics is deeply embedded in modern society. From the numeracy skills required to manage personal finances, to making sense of data in various forms, to leading-edge technologies in the Sciences and Engineering ...</p> <p>The need to interpret the large volumes of data made available through technology draws on skills in logical thought and in checking claims and assumptions in a systematic way ...The thinking required to enhance further the power and usefulness of technology in real-world applications requires advanced mathematical training. ...</p>
5-6	"4. Different ways of presenting the same data" and supporting Excel® data files	70	PMA6.1: Types of variables, measures of location and spread (variability), graphical and tabular representations of data
7	"5. Long term trends in temperature data from different sites" and supporting appendices 4, 4(a), 4(b) and 4(c)	72-73	<p>PMA6.2: Correlation and regression - constructing scatterplots by hand and with suitable technology - describing patterns (if any) in the scatterplot, and what this indicates about the relationship (or lack of relationship) between the variables - technology (spreadsheets, graphing calculators) should be used to create data displays and to calculate correlation coefficients and trendlines.</p>
8-10	"6. A graphical analysis of the long term temperature data for Newcastle" and supporting appendices 5, 6 and 7	72-73	<p>PMA6.2: Correlation and regression - constructing scatterplots by hand and with suitable technology - describing patterns (if any) in the scatterplot, and what this indicates about the relationship (or lack of relationship) between the variables - technology (spreadsheets, graphing calculators) should be used to create data displays and to calculate correlation coefficients and trendlines.</p>
11-14	"7. Comparing temperature anomalies" and "8. Calculation of the annual mean temperatures from the maxima and minima" and "9. Comparison of mean temp anomaly trends for selected rural stations"	72-73	<p>PMA6.2: Correlation and regression - describing patterns (if any) in the scatterplot, and what this indicates about the relationship (or lack of relationship) between the variables - using a line of best fit to interpolate - Technology (spreadsheets, graphing calculators) should be used to create data displays and to calculate correlation coefficients and trendlines.</p>
15	"10. Averaging temperature anomalies for whole regions" and supporting appendix 8	68	<p>PMA6 Data Analysis Outcomes addressed A student: <u>PA1</u> provides reasoning to support conclusions appropriate to the context <u>PA2</u> uses algebraic and graphical concepts in the solution of problems involving functions and coordinate geometry <u>PA8</u> uses concepts and techniques from descriptive statistics to present and interpret data <u>PA12</u> interprets and uses mathematical language.</p>
16	"11. Average temperature anomaly trends in Vic, NSW, QLD"	68	<p>PMA6 Data Analysis Outcomes addressed A student: <u>PA1</u> provides reasoning to support conclusions appropriate to the context <u>PA2</u> uses algebraic and graphical concepts in the solution of problems involving functions and coordinate geometry <u>PA8</u> uses concepts and techniques from descriptive statistics to present and interpret data <u>PA12</u> interprets and uses mathematical language.</p>
17-18	"12. Global Warming?" and "13. Postscript – The Newcastle High Quality Dataset" and supporting appendix 9	13	<p>Objectives Knowledge, understanding and skills Students will develop the ability to:</p> <ul style="list-style-type: none"> apply deductive reasoning, and use appropriate language, in the construction of proofs and mathematical arguments interpret solutions to problems and communicate Mathematics in appropriate forms. <p>Values and attitudes Students will develop:</p> <ul style="list-style-type: none"> appreciation of the scope, usefulness, power and elegance of Mathematics

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Guidelines for use of the case study in other areas of the NSW curriculum; Stage 5 Science, Stage 5 Geography and Stage 6 Earth and Environmental Science.

Case Study		NSW Syllabus connections
Page No.	Page title	Stage 5 Science, Stage 5 Geography, and Stage 6 Earth and Environmental Science
1-2	"Global Warming - the forest from the trees"	Science 5.19: uses critical thinking skills in evaluating information and drawing conclusions Geography Stage 5 Focus Area E1 Physical Geography: climate, weather, climate change, analyse climate data from a variety of sources Earth and Environmental Science Stage 6 P14: draws valid conclusions from gathered data and information
3-4	"Long term Temperature Records"	Geography Stage 5 Focus Area E1 Physical Geography: climate, weather, climate change, analyse climate data from a variety of sources Earth and Environmental Science Stage 6 P12: discusses the validity and reliability of data gathered from first-hand investigations and secondary sources, P13: identifies appropriate terminology and reporting styles to communicate information and understanding
5-6	"4. Different ways of presenting the same data" and supporting Excel® data files	Science 5.17: explains trends, patterns and relationships in data and/or information from a variety of sources Science 5.18: presenting information (e), (f) Geography 5.3: selects and uses appropriate written, oral and graphic forms to communicate geographical information Earth and Environmental Science Stage P13: identifies appropriate terminology and reporting styles to communicate information and understanding
7	"5. Long term trends in temperature data from different sites" and supporting appendices 4, 4(a), 4(b) and 4(c)	Science 5.18: presenting information (e), (f) Earth and Environmental Science Stage P13: identifies appropriate terminology and reporting styles to communicate information and understanding
8-10	"6. A graphical analysis of the long term temperature data for Newcastle" and supporting appendices 5, 6 and 7	Science 5.16 (c): extract information from column graphs, histograms, divided bar and sector graphs, line graphs, composite graphs, flow diagrams, other texts and audio/visual resources Geography 5.3: selects and uses appropriate written, oral and graphic forms to communicate geographical information Earth and Environmental Science Stage 6 P12: discusses the validity and reliability of data gathered from first-hand investigations and secondary sources, P13 identifies appropriate terminology and reporting styles to communicate information and understanding
11-14	"7. Comparing temperature anomalies" and "8. Calculation of the annual mean temperatures from the maxima and minima" and "9. Comparison of mean temp anomaly trends for selected rural stations"	Science 5.17: explains trends, patterns and relationships in data and/or information from a variety of sources Earth and Environmental Science Stage 6 P12: discusses the validity and reliability of data gathered from first-hand investigations and secondary sources, P13: identifies appropriate terminology and reporting styles to communicate information and understanding
15	"10. Averaging temperature anomalies for whole regions" and supporting appendix 8	Earth and Environmental Science Stage 6 P12: discusses the validity and reliability of data gathered from first-hand investigations and secondary sources,
16	"11. Average temperature anomaly trends in Vic, NSW, QLD"	Science 5.19: A student uses critical thinking skills in evaluating information and drawing conclusions. Earth and Environmental Science Stage 6 P14: draws valid conclusions from gathered data and information
17	"12. Global Warming?"	Earth and Environmental Science Stage 6 P14: draws valid conclusions from gathered data and information