

Ocean Acidification

LOCATION: NZ Marine Studies Centre, Portobello, Dunedin

PROGRAMME DESCRIPTION:

Students are guided through building a background on ocean acidification (OA) and the impacts on marine ecosystems, then carrying out a practical investigation in an earth and space science context. Day one introduces OA and its ecological context, animal handling, valid environmental variables and various measurable responses. The day ends with students deciding on and formulating their own investigation. Day two begins with an overview of bioethics (if using live animals) in the practical context of research and their own investigations. Staff provide guidance for students as they set up and carry out their investigations. The day ends with a quick review. Day three allows for a replicate and any minor changes students deem prudent as a result of the review. The programme concludes with a quick guide to finding and using references and links to concepts in the interpretation, explanation and discussion of their investigation.

Extensions: If desired, a more in-depth explanation of statistics, with a handout, can also be given.

LEARNING OUTCOMES

Students will:

- extend and apply concepts of anthropogenic changes (OA and/or temperature rise) to design and carry out their own practical biological investigation.
- formulate and critique hypothesis formation and practice translation of sound hypothesis to a rigorous methodology that addresses issues of validity and reliability.
- carry out practical work and collect data to meet the needs of NCEA EES 3.1 Achievement Standard 91410.
- apply bioethical understanding to practical research with animals (if using animals).
- begin to make connections between their own research and ESS concepts, models or other research.

Extras

Gain a new understanding of the depth, detail and determination needed in sound science.

Gain a new or renewed appreciation for marine life and the marine environment.

Gain a new appreciation of marine science as a possible field of study or a future career.

YEAR/LEVEL Year 13, Earth and Space Science, Level 8.

CURRICULUM LINKS

Planet earth and beyond: anthropogenic processes: ocean pH and temperature. Understand the relationship between OA and the environment. Develop and carry out investigations that extend their science knowledge.

KEY COMPETENCIES: Thinking, language symbols and text, managing self. Nature of Science: understanding, investigating, communicating, participating and contributing.

PRE TRIP PREPARATION: Teachers should share and unpack the Achievement standard requirements and assessment criteria with the students before coming. Some general background research on OA and environmental effects will be helpful.

RESOURCES AVAILABLE TO SUPPORT PROGRAMME

A student booklet for photocopying is sent out with booking confirmation. While on the programme, teachers can select suitable papers and readings to support student report writing from a comprehensive file held at the Centre. The Powerpoint presentations and resource links during the delivery of the programme are available to teachers on request.

RELATED TOPICS: Marine Plastics, from Micro to Macro

The NZ Marine Studies Centre is part of the Marine Science Department, University of Otago. This programme is supported by the Ministry of Education's LEOTC service.

See WWW.MARINE.AC.NZ for more programmes and resources.

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PROGRAMME COSTS: Approx \$76.00 per student (GST excl.)

PROGRAMME LENGTH: Approx 19 hours over 3 days.

GROUP INFORMATION: Groups of 15 or more are preferred, up to a maximum of 35 students.

If more than 35, we divide the group into two separate labs for the duration of the programme.

SAFETY ACTION PLAN

In the field: as per field operations.

In Laboratory: as per Lab safety.

Covid guidelines: as per Government and University of Otago operations.

NZMSC CONTACT: Rob Lewis

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Example itinerary

Day One

10.30am: Arrive at NZ Marine studies centre.

10.40am: LAB: Welcome and introduction. Anthropogenic changes with demonstration of link between CO₂ and pH.

11.00am: FIELD: Measuring ocean abiotic factors, instrument use and protocols.

11.30am: LAB: Set up mesocosm investigation in teams involving different organisms (phytoplankton, seaweed and larger animals). Light vs. dark environmental impact.

12.00pm: Lunch.

12.30pm: LAB: OA impact on carbonate producers. Familiarise with carbonate producers and other organisms available for the investigation. Examples of previous trials and data.

2.00pm: Visit Portobello Marine Lab and see current OA research facilities.

2.30pm: LAB: collect and analyze data on mesocosm investigations.

3.00pm: Afternoon tea.

3.15pm: LAB: The Hypothesis. Students to decide on hypothesis with teacher and NZMSC staff. Students hand in hypotheses and planned equipment needs. Set up work station for the next day.

5.00pm: Depart NZ Marine Studies Centre.

Day Two

9.00am: Arrive at NZ Marine Studies Centre.

9.15am: LAB: Bioethics. Socio-scientific perspectives and good practice.

10.00am: Setup and start investigations. Time management is up to the individual student in terms of breaks.

4.00pm: Clean up and prepare for next day. Review of work and data management, changes to methodology for Day Three.

5.00pm: Depart NZ Marine Studies Centre.

Day Three

9.00am: Arrive at NZ Marine Studies Centre.

9.15am: Setup and start repeat investigations. Time management is up to the individual student in terms of breaks.

2.00pm: Finish investigations and clean up lab. Review of work.

2.30pm: Depart NZ Marine Studies Centre.