General themes for "Harnessing the Wind"

Connected 3 2010: *Wind Power* contains five articles focusing on the use of wind to generate energy. These include an explanation of what wind is and how turbines convert wind energy to electricity, a discussion of some of the issues around the use of wind turbines, an account of an investigation by a group of students into the best site for a turbine in their local environment (including weather factors and the economics of the project), an examination of the pros and cons of other sources of energy, and a profile of a young electrical engineer working in the energy industry.

Each article relates to specific science, technology, and mathematics curriculum strands. These are outlined in the table below, along with links to detailed notes for each individual text. The notes include a brief summary of the article, its key ideas, suggested shared learning goals and achievement objectives in each curriculum area, learning activities, and useful resources.

"Harnessing the Wind" provides an explanation of concepts and ideas involving wind power and the associated big questions, such as "What is energy?" and "What is wind and how is it formed?" It explains how wind energy can be harnessed by using turbines to produce electrical energy. It also outlines the many variables that can affect the performance of turbines and that need to be taken into account when designing and siting them.

The article contains key ideas in science, technology, and mathematics. Focus on one learning area, or integrate them to meet the needs of your students. Teacher support material for each learning area includes discussion of the key ideas, suggested achievement objectives, activities you can use with your students to explore those ideas, and useful resources.

Key ideas

Science

Nature of Science

- Scientists identify trends and patterns when exploring natural phenomena.
- Scientists use the trends and patterns to generate questions whose answer will help them create explanations.
- Scientist check their explanations by testing their evidence.
- Scientist record and share both their explanations and the processes they used to test their ideas with other interested scientists and the general public.

Physical and Material World

- Wind is moving air particles.
- For air particles to move, there needs to be a source of energy.
- Energy makes things happen by generating forces that do work.
- Energy cannot be created or destroyed, but it can be transformed from one form to another.

- Forms of energy include mechanical, heat, light, chemical, sound, electrical, and nuclear.
- Scientists and technologists use their knowledge of the physical and chemical properties of materials when seeking explanations and solutions to problems and needs.

Technology Societal and environmental issues can influence what technological outcomes are made and how they are made.

- Technological outcomes change over time.
- Technology impacts on the social and natural worlds over time.
- Technological knowledge is knowledge that technologists agree is important because it ensures the success of a technological outcome.

Mathematics

- When two objects travel at the same velocity, the one with the greater mass has the most energy. We can calculate the kinetic energy of an object if we know its velocity and mass.
- Graphs are valuable mathematical tools for observing trends. We can graph data to compare how changes in particular factors affect energy production or technological performance.
- Different types of graphs display the same data in different ways. When choosing the type of graph to use, we should consider which is most appropriate for the information we want to show.
- By using cog-wheels of different ratios, we can change the power delivered by a machine.
- To gain the maximum generating capacity from wind turbines, gear systems are used.

Connected - the reading standards and the literacy learning progressions

Your students are working towards the Reading standard for the end of year 7 or the end of year 8.

> By the end of year 7, students will read, respond to, and think critically about texts in order to meet the reading demands of the New Zealand Curriculum as they work towards level 4 [at level 4 by the end of year 8]. Students will locate, evaluate, and synthesis information and ideas within and across a range of texts appropriate to this level as they generate and answer questions to meet specific learning purposes across the curriculum
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> Reading standard, end of years 7 and 8

The texts in *Connected* 3 2010: *Wind Power* provide opportunities for students to:

- increasingly control a repertoire of comprehension strategies that they can use flexibly and draw on when they know they are not comprehending fully, including such strategies as:
    - using their prior knowledge, along with information in the text, to interpret abstract ideas …
    - identifying and resolving issues arising from competing information in texts
    - gathering, evaluating, and synthesizing information across a small range of texts
- apply some criteria to evaluate texts (e.g., accuracy of information; presence of bias).
- recognise and understand the features and structures of a wide variety of continuous and non-continuous text types and text forms
- use their growing academic and content-specific vocabulary to understand texts.

Reading progressions, end of year 8

The mathematics standards

The approaches and thinking that students demonstrate as they engage with these activities can provide evidence in relation to the mathematics standards.