

School Program - Learning Outcomes

From the New Zealand Curriculum about the Nature of Science:

<http://nzcurriculum.tki.org.nz/The-New-Zealand-Curriculum/Science>

Understanding about science

Learn about science as a knowledge system: the features of scientific knowledge and the processes by which it is developed; and learn about the ways in which the work of scientists interacts with society.

Investigating in science

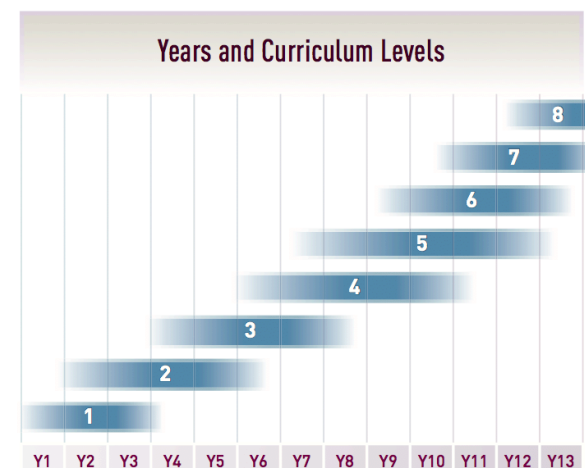
Carry out science investigations using a variety of approaches: classifying and identifying, pattern seeking, exploring, investigating models, fair testing, making things, or developing systems.

Communicating in science

Develop knowledge of the vocabulary, numeric and symbol systems, and conventions of science and use this knowledge to communicate about their own and others' ideas.

Participating and contributing

Bring a scientific perspective to decisions and actions as appropriate.



“Brave Hearts” within the curriculum:

“The Living World: Life processes”– Understand the processes of life and appreciate the diversity of living things.

Students Y7 to Y10 fall under the level 4 to 5.

Achievement objectives for Level 4 and 5:

Understanding about science

- Appreciate that science is a way of explaining the world and that science knowledge changes over time.
- Identify ways in which scientists work together and provide evidence to support their ideas.
- Understand that scientists' investigations are informed by current scientific theories and aim to collect evidence that will be interpreted through processes of logical argument.

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Investigating in science

- Build on prior experiences, working together to share and examine their own and others' knowledge.
- Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations.
- Develop and carry out more complex investigations, including using models.
- Show an increasing awareness of the complexity of working scientifically, including recognition of multiple variables.
- Begin to evaluate the suitability of the investigative methods chosen.

Communicating in science

- Begin to use a range of scientific symbols, conventions, and vocabulary.
- Engage with a range of science texts and begin to question the purposes for which these texts are constructed.
- Use a wider range of science vocabulary, symbols, and conventions.
- Apply their understandings of science to evaluate both popular and scientific texts (including visual and numerical literacy).

Participating and contributing

- Use their growing science knowledge when considering issues of concern to them.
- Explore various aspects of an issue and make decisions about possible actions.
- Living world
- Develop an understanding of socio-scientific issues by gathering relevant scientific information in order to draw evidence-based conclusions and to take action where appropriate.

Regarding "Life processes" Students will:

- Recognise that there are life processes common to all living things and that these occur in different ways.
- Identify the key structural features and functions involved in the life processes of plants and animals.
- Describe the organisation of life at the cellular level

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Brave Hearts: an exhibition celebrating the heart			
SCIENCE STRANDS: Living World: Life Processes	MAIN IDEA: Students will Learn about the mechanics, the physiology and electrophysiology of the heart, and the various heart conditions. Students will learn how surgeons pushed the boundaries to treat heart diseases.	LEVEL: 4 & 5 YEAR: 7 to 10	
<ul style="list-style-type: none"> • Thinking – about the impact that lifestyle choices has on the body and how medical technology can help measure, change and treat these negative impacts • Using language, symbols, and texts – learn and use anatomical, physiological and technological terminology. • Managing self – students will think about choices regarding their personal diet and consequences of drug taking (smoking) • Relating to others – Develop empathy for people who suffer from medical conditions by listening to personal stories. Students will discuss and share ideas within groups and in class. • Participating and contributing – working together within the class community to investigate activities and subsequent discussion. 			
Nature of Science: Understanding	Nature of Science: Investigating	Nature of Science: Communicating	Nature of Science: Participating and contributing
<i>Students will:</i> 1. Understand and appreciate that science is a way of explaining the world and that science knowledge changes over time: Scientists are always thinking about why and how things happen - they build on (add ideas and adjust) what they already know, eg. adjust and create technology to measure and	<i>The students will:</i> 3. Build on prior experiences, working together to share and examine their own and others' knowledge. Listen to experiences and personal stories of patients with heart conditions and how science and technology has helped them.	<i>Students will:</i> 5. Begin to use a range of scientific symbols, conventions, and vocabulary. Use and understand correct medical and anatomical vocabulary. 6. Ways of communicating	<i>Students will:</i> 6. Use their growing science knowledge when considering issues of concern to them. Observe the anatomy and physiology of the healthy and unhealthy heart. Compare and contrast hearts that have been exposed to unhealthy and healthy lifestyle choices.

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BRAVE HEARTS

THE NEW ZEALAND CARDIAC STORY

<p>treat medical conditions that are forever changing. <i>"Brave Hearts"</i> looks at how imaging machines and techniques improved and changed the knowledge and understanding of the heart and how surgeons pushed the boundaries to treat heart diseases. <i>"Brave Hearts"</i> illustrates the breakthrough in cardiac research.</p> <p>2. Identify ways in which scientists work together and provide evidence to support their ideas: Scientists initiate exploration because of problems experienced by human beings. Scientists often explore problems that are a consequence of human activity.</p>	<p>4. Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations. Through our post-visit activity, students will experience "being a doctor and making a diagnosis", they will be invited to ask questions, find evidence and investigate.</p>	<p>science: Students will have to reflect on why some models/representation are simplified to explain a key idea.</p>	<p>Students will reflect on ways to inform their families or community about healthy lifestyle choices.</p> <p>7. Explore various aspects of an issue and make decisions about possible actions. Draw conclusions from the physical evidence of a damaged heart which helps them make independent healthy choices.</p>
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Focus	Activity Description	Learning Objectives	Reflections/Self Assessment
Section 1 – INTRODUCTION			
Introduction to the exhibition	<ul style="list-style-type: none"> Overview and introduction of the “<i>Brave Hearts</i>” exhibition. 	<ul style="list-style-type: none"> Through the space, the students will identify, label and define the different components of the heart: Atrium, ventricles, septum, aorta, arteries, myocardium, pericardial, cusps, mitral valve. 	<ul style="list-style-type: none"> Worksheet 1: label and define the heart
Heart show case: various animal hearts	<ul style="list-style-type: none"> Showcase of heart of an elephant, alligator, worm, chicken, sheep, marlin, trout, deer and human Human 3D printed heart models 	<ul style="list-style-type: none"> Students will compare and contrast the heart of different animals: mammals, fish, birds, reptiles and amphibians. Students will learn about different technologies to observe the heart: preserved, 3D printed and model 	<ul style="list-style-type: none"> Worksheet 1: In your own words describe the difference between the different animal hearts displayed and the human heart
Virtual - Tee	<ul style="list-style-type: none"> It shows where the heart is in the body using an AR experience 	<ul style="list-style-type: none"> Students will visualize where the heart is located in the body compared to other organs. 	
“Build your own heart” activity	<ul style="list-style-type: none"> Tinkering activity inviting students to build their own working heart model using valves and pumps. 	<ul style="list-style-type: none"> Students will experience why the heart has four chambers and the roles of each valve by building a model of a heart using pumps and valves. 	

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Focus	Activity Description	Learning Objectives	Reflections/Self Assessment
Section 2 – THE MECHANICS OF THE HEART			
2.01 The heart is a pump	<ul style="list-style-type: none"> Explanation of heart mechanics 	<ul style="list-style-type: none"> Students will observe heart mechanics 	
Pumping activity: Heart Valve 2.04 The all important valves	<ul style="list-style-type: none"> Hands-on activity to demonstrate how the valves of the heart work. Panel explaining the role of valves in the heart. 	<ul style="list-style-type: none"> Students will experience the function of a heart valve. Students will recognize the difference between diastole and systole 	
2.02 Born with heart defects	<ul style="list-style-type: none"> Description of all the different heart conditions 	<ul style="list-style-type: none"> Students will differentiate the six most common heart defects: ductus arteriosus, coarctation of the aorta, atrial and ventricular septal defects, tetralogy of Fallot, transposition of the great arteries. Students will read a personal heart story about the first open heart surgery on a new born. 	<ul style="list-style-type: none"> Worksheet 4: word/clue search
2.03 Heart bypass	<ul style="list-style-type: none"> Description of a bypass 	<ul style="list-style-type: none"> Students will identify what a bypass is and how it is used in open-heart surgery. 	<ul style="list-style-type: none"> Worksheet 4: word/clue search
2.05 Mending damaged valves	<ul style="list-style-type: none"> Description of how surgeons repair leaky and faulty valves. 	<ul style="list-style-type: none"> Understanding how valves are repaired. 	<ul style="list-style-type: none"> Worksheet 4: word/clue search
AV1	<ul style="list-style-type: none"> Biographies of patients/surgeons Films Animations Infographics on the risks for heart disease/history of heart disease 	<ul style="list-style-type: none"> Students will listen to experiences and personal stories of patients with heart conditions and how science and technology has helped them. 	<ul style="list-style-type: none"> Worksheet 4: word/clue search

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Section 3 – ELECTROPHYSIOLOGY OF THE HEART			
3.02 Electrical signals of the heart.	<ul style="list-style-type: none"> Explanation of the electrophysiology of the heart. 	<ul style="list-style-type: none"> Students will visualize what the electrical signals of the heart look like. Students will identify what a Sinus Node and its role is. 	
Hands On activity 2: Heart model of the electrical signal	<ul style="list-style-type: none"> Visuals of the electrical signals of the heart 	<ul style="list-style-type: none"> Students will visualize the different phases of the electrical heart signals. Students will compare those visuals with a electrocardiograph. 	<ul style="list-style-type: none"> Worksheet 2: describe the different phases of the electrocardiograph.
3.04 Electrical system not functioning well.	<ul style="list-style-type: none"> Explanation of the different problems that can occur with the electrophysiology of the heart. 	<ul style="list-style-type: none"> Students will identify and define the different type heart rate abnormalities: arrhythmias, bradycardia, tachycardia. 	<ul style="list-style-type: none"> Worksheet 4: Link the different heart diseases with the symptoms explained.
3.04 Mending the broken electrical system	<ul style="list-style-type: none"> Pacemakers and defibrillator display 	<ul style="list-style-type: none"> Students will compare the evolution of pacemakers and defibrillators for the past 20 years. Students will visualize how defibrillators and pacemakers are used to save healthy hearts. Students will recognise what the AED symbol is and what it is used for. 	<ul style="list-style-type: none"> Worksheet 4: word/clue search
AV2: Model of the heart	<ul style="list-style-type: none"> Touchscreen showcasing different models of the heart: <ul style="list-style-type: none"> Electrical currents and muscle activity for a normal heart and under arrhythmia. What happens during a heart attack and the effects of medication. What happens when the heart fails What happens under fibrillation 	<ul style="list-style-type: none"> Students will differentiate between fibrillation, heart attack and heart failure. Students will observe the impact of statins, diet, aspirin, exercise, smoking and the link to heart attack. Students will identify, label and define the different components of the heart: atrium and ventricles. Students will observe an ECG and blood pressure reading. 	<ul style="list-style-type: none"> Worksheet 4: Link the different heart diseases with the symptoms explained.

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Section 4 – MEASURING THE HEART			
4.03 Your pulse	<ul style="list-style-type: none"> Pulse measurement 	<ul style="list-style-type: none"> Students will measure their own heart rate. Students will identify the different technologies available for heart rate measurement. Students will experience their heart rate increase while exercising. 	<ul style="list-style-type: none"> Worksheet 3: Record heart and blood pressure measurements.
4.03 Blood pressure	<ul style="list-style-type: none"> Blood pressure measurement 	<ul style="list-style-type: none"> Students will learn the meaning behind the blood pressure measures. Students will identify the unit used to measure blood pressure mmHg (millimetres of mercury) 	<ul style="list-style-type: none"> Worksheet 3: Record heart and blood pressure measurement Worksheet 3: Explain in your own words the two numbers in a blood pressure measurement.
Hands-on 3: stethoscope	<ul style="list-style-type: none"> Stethoscope measurement 	<ul style="list-style-type: none"> Students will listen to the “sound” of blood in the heart’s chambers and valves using an amplified stethoscope. 	
4.04 Hearing the heart	<ul style="list-style-type: none"> What is a stethoscope used for? What is a murmur 	<ul style="list-style-type: none"> Students will identify a murmur 	

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Section 5 – CORONARY HEART DISEASE			
5.01a Seeing the heart	<ul style="list-style-type: none"> Explanation of the different technologies used to visualise the heart 	<ul style="list-style-type: none"> Students will differentiate the different imaging methods: Angiography, Echocardiography, MRI, CT scan 	
5.02 Coronary heart disease	<ul style="list-style-type: none"> Explanation of coronary heart disease Explanation of the coronary bypass Roles of statins and stents 	<ul style="list-style-type: none"> Students will identify the role of the coronary circulation system. Students will observe the link between coronary failure and heart attack. Students will understand the role of statins and stents as treatments for a heart attack. 	<ul style="list-style-type: none"> Worksheet 4: Link the different heart diseases with the symptoms explained.
AV3	<ul style="list-style-type: none"> Biographies of patients/surgeons Films Animations Infographics on the risks for heart disease/ history of heart disease 	<ul style="list-style-type: none"> Students will listen to experiences and personal stories of patients with heart conditions and how science and technology has helped them. 	<ul style="list-style-type: none"> Worksheet 4: word/clue search
Hands-on 4: Personal message	<ul style="list-style-type: none"> Personal stories of visitors 	<ul style="list-style-type: none"> Students will reflect their own experiences with heart disease and how surgery/treatment has improved the lives of patients they know 	<ul style="list-style-type: none"> Pre-visit activity
Melrose Machine	<ul style="list-style-type: none"> The Melrose machine made it possible for surgeons to operate on an exposed dry heart, using the machine to bypass the heart temporarily 	<ul style="list-style-type: none"> Students will observe how technology in the 1950's help cardiac surgeons and patient requiring open heart surgery. 	