

Strand	Content Descriptions	Elaborations	Robotics activities	Teacher notes
<p><b>Science Understanding</b></p>	<p><b>Physical sciences</b> Change to an object's motion is caused by unbalanced forces acting on the object. (ACSSU117)</p>	<p>Investigating the effects of applying different forces to familiar objects.</p> <hr/> <p>Investigating common situations where forces are balanced, such as stationary objects, and unbalanced, such as falling objects.</p> <hr/> <p>Investigating a simple machine such as lever or pulley system.</p>	<p><b>Design and build an amusement park ride using pulleys and gears. Investigate how simple machines (levers, ramps, gears and pulleys) reduce effort and/or force. Use gears to change the speed and direction of the ride.</b></p> <p><b>Design a 'safe' robot car and investigate the use of seatbelts by testing different power levels and ways of stopping car (brake or coast).</b></p>	<p>Minifig can be placed on car. How far forward does it travel at different Powers (velocities).</p>
<p><b>Science as a Human Endeavour</b></p>	<p>Use and influence of Science Science understanding influences the development of practices in areas of human activity such as industry, agriculture and marine and terrestrial resource management. (ACSHE121)</p>		<p><b>Give examples of robots working in industry, agriculture etc.</b></p> <p><b>What advantages does a robot have over a human worker?</b></p> <p><b>What disadvantages?</b></p> <p><b>What type of jobs will robots have in the future?</b></p>	

# SCIENCE INQUIRY SKILLS

# GRADE 7

Questioning and predicting	Planning and conducting	Processing and analysing data & information	Evaluating	Communicating
<p>Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge. (ACSIS124)</p>	<p>Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed. (ACSIS125)</p>	<p>Summarise data, from students' own investigations and secondary sources, use scientific understanding to identify relationships and draw conclusions. (ACSIS130)</p>	<p>Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method. (ACSIS131)</p>	<p>Communicate ideas, findings and solutions to problems using scientific language and representations using digital technologies as appropriate. (ACSIS133)</p>
	<p>In fair tests, measure and control variables, and select equipment to collect data with accuracy appropriate to the task. (ACSIS126)</p>		<p>Use scientific knowledge and findings from investigations to evaluate claims. (ACSIS132)</p>	

Strand	Content Descriptions	Elaborations	Robotics activities	Teacher notes
<b>Science Understanding</b>	<b>Physical sciences</b> Energy appears in different forms including movement (kinetic energy), heat and potential energy, and causes change within systems. (ACSSU155)	Summary <ul style="list-style-type: none"> <li>• KE (moving bodies)</li> <li>• PE (Gravitational, chemical, elastic)</li> <li>• Heat Energy by products</li> <li>• Use of Flow diagrams</li> </ul>	<b>Teacher/student group discussion on energy changes that occur in a moving robot.</b>	Investigation questions <ul style="list-style-type: none"> <li>• How is energy stored in a LEGO robot (battery type?)</li> <li>• Steps to movement (consider computer command, electric pulse, gearing, wheel, friction)</li> <li>• Where is energy lost?</li> <li>• Energy and sensors (Light, Ultrasonic)</li> </ul> Research the internals of a LEGO motor.
<b>Science as a Human Endeavour</b>	<b>Use and influence of Science</b> Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations. (ACSHE135)	Investigating the development of robotics (and vehicles) over time, including the application of science to contemporary designs of Robots.	<ul style="list-style-type: none"> <li>• <b>What will a world of robots look like in 50, 100 or 1000 years?</b></li> <li>• <b>Will robots take all our jobs?</b></li> <li>• <b>Has robotics made our lives easier?</b></li> <li>• <b>Are robots in war fair?</b></li> <li>• <b>Should robots have rights?</b></li> </ul>	

# SCIENCE INQUIRY SKILLS

# GRADE 8

Questioning and predicting	Planning and conducting	Processing and analysing data & information	Evaluating	Communicating
<p>Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge. (ACSIS124)</p>	<p>Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed. (ACSIS125)</p>	<p>Summarise data, from students' own investigations and secondary sources, use scientific understanding to identify relationships and draw conclusions. (ACSIS130)</p>	<p>Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method. (ACSIS131)</p>	<p>Communicate ideas, findings and solutions to problems using scientific language and representations using digital technologies as appropriate. (ACSIS133)</p>
	<p>In fair tests, measure and control variables, and select equipment to collect data with accuracy appropriate to the task. (ACSIS126)</p>		<p>Use scientific knowledge and findings from investigations to evaluate claims. (ACSIS132)</p>	

Strand	Content Descriptions	Elaborations	Robotics activities	Teacher notes
<b>Science Understanding</b>	<b>Physical sciences</b> Energy transfer through different mediums can be explained using wave and particle models. (ACSSU182)	Exploring how and why the movement of energy varies according to the medium through which it is transferred.	<b>Class activity</b> <b>Wave simulation (Mexican wave)</b>	Students line up robots, use Wait for button (1 sec for first, 2 seconds for second etc.) then Move forward 2 rotations.  Line up robots, use Wait for Ultrasonic sensor on the side of robot (set distance to beyond adjacent robot), 1st robot moves, rest follow in order.  Discuss - Are these Wave simulation activities real waves - why or why not?
<b>Science as a Human Endeavour</b>	<b>Nature &amp; development of Science</b> Advances in scientific understanding often rely on developments in technology and technological advances are often linked to scientific discoveries. (ACSHE158)  <b>Nature &amp; development of Science</b> The values and needs of contemporary society can influence the focus of scientific research. (ACSHE228)	Investigating how scientific and technological advances, involving robotics, have been applied to space exploration, war, manufacturing and the wider society.	<b>Assignment Topics:</b> <ul style="list-style-type: none"> <li>• <b>Mars rovers: History and achievements.</b></li> <li>• <b>Artificial intelligence, what is it and how will it impact on future societies.</b></li> <li>• <b>Humanoid robots - how close are we getting to replicating humans (limitations?)</b></li> <li>• <b>Robots in war, impacts and issues.</b></li> </ul>	Possible Assignment Genres: <ul style="list-style-type: none"> <li>• Oral Presentation (PowerPoint)</li> <li>• Poster</li> <li>• Web pages</li> <li>• Essay</li> <li>• Group presentation (Play)</li> </ul>

# SCIENCE INQUIRY SKILLS

# GRADE 9

Questioning and predicting	Planning and conducting	Processing and analysing data & information	Evaluating	Communicating
<p>Formulate questions or hypotheses that can be investigated scientifically. (AC SIS164)</p>	<p>Plan, select and use appropriate investigation methods, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods. (AC SIS165)</p>	<p>Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies. (AC SIS169)</p>	<p>Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data. (AC SIS205)</p>	<p>Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations.(AC SIS174)</p>
	<p>Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data. (AC SIS166)</p>			

Strand	Content Descriptions	Elaborations	Robotics activities	Teacher notes
<b>Science Understanding</b>	<b>Physical sciences</b> Energy conservation in a system can be explained by describing energy transfers and transformations. (ACSSU190)	Recognising that the Law of Conservation of Energy explains that total energy is maintained in energy transfer and transformation.	<b>What energy changes occur in a moving LEGO robot? (Brainstorm)</b>  <b>Gears - Construct a simple Gear system to a) increase turns/ reduce torque and decrease turns/increase torque.</b>	Introduce Potential, Kinetic, Heat, Sound etc.  Discuss energy conservation in gears.  Explore gear ratios with different and/or more gears - including compound gear ratios.  Create a hill climbing robot using gears - which group can climb the steepest (angled) hill.
		Recognising that in energy transfer and transformation, a variety of processes can occur, so that the usable energy is reduced and the system is not 100% efficient.	<b>Trial the same robot travelling for same duration on different surfaces.</b>	Compare distance travelled for a set time - discuss losses to friction, efficiency.  Try using different tyres/tank tracks etc.
		Comparing energy changes in interactions such as car crashes, pendulums, lifting and dropping.	<b>Design a 'safe' LEGO car and investigate the use of seatbelts by testing different power levels and ways of stopping car (brake or coast).</b>	How far forward does LEGO minifig (or marble) travel when car stopped suddenly. Change power and investigate.  Graph changing power against distance travelled by figurine.

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<b>Science Understanding</b>	<b>Physical sciences</b> The motion of objects can be described and predicted using the laws of physics. (ACSSU229)	Gathering data to analyse everyday motions produced by forces, such as measurements of distance and time, speed, force, mass and acceleration.	<b>Calculate velocity (speed) from distance and time of a robot car.</b>	Extend the activity to use different power percentages. Graph velocity against (different) Power % - does power increase linearly.
			<b>Create photogate speed timer using moving robot, light sensor and data-logging.</b>	Robot passes over measured equally spaced black tape on white paper. Time between black tape measured on datalog. Data can be calculated or graphed to find velocity. (Power could be varied between trials)
			<b>Program robot to accelerate uniformly.</b>	In software use a variable to store a value. Use maths block to add power. Loop program.
<b>Science as a Human Endeavour</b>	<b>Use and influence of Science</b> Advances in science and emerging sciences and technologies can significantly affect people's lives, including generating new career opportunities. (ACSHE195)	Recognising that the study of the universe and the exploration of space involve teams of specialists from the different branches of science, engineering and technology.	<b>Assignment - Careers in Robotics</b> <ul style="list-style-type: none"> <li>• How is technology effecting employment trends?</li> <li>• What type of work and education are involved in a career in robotics?</li> <li>• What robotics jobs may exist in the future?</li> </ul>	
		Recognising that scientific developments in areas such as sustainable transport and low-emissions electrical generation require people working in a range of fields of science, engineering and technology.		



# SCIENCE INQUIRY SKILLS

# GRADE 10

Questioning and predicting	Planning and conducting	Processing and analysing data & information	Evaluating	Communicating
<p>Formulate questions or hypotheses that can be investigated scientifically. (AC SIS164)</p>	<p>Plan, select and use appropriate investigation methods, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods. (AC SIS165)</p>	<p>Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies. (AC SIS169)</p>	<p>Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data. (AC SIS205)</p>	<p>Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations.(AC SIS174)</p>
	<p>Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data. (AC SIS166)</p>			