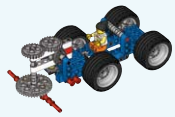
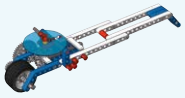
Science and Technology Learning Grid

	9686																		
	Sweeper	Fishing Rod	Freewheeling	The Hammer	Trundle Wheel	Letter Balance	Click-Clock	Windmill	Land Yacht	Flywheeler	Power Car	Dragster	The Walker	Dogbot	Uphill Struggle	The Magic Lock	Stamping Letters	Beaten	The Lifter	The Bat
Science																				
Science as inquiry	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Identifying questions to be answered	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Designing and conducting investigations	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Using tools to gather and interpret data	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Developing understanding of forces and motion	■	■	■	■				■	■	■	■	■	■	■	■			■	■	■
Motion, position, direction	■	■	■	■	■		■			■	■	■	■	■	■			■	■	■
Gears and ratios (mechanical advantage)	■		■		■		■			■	■	■	■	■	■			■	■	■
Gearing up and down for speed	■		■		■		■			■	■	■	■	■	■			■	■	
Friction	■		■	■	■				■	■	■	■	■	■	■					
Block and tackle		■									■		■							
Levers, cams		■		■		■	■					■	■	■		■	■			■
Momentum							■				■		■	■					■	■
Balanced and unbalanced forces	■	■		■		■	■	■	■	■	■	■	■		■	■			■	■
Period of swing, pendulums							■													
Developing understanding of energy	■		■				■	■	■	■	■	■	■	■					■	■
Capturing, storing and transferring energy								■	■	■		■		■						
Technology																				
Understanding of attribute designs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Developing the ability to apply design processes	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Identifying appropriate problems															■	■	■	■	■	■
Designing solutions and products	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Evaluating products	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Properties of materials			■	■	■	■	■	■	■					■						
Counting systems			■		■		■									■	■			
Controlling and timing actions							■			■			■	■						■
Transportation	■		■		■				■	■	■	■	■		■				■	
Reasoning with evidence	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Engineering																				
Describe and explain a purpose															■	■	■	■	■	■
Identifying goals, inputs, processes, outputs and feedback	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Developing understanding of engineering designs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Test and evaluate	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Math																				
Making reasonable estimates	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Understanding metric systems			■		■				■		■	■	■		■				■	
Understanding ways of representing numbers			■		■	■	■		■			■								
Transferring 2D representations to 3D models	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Visual discrimination	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Informal and formal measuring of distance/time			■		■		■	■	■	■	■	■	■	■	■		■		■	■
Informal and formal measuring of weight/mass		■		■		■		■			■	■				■	■		■	
Solving problems involving scale factors			■		■	■	■													
Sorting and classifying	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Selecting appropriate methods for estimating and measuring		■	■		■		■	■	■	■	■	■	■		■		■		■	■
Using fractions and decimals			■	■	■	■					■	■	■			■			■	
Collecting and handling data	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Critical and logical thinking	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Cooperating and using teamwork	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logic, reasoning and proof	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Fair testing															■	■	■	■	■	■

	Sweeper	Fishing Rod	Freewheeling	The Hammer
				
FORCES & MOTION				
Technology curriculum: Identifying a need and developing ideas. Working as individuals and in teams. Use materials and components as well as modular construction kits to design and make high-quality working prototypes. Use appropriate testing to identify improvements. Assembling and disassembling a range of familiar products and testing how well they meet the intended purpose.	• Investigating pulley drives for safety and gears for speed • Controlling friction and slip • Designing and making: the most efficient push along cleaning machine	• Investigating the ratchet and pawl as a safety system • Investigating automatic mechanical control of motion • Designing and making: a fishing game with easy-to-understand rules and a fair scoring system	• Investigating the effects of different wheel sizes and tire material on vehicle efficiency (working characteristics of materials) • Wheels and axles to move loads • Designing and making: a downhill runner vehicle that rolls as far as possible	• Investigating mechanical control and timing of complex actions by cams and levers • Investigating how industries test quality of components • Designing and making: a mechanical toy with as many actions as possible
Science curriculum: Scientific inquiry including predicting and measuring the effect of variables on the performance of simple machines. Careful observation, measurement, and recording.	• Balanced and unbalanced forces • Friction • Force and motion • Gear ratio	• Reducing speed and increasing force using string and pulleys (block and tackle) • Force and motion	• Inclined planes • Friction • Force and motion	• Inclined planes • Friction • Force and motion
Math curriculum: Using and applying mathematical ideas. Calculations using all number operations. Calculate and use notions of area, averages, and ratios. Measure time, distance, force, and weight to a suitable degree of accuracy. Use word equations; solve simple equations to calculate speed. Identify patterns in results; collect and handle data in tables. Communicate mathematical ideas in speech, and in written and graphic forms.	• Measuring distance • Ratios • Notions of efficiency as a percent or fraction	• Measuring distance • Estimating and comparing force, speed • Designing and evaluating fair scoring systems and fair rules for games • Ratios and fractions	• Reading and calibrating scales • Measuring distance, mass • Working with negative numbers (at bottom of hill, rolling the car backwards to zero) • Exploring limits to accuracy • Calculating averages	• Measuring number of 'impacts' per unit time • Estimating and comparing LEGO® element grip forces • Expressing relative grip forces using mathematical terms

	Trundle Wheel	Letter Balance	Click-Clock	
				
MEASUREMENTS				
Technology curriculum: Identifying a need and developing ideas. Working as individuals and in teams. Use materials and components as well as modular construction kits to design and make high-quality working prototypes. Use appropriate testing to identify improvements. Assembling and disassembling a range of familiar products and testing how well they meet the intended purpose.	• Investigating gearing down and complex gearing • Designing scales that are accurate and easily readable by the user • Designing and making: the most accurate and easy-to-use distance measuring device	• Investigating lever and linkage systems • Designing scales that are accurate and easily readable • Designing and making: the most accurate and easy-to-use weighing machine	• Investigating feedback control systems (pendulum and escapement) and gearing up • Designing scales that are accurate and easily readable • Designing and making: the longest running and most accurate time measuring device	
Science curriculum: Scientific inquiry including predicting and measuring the effect of variables on the performance of simple machines. Careful observation, measurement, and recording.	• Calibrating and reading scales • Measuring distance to limits of accuracy • Force and motion • Gear ratio	• Balancing forces • Calibrating and reading scales • Measuring weight to limits of accuracy • Force and motion	• The pendulum • Calibrating and reading scales • Measuring weight to limits of accuracy • Force and motion	
Math curriculum: Using and applying mathematical ideas. Calculations using all number operations. Calculate and use notions of area, averages, and ratios. Measure time, distance, force, and weight to a suitable degree of accuracy. Use word equations; solve simple equations to calculate speed. Identify patterns in results; collect and handle data in tables. Communicate mathematical ideas in speech, and in written and graphic forms.	• Reading and calibrating scales • Measuring distance • Counting up, counting down • Comparing accuracy of different measuring methods • Ratios and fractions • Expressing the degree of error	• Reading and calibrating scales • Measuring mass • Comparing accuracy of different measuring methods • Working with negative numbers • Expressing the degree of error	• Measuring time • Reading and calibrating scales • Comparing accuracy of different measuring methods • Expressing the degree of error	

	Windmill 	**Land Yacht** 	**Flywheeler** 	
ENERGY				
Technology curriculum: Identifying a need and developing ideas. Working as individuals and in teams. Use materials and components as well as modular construction kits to design and make high-quality working prototypes. Use appropriate testing to identify improvements. Assembling and disassembling a range of familiar products and testing how well they meet the intended purpose.	• Investigating sail material, shape, and area for effectiveness in capturing wind energy • Investigating structures • Designing and making: the most effective energy storage and release system for a windmill	• Investigating sail shape, area, and angle to wind for effectiveness in capturing wind energy • Investigating mechanisms for efficient energy for use in transport • Designing and making: the most efficient omni-directional wind powered vehicle	• Investigating the flywheel as a speed control (gearing up) and safety mechanism • Investigating the flywheel as an energy store • Using gears to increase speed • Designing and making: the smoothest running vehicle that rolls furthest using its onboard energy store	
Science curriculum: Scientific inquiry including predicting and measuring the effect of variables on the performance of simple machines. Careful observation, measurement, and recording.	• Capturing wind energy to run machines • Storing and transferring energy; kinetic to potential energy transformations • Balanced and unbalanced forces • Force and motion	• Capturing wind energy for transport • Transforming energy by gearing down • Forces and wind resistance • Balanced and unbalanced forces • Force and motion	• Storing kinetic/ moving energy • Friction • Balanced and unbalanced forces • Force and motion • Gear ratio	
Math curriculum: Using and applying mathematical ideas. Calculations using all number operations. Calculate and use notions of area, averages, and ratios. Measure time, distance, force, and weight to a suitable degree of accuracy. Use word equations; solve simple equations to calculate speed. Identify patterns in results; collect and handle data in tables. Communicate mathematical ideas in speech, and in written and graphic forms.	• Measuring force in time and area • Estimating and comparing speed and efficiency related to sail shape and area	• Estimating and measuring distance, area, time, and angle • Expressing speed and efficiency, related to the angle to wind. • Expressing speed and efficiency, related to the shape and area of the sail	• Measuring distance and time • Expressing speed and distance travelled related to the mass of the flywheels	

	Power Car	Dragster	The Walker	Dogbot
				
POWERED MACHINES				
Technology curriculum: Identifying a need and developing ideas. Working as individuals and in teams. Use materials and components as well as modular construction kits to design and make high-quality working prototypes. Use appropriate testing to identify improvements. Assembling and disassembling a range of familiar products and testing how well they meet the intended purpose.	• Investigating gearing down, different tire types and wheel types to give more torque • Investigating the speed and pulling power of different arrangements of gears and wheels • Designing and making: a powered vehicle that can pull the heaviest possible load	• Investigating gearing up • Designing and making: a dragster that will travel the furthest when released from a launcher	• Investigating cranks, levers, and linkages on stability and stride distance to produce walking or reciprocating movements • Investigating ratchets to control slippage and create one-way movement • Investigating relative positions of cranks to produce a variety of life-like 'gaits' • Investigating the worm gear for extreme gearing down • Designing and making: a walker that can tackle the steepest hills and most difficult terrain	• Investigating levers, linkages, cams, and cranks to produce complex timed and controlled movements • Investigating pulleys and slip for safety • Using a variety of materials to create a 'skin' for a dynamic model • Designing and making: an 'animatronic' creature that simulates dog-like behavior
Science curriculum: Scientific inquiry including predicting and measuring the effect of variables on the performance of simple machines. Careful observation, measurement, and recording.	• Investigating the effects of load on friction; reducing friction • Inclined planes and work • Force and motion • Gear ratio	• Investigating the transfer of movement and energy • Investigating relationship between speed and mass; momentum and kinetic energy • Force and motion • Gear ratio	• Careful observation of the way a person moves in order to compare with the way a walker actually moves • Force and motion • Balance and load	• Careful observation of the way a dog moves to compare with Dogbot's movements • Force and motion
Math curriculum: Using and applying mathematical ideas. Calculations using all number operations. Calculate and use notions of area, averages, and ratios. Measure time, distance, force, and weight to a suitable degree of accuracy. Use word equations; solve simple equations to calculate speed. Identify patterns in results; collect and handle data in tables. Communicate mathematical ideas in speech, and in written and graphic forms.	• Measuring distance and time of travel • Measuring and expressing angle of slope • Notions and calculations of wheel diameter and circumference related to distance travelled per rotation	• Measuring distance and time of travel • Noticing patterns of distance travelled related to wheel mass	• Measuring distance, time • Calculating speed • Noticing pattern of stride length related to crank length • Measuring and expressing angle of slope	• Measuring and expressing the degree and direction of movement of 'body parts', and number of actions per unit of time • Noticing patterns of eye movements related to fulcrum position in cams • Evaluating and expressing model performance (behavior), qualitatively and quantitatively