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Design and Technologies FOUNDATION - 2

Strand		Content Descriptions	Elaborations	LEGO Education	Teacher notes
Knowledge and understanding	**Technologies and society**	Identify how people design and produce familiar products, services and environments and consider sustainability to meet personal and local community needs (ACTDEK001)	Exploring how local products, services and environments are designed by people for a purpose and meet social needs	**Design and build simple WeDo playground equipment. Build Early Simple Machines Car Launcher. Follow building instructions to build WeDo wild animals, dancing birds, roaring lion, and hungry croc.**	Explore local parks and playgrounds. Sketch area identifying major components. Identify purpose of area and the needs it meets.
	Technologies contexts	Explore how technologies use forces to create movement in products (ACTDEK002)	Exploring how the principles of push and pull are used in the design of toys		Discuss how the principles of push and pull are used WeDo (See WeDo Software v1.2 & Activity Pack + building instructions). Car Launcher (See Early Simple Machines Activity Pack 9659). Experiment with different size wheels. Discuss changes in movement. Test cars of different sizes, weight, and length and compare predicted outcomes to results. Use ramp to investigate how cars travel with and without a push or pull.
	Engineering principles and systems		Identifying, and playing and experimenting with, components, such as wheels and balls, tools and equipment to solve problems requiring movement		
			Exploring how to manipulate materials using a range of tools, equipment and techniques to create movement		

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Design and Technologies FOUNDATION - 2

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Investigating	Explore needs or opportunities for designing, and the technologies needed to realise designed solutions (ACTDEP005)	Identifying, gathering and playing with materials, components, tools and equipment to generate personal design ideas	Explore with robots to generate movement ideas. Explore WeDo kit components and then draw (and label) what the final WeDo animal or playground equipment could look like. Follow building instructions to build WeDo wild animals, dancing birds, roaring lion, and hungry croc or Design and build WeDo playground equipment. Compare final build to original design. Rate designs (with teacher guidance) and give feedback. Make adjustments as required. Suggest areas for improvement.
	Generating	Visualise, generate, develop and communicate design ideas through describing, drawing and modelling (ACTDEP006)	Communicating design ideas by modelling, and producing and labelling two-dimensional drawings using a range of technologies to show different views (top view and side view)	
			Recording a judgment about design ideas with teacher guidance, for example expressing own likes and dislikes about a design idea	
	Producing	Use materials, components, tools, equipment and techniques to safely make designed solutions (ACTDEP007)	Assembling components of systems and checking they function as planned	
	Evaluating	Use personal preferences to evaluate the success of design ideas, processes and solutions including their care for environment (ACTDEP008)	Recording a judgment about design ideas with teacher guidance, for example expressing own likes and dislikes about a design idea	
			Suggesting areas for design improvement	
	Collaborating and Managing	Sequence steps for making designed solutions and working collaboratively (ACTDEP009)	Checking that planned features have been included in design plans and drawings by referring to identified criteria for success	List features that final robot needs to include. Check list and make adjustments as required.
			Identifying roles for each member of a group when working collaboratively	Groups choose team and task roles.

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Digital Technologies FOUNDATION - 2

Strand		Content Descriptions	Elaborations	LEGO Education	Teacher notes
Knowledge and understanding	Digital systems	Identify, use and explore digital systems (hardware and software components) for a purpose (ACTDIK001)	Exploring and identifying hardware and software components of digital systems when creating ideas and information, for example experimenting with different ways of providing instructions to a robot. Recognising and using hardware and software components of digital systems and experimenting with their functions, for example playing with interactive toys and robotic devices to determine which ones can work with other devices Recognising that a digital system follows instructions or commands, for example instructing robotic toys to perform a function such as a dance movement Constructing a model of a real or imaginary digital systems device for use in role-play scenarios and explaining the features of the device to an adult	**Follow instructions to build an EV3 or NXT robot car to push can around flat surface. Modify existing program to investigate how different power levels affect the movement of the robot. Program robot on brick and on software.**	Explore program and use software to modify existing program. Describe difference and how changes in the program affect the movement of the robot. Use robot to solve a problem. For example, collecting cans to recycle. Describe the features and movement of the robot.

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Digital Technologies FOUNDATION - 2

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Defining	Follow, describe and represent a sequence of steps and decisions (algorithms) needed to solve simple problems (ACTDIP004)	Experimenting with very simple, step-by-step procedures to explore programmable devices, for example providing instructions to robotic devices to move in an intended manner, such as following a path around the classroom	Follow building instructions to build WeDo, NXT or EV3 robots. Describe the features and movement of the robot. Design a set of instructions for the robot before programming the robot to follow the instructions.
			Writing and entering a simple set of instructions jointly to sequence events and instructions. Describing the steps involved in the process	
			Presenting a sequence of instructions or events in a series of slides or screens with text and pictures	
			Recognising sequences of instructions or events	
			Following a series of instructions to use a piece of hardware or software	

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Design and Technologies GRADE 3 - 4

Strand		Content Descriptions	Elaborations	LEGO Education	Teacher notes
Knowledge and understanding	**Technologies and society**	Recognise the role of people in design and technologies occupations and explore factors, including sustainability that impact on the design of products, services and environments to meet community needs (ACTDEK010)	Examining the suitability of a service or everyday system and proposing improvements, for example a water saving system for a bathroom at home	**Design, build and program a robot that meets a design brief. Label robot design and program. Identifying major features (including inputs, outputs and processes) of the robotic system. Explore how forces affect the system.**	Examine recycling service and design a robotic system to solve a recycling problem. For example, collecting cans to recycle or a water saving system.
			Critiquing designed products, services and environments to establish the factors that influence the design and use of common technologies		
	Technologies contexts	Investigate how forces and the properties of materials affect the behaviour of a product or system (ACTDEK011)	Examining models to identify how forces and materials are used in the design of a toy		Build and program a LEGO car and compare the friction of different surfaces. Investigate how the surface used affects the performance of the robot car. Identify major features of the robotic system including inputs, outputs and processes. Describe the major features and movement of the robot.
	Engineering principles and systems		Exploring through play how movement can be initiated by combining materials and using forces		
			Conducting investigations to understand the characteristics and properties of materials and forces that may affect the behaviour and performance of a system		
			Identifying and exploring properties and construction relationships of an engineered system		
			Experimenting with available local materials, tools and equipment to solve problems requiring forces including identifying inputs (what goes in to the system), processes (what happens within the system) and outputs (what comes out of the system)		

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Design and Technologies GRADE 3 - 4

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Investigating	Explore needs or opportunities for designing, and the technologies needed to realise designed solutions (ACTDEP005)	Identifying, gathering and playing with materials, components, tools and equipment to generate personal design ideas	Explore with robots to generate design ideas. Label major features of the robotic system including inputs, outputs and processes. Compare final build to original design. Rate designs (with teacher guidance) and give suggestions for improvement. Make adjustments as required. Collect components needed for robot design and build robot. Evaluate final build and justify changes made.
	Generating	Visualise, generate, develop and communicate design ideas through describing, drawing and modelling (ACTDEP006)	Communicating design ideas by modelling, and producing and labelling two-dimensional drawings using a range of technologies to show different views (top view and side view)	
			Recording a judgment about design ideas with teacher guidance, for example expressing own likes and dislikes about a design idea	
	Producing	Use materials, components, tools, equipment and techniques to safely make designed solutions (ACTDEP007)	Assembling components of systems and checking they function as planned	
	Evaluating	Use personal preferences to evaluate the success of design ideas, processes and solutions including their care for environment (ACTDEP008)	Recording a judgment about design ideas with teacher guidance, for example expressing own likes and dislikes about a design idea	
			Suggesting areas for design improvement	
	Collaborating and Managing	Sequence steps for making designed solutions and working collaboratively (ACTDEP009)	Checking that planned features have been included in design plans and drawings by referring to identified criteria for success	Create group plan and list features that final robot will include. Monitor list and original design and make adjustments as required. Evaluate final build and justify changes made.
			Identifying roles for each member of a group when working collaboratively	Groups choose team and task roles.

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Digital Technologies GRADE 3 - 4

Strand		Content Descriptions	Elaborations	LEGO Education	Teacher notes
Knowledge and understanding	Digital systems	Explore and use a range of digital systems with peripheral devices for different purposes, and transmit different types of data (ACTDIK007)	Using specific peripheral devices to capture different types of data Experimenting with different types of digital system components and peripheral devices to perform input, output and storage functions	**Use robot car to collect data to predict how long the robot car will take to travel a given distance (see Mathematics Data and Statistics Activity -Don't hit the LEGO person). Use light sensor or ultrasonic sensor to stop the robot car before the LEGO person.**	Trial robot car and measure distance travelled to predict how long the robot car will take to travel a given distance (see Data and Statistics Activity -Don't hit the LEGO person). Extend activity by using a light sensor or ultrasonic sensor to stop the robot car before the LEGO person. Use NXT or EV3 as a data logger and preprogram to measure brightness of light in the classroom using light sensor. Modify existing program to investigate how different light levels affect the data.

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Digital Technologies GRADE 3 - 4

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Defining	Define simple problems, and describe and follow a sequence of steps and decisions (algorithms) needed to solve them (ACTDIP010)	Describing, using drawings, pictures and text, the sequence of steps and decisions in a solution	Create a flowchart to show the instructions for the robot before programming.. Test the program and make necessary adjustments to complete the challenge.
			Explaining to others how to follow technical instructions	
			Experiment ing with different ways of describing a set of instructions, for example writing two versions of the same simple set of instructions for a programmable robotic device	
	Implementing	Implement simple digital solutions as visual programs with algorithms involving branching (decisions) and user input (ACTDIP011)	Designing and implementing a simple interactive digital solution using a visual programming language	
			Using different design tools to record ways in which digital solutions will be developed, for example creating storyboards or flowcharts to record relationships or instructions about content or processes	
	Evaluating	Explain how developed solutions and existing information systems meet common personal, school or community needs, and envisage new ways of using them (ACTDIP012)	Testing the adequacy of developed solutions, for example asking a classmate to review a digital solution and provide feedback	Present final robot and program to peers for feedback. Make adjustments as required.

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Design and Technologies GRADE 5 - 6

Strand		Content Descriptions	Elaborations	LEGO Education	Teacher notes
Knowledge and understanding	**Technologies and society**	Investigate how people in design and technologies occupations address competing considerations, including sustainability in the design of products, services and environments for current and future use (ACTDEK019)	Evaluating the sustainability implications of materials, systems, components, tools and equipment, for example materials can be recycled or re-used to reduce waste; systems may benefit some, but disadvantage others	**LEGO Green City Challenge®** **FIRST® LEGO® League Challenge** **RoboCup**	Explore energy efficient cities and build and program robot to complete Green City Challenge tasks such as powering a wind turbine and closing a dam. Design and build an energy efficient house using NXT or EV3 e.g. Lights turn on when car approaches garage.
			Identifying the components of a system that contribute to its success and assessing potential risk or failure		Design, build and program robot for challenge, FIRST LEGO League or RoboCup. Use EV3 Content Editor to document development of robot design and program. Identify the major features (inputs, outputs and processes) of the robotic system. Include both images and text of production steps, original design and program and re-designs, and an evaluation of the task justifying choices made.
	Technologies contexts Engineering principles and systems	Investigate how forces or electrical energy can control movement, sound or light in a designed product or system (ACTDEK020)	Recognising the need to carefully plan and select components for a system to perform a specific task		
			Investigating the technologies in a control system for an identified need or opportunity and user		
	Materials and technologies specialisations	Investigate characteristics and properties of a range of materials, systems, components, tools and equipment and evaluate the impact of their use (ACTDEK023)	Comparing tools, equipment and techniques to select those most appropriate for a given purpose		

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Design and Technologies GRADE 5 - 6

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Investigating	Critique needs or opportunities for designing, and investigate materials, components, tools, equipment and processes to achieve intended designed solutions (ACTDEP024)	Exploring the steps involved in the process to satisfy a design brief, need or opportunity	Design, build and program robot. Create production steps and identify major features of the robot. Test robot and make adjustments to improve the robot build and program to complete the challenge. Justify robot design and changes made to initial design.
			Identifying the importance of complementary parts of working, everyday systems by deconstructing the components, structure and purpose of products, services or environments	
	Generating	Generate, develop, communicate and document design ideas and processes for audiences using appropriate technical terms and graphical representation techniques (ACTDEP025)	Analysing and modifying design ideas to enhance and improve the sustainability of the system	
	Producing	Apply safe procedures when using a variety of materials, components, tools, equipment and techniques to make designed solutions (ACTDEP026)	Matching material and joining techniques to the design intention for example joining components to produce a robotic system	

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Design and Technologies GRADE 5 - 6

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Evaluating	Negotiate criteria for success that include consideration of sustainability to evaluate design ideas, processes and solutions (ACTDEP027)	Independently and collaboratively identifying criteria for success, processes and planning, for example using visual representations such as a flowchart	Create flowchart showing robot instructions. Use flowchart to evaluate robotic system and incorporate flowchart in FIRST LEGO League robot design presentation.
			Evaluating products, services and environments from a range of technologies contexts with consideration of ethics and sustainability	Use Green City Challenge to initiate discussion, investigation and evaluation of energy efficient green city.
	Collaborating and Managing	Develop project plans that include consideration of resources when making designed solutions individually and collaboratively (ACTDEP028)	Setting milestones for production processes and allocating roles to team members	Groups Identify team and task roles and plan the production steps to design, build and program their robot. Groups use digital calendar to set milestones to monitor their plan and modify their group team and task roles.
			Outlining the planning and production steps needed to produce a product, service or environment using digital technologies	
			Reflecting on planned steps to see if improvements can be made	Groups reflect on their plan, justifying choices made and identifying future improvements to plan and group team and task roles.

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Digital Technologies GRADE 5 - 6

Strand		Content Descriptions	Elaborations	LEGO Education	Teacher notes
Knowledge and understanding	Digital systems	Investigate the main components of common digital systems, their basic functions and interactions, and how such digital systems may connect together to form networks to transmit data (ACTDIK014	Describing digital systems as having internal and external components that perform different functions, for example external components; internal processing components include the central processing unit; external output components including motors and input components including sensors Explaining how data may be transmitted between two digital systems in different ways, for example that wires or cables are used to transfer data from computer program to robot	**Program a NXT or EV3 robot car for FIRST LEGO League Challenge or RoboCup. The robot needs to incorporate sensors and motors.**	Explore NXT or EV3 system -Identify processor and different inputs (sensors) and outputs (motors). Describe how the different components work together as a system. Program a robot using switches and loops. Use USB cable to transfer program to robot. Explain how the program is transferred to the robot.

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Digital Technologies GRADE 5 - 6

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Collecting, managing and analysing data	Acquire, store and validate different types of data and use a range of commonly available software to interpret and visualise data in context to create information (ACTDIP016)	Using digital systems to validate data, for example setting data types in a spreadsheet to make sure a date is input correctly	Use robot car to collect data (see Mathematics Data and Statistics Activity -Don't hit the LEGO person). Input data into Excel spreadsheet to predict how long the robot car will take to travel a given distance.
			Selecting and using peripheral devices suitable to the data, for example using a data probe to collect data about changing soil temperatures for plants, interpreting the data and sharing the results as a digital graph	Investigate and use NXT or EV3 as a data logger and preprogram to collect data. For example, measure brightness of light in the classroom using light sensor. Define challenge and production process. Use data logging graph to explain how different light levels affect the data. Incorporate temperature sensor to investigate the soil temperature of plants and combine with light sensor graph to justify changes in soil temperature and share results.
	Defining	Define problems in terms of data and functional requirements, and identify features similar to previously solved problems (ACTDIP017)	Checking existing solutions to identify features that are transferable to new but similar digital solutions	
			Describing in simple terms the nature of a problem and what a solution needs to achieve	

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Digital Technologies GRADE 5 - 6

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Designing	Design, modify and follow simple algorithms represented diagrammatically and in English involving sequences of steps, branching, and iteration (repetition) (ACTDIP019)	Following, modifying and describing the design of a game involving simple algorithms represented diagrammatically or in English, for example creating a flowchart with software that uses symbols to show decisions, processes and inputs and outputs	Create a flowchart using the EV3 content editor to show decisions, processes, inputs and outputs of the robotic system. Experiment with switches in NXT or EV3 program (IF statements) and loops (repeat statements) and Incorporate switches and loops into robot instructions for robot vacuum cleaner, maze follower, RoboCup or FIRST LEGO League Challenge robot.
			Experimenting with different ways of representing an instruction to make a choice, for example branches in a tree diagram or using an 'IF' statement (a common statement used to branch) to indicate making a choice between two different circumstances using a spreadsheet or a visual program	
			Experimenting with different ways of representing an instruction to make a repetition, for example loops in a flowchart diagram or using a 'REPEAT' statement	
			Designing the instructions for a robot vacuum cleaner to clean a room	
			Using different design tools to record ways in which digital solutions will be developed, for example creating storyboards or flowcharts to record relationships or instructions about content or processes	

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Digital Technologies GRADE 5 - 6

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Implementing	Implement digital solutions as simple visual programs involving branching, iteration (repetition), and user input (ACTDIP020)	Experimenting with different options that involve repeat instructions	Use flowchart to design instructions for a robot vacuum, maze follower, RoboCup or FIRST LEGO League robot. Experiment with sensors, switches and loops and incorporate into the robot program. Test robot and make necessary adjustments to robot program.
			Programming a robot to operate independently, for example to find its way out of a maze	
			Experimenting with different ways of instructing to make choices and repeat instructions, for example using 'IF' statements to allow for making choices and iterations (repeat instructions) until a goal is achieved	
	Collaborating and managing	Manage the creation and communication of ideas and information including online collaborative projects, applying agreed ethical, social and technical protocols (ACTDIP022)	Applying practices that support the organisation of collaborative problem-solving, for example finding online meeting times that suit all members, and agreeing on ways of protecting files and sharing information digitally with members	Share robot design ideas online and encourage feedback. Test and make adjustments to prototypes to improve the robot build and program to complete the challenge.
			Using a range of communication tools to share ideas and information, for example participating in collaborative online environments	

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Design and Technologies GRADE 7 - 8

Strand		Content Descriptions	Elaborations	LEGO Education	Teacher notes
Knowledge and understanding	**Technologies and society**	Examine and prioritise competing factors including social, ethical and sustainability considerations in the development of technologies and designed solutions to meet community needs for preferred futures (ACTDEK029)	Investigating how sustainability considerations impact on design and technologies	**Renewable Energy Activity Pack** **LEGO Green City Challenge®**	Research alternative energy sources for a sustainable future. Build and program robot to complete Green City Challenge tasks such as powering a wind turbine and closing a dam. Present ways to obtain energy for an environmentally sustainable robot.
	Technologies contexts	Analyse how motion, force and energy are used to manipulate and control electromechanical systems when designing simple, engineered solutions (ACTDEK031)	Investigating influences impacting on manufactured products and processes such as historical developments, society, new materials, control systems and biomimicry, for example the development of robots	**Explore history of robotics: Fact and fiction.**	Investigate how science fiction has affected the development of robots. What will a world of robots look like in 50, 100 or 1000 years? (See: Science as a Human Endeavour Activity- Grade 8).
	Engineering principles and systems		Calculating an engineered system's outputs, for example speed, brightness of light, volume of sound	**Design, Build and Program a NXT or EV3 robot car for the FIRST LEGO League Challenge or RoboCup. The robot needs to incorporate sensors and motors.**	Design, build and program robot. Calculate velocity (speed) from distance and time of a wheeled NXT or EV3 robot. Test robot and make adjustments to improve the robot build.
			Using code to control systems, for example code to program a microcontroller or a simple, object-based coding application to program a system such as a remote-controlled car or simple robotic arm		Build and program robotic arm for FIRST LEGO League Challenge. Test robot and make adjustments to improve the robot program to complete the challenge.
	Materials and technologies specialisations	Analyse ways to produce designed solutions through selecting and combining characteristics and properties of materials, systems, components, tools and equipment (ACTDEK034)	Investigating and selecting from a broad range of technologies – materials, systems, components, tools and equipment – when designing for a range of technologies contexts		Select and combine components of robotic system. Identify major components and justify selection made. Incorporate justification in FIRST LEGO League robot design presentation.

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Design and Technologies GRADE 7 - 8

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Investigating	Critique needs or opportunities for designing and investigate, analyse and select from a range of materials, components, tools, equipment and processes to develop design ideas (ACTDEP035)	Considering community needs when identifying opportunities for designing, for example gardens for a community centre, cost effective food service for a sport club	Design and build robot model. Identify major features of the robot. Test robot and make adjustments to improve the robot build and program to complete the challenge. Justify robot design and changes made to initial design.
			Investigating emerging technologies and their potential impact on design decisions	
	Generating	Generate, develop, test and communicate design ideas, plans and processes for various audiences using appropriate technical terms and technologies including graphical representation techniques (ACTDEP036)	Developing models, prototypes or samples using a range of materials, tools and equipment to test the functionality of ideas	
			Producing annotated concept sketches and drawings, using: technical terms, scale, symbols, pictorial and aerial views to draw environments; production drawings, orthogonal drawings; patterns and templates to explain design ideas	Produce annotated design to scale, identifying components, inputs, outputs, and processes of NXT or EV3 robot. Incorporate design in FIRST LEGO League robot design presentation.
			Documenting and communicating the generation and development of design ideas for an intended audience, for example developing a digital portfolio with images and text which clearly communicates each step of a design process	Use EV3 Content Editor to document development of robot design and program. Include both images and text of original design and program and re-designs.

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Design and Technologies GRADE 7 - 8

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Producing	Effectively and safely use a broad range of materials, components, tools, equipment and techniques to make designed solutions (ACTDEP037)	Developing technical production skills and safe working practices with independence to produce quality solutions designed for sustainability	Develop a time line and plan the production step incorporating criteria for success. Test and make adjustments as required and evaluate final build, justifying changes made. Label major features of the robotic system including inputs, outputs and processes.
			Practising techniques to improve expertise	
	Evaluating	Independently develop criteria for success to assess design ideas, processes and solutions and their sustainability (ACTDEP038)	Developing criteria for success to assess the success of designed solutions in terms of aesthetics, functionality and sustainability	
			Considering how to improve technical expertise	
			Evaluating designed solutions and processes and transferring new knowledge and skills to future design projects	
	Collaborating and Managing	Use project management processes when working individually and collaboratively to coordinate production of designed solutions (ACTDEP039	Explaining and interpreting drawings, planning and production steps needed to produce products, services or environments for specific purposes	
			Organising time, evaluating decisions and managing resources to ensure successful project completion and protection of the work space and local environment	
			Investigating the time needed for each step of production	

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Digital Technologies GRADE 7 - 8

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Defining	Define and decompose real-world problems taking into account functional requirements and economic, environmental, social, technical and usability constraints (ACTDIP027)	Identifying that problems can be decomposed into sub elements, for example creating a decision tree to represent the breakdown and relationships of sub elements to the main problem or identifying the elements of game design such as characters, movements, collisions and scoring	Create instructions for program including loops and switches for FIRST LEGO League Challenge or RoboCup competition. Create Flowchart showing robot instructions. Use Flowchart to evaluate robotic system and incorporate flowchart in FIRST LEGO League robot design presentation.
	Designing	Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors (ACTDIP029)	Using diagrams to describe key decisions, for example creating flowcharts using digital systems to describe a set of computational instructions	
			Using structured English to express algorithmic instructions, for example using conventional statements such as 'while' and 'endwhile' in a 'while loop' when describing interactive instruction	
	Implementing	Implement and modify programs with user interfaces involving branching, iteration and functions in a general-purpose programming language (ACTDIP030)	Programming a robot to recognise particular objects and to treat them differently, for example choose objects based on colour	Program an EV3 colour-sorting robot using the colour sensor.

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Digital Technologies GRADE 7 - 8

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Evaluating	Evaluate how well developed solutions and existing information systems meet needs, are innovative and take account of future risks and sustainability (ACTDIP031	Comparing developed solutions with existing solutions that solve similar problems	Organise robot programs using file-naming conventions for FIRST LEGO League Challenge or RoboCup program files. Create timeline to sequence tasks and organise group team and tasks roles. Evaluate final solution to robot challenge. Reflect on plan justifying choices made, identifying future improvements to plan and group team and task roles.
	Collaborating and managing	Plan and manage projects, including tasks, time and other resources required, considering safety and sustainability (ACTDIP033	Organising the instructions and files in readiness for implementation of a solution, for example applying a file naming convention to all data files that are going to be used to create solutions	
			Documenting the tasks that need to be done, their order and the resources that are needed to create solutions	
			Organising the timeline, resources, file naming conventions, back-up measures and sequence of tasks required to collaboratively create solutions that meet specified needs	

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Design and Technologies GRADE 9 - 10

Strand		Content Descriptions	Elaborations	LEGO Education	Teacher notes
Knowledge and understanding	**Technologies and society**	Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global preferred futures and the complex design and production processes involved (ACTDEK040)	Recognising the impact of past designed solutions and possible future decisions in relation to creating preferred futures, for example the design of public transport systems that use renewable energy and the design of rural communities to reduce fire risk	**Renewable Energy Activity Pack.** **Design, Build and Program a NXT or EV3 robot for the FIRST LEGO League Challenge or RoboCup Junior Competition.**	Investigate and design a robotic system that uses renewable energy. Design and build robot for FIRST LEGO League Challenge or RoboCup Junior
		Explain how products, services and environments evolve with consideration of preferred futures and the impact of emerging technologies on design decisions (ACTDEK041)	Predicting the impact of emerging technologies for preferred futures Constructing scenarios of how the future may unfold (forecasting) and what impacts there may be for society and particular groups, and back casting from preferred futures	**Assignment Topics:** • **Mars Rovers - History and Achievements.** • **Humanoid Robots - how close are we getting to replicating humans (limitations?) (See: Science as a Human Endeavour -Grade 9)**	Possible Assignment Genres: • Oral Presentation • Poster • Web page • Essay
	Technologies contexts Engineering principles and systems	Investigate and make judgments on how the characteristics and properties of materials are combined with force, motion and energy to create engineered solutions (ACTDEK043)	Explaining the way common machines combine properties of materials and force, motion and energy in	**Investigate gears with NXT or EV3 Robots.**	Identify major features of the robot and explore gear ratios. Create a hill climbing robot using gears and investigate different ramp surfaces. Discuss losses due to friction. Try different tyres and tracks.

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Links to ACARA

Design and Technologies GRADE 9 - 10

Strand		Content Descriptions	Elaborations	LEGO Education	Teacher notes
Knowledge and understanding	Food and fibre production	Investigate and make judgments on the ethical and sustainable production and marketing of food and fibre (ACTDEK044)	Investigating how digital technologies could be used to enhance food production systems, for example global positioning system (GPS) for managing animals, crop sensors or automated animal feeding or milking	**Investigate food production and design and build robotic food production system using sensors.**	Investigate, present and justify the designed food production system.
	Materials and technologies specialisations	Investigate and make judgments on how the characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions (ACTDEK046)	Critiquing the design of an existing product to identify environmental consequences of material selection		
			Justifying decisions when selecting from a broad range of technologies – materials, systems, components, tools and equipment		
			Analysing and explaining the ways in which the properties and characteristics of materials have been considered in the design of a product with specific requirements		

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Design and Technologies GRADE 9 - 10

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Investigating	Critique needs or opportunities to develop design briefs and investigate and select an increasingly sophisticated range of materials, systems, components, tools and equipment to develop design ideas (ACTDEP048)	Critiquing a range of design and technologies ideas Identifying appropriate tools, equipment, techniques and safety procedures for each process and evaluating production processes for accuracy, quality, safety and efficiency	Design and build a robot. Use EV3 Content Editor to create a digital portfolio of the design processes and identify major features of the robot and program. Share innovative designs online with peers. Develop production process and criteria for success, test robot and make adjustments to improve the robot build and program to complete the challenge.
	Generating	Apply design thinking, creativity, innovation and enterprise skills to develop, modify and communicate design ideas of increasing sophistication (ACTDEP049)	Using techniques including combining and modifying ideas and exploring functionality to generate solution concepts Communicating using appropriate technical terms and recording the generation and development of design ideas for an intended audience including justification of decisions, for example developing a digital portfolio with images and text which clearly communicates each step of a design process	

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Design and Technologies GRADE 9 - 10

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Producing	Work flexibly to safely test, select, justify and use appropriate technologies and processes to make designed solutions (ACTDEP050)	Refining technical skills and using production skills with independence to produce quality designed solutions and to reduce risks in production	Design and build a robot. Use EV3 Content Editor to create a digital portfolio of the design processes and identify major features of the robot and program. Share innovative designs online with peers. Develop production process and criteria for success, test robot and make adjustments to improve the robot build and program to complete the challenge.
			Experimenting with innovative combinations and ways of manipulating traditional and contemporary materials, components, tools, equipment and techniques, and recording findings in a collaborative space to debate the merits of each with peers	
			Modifying production processes to respond to unforeseen challenges or opportunities	
	Evaluating	Evaluate design ideas, processes and solutions against comprehensive criteria for success recognising the need for sustainability (ACTDEP051)	Establishing specific criteria for success for evaluating designed solutions	
			Evaluating choices made at various stages of a design process and modifying plans when needed with consideration of criteria for success	Evaluate final build and reflect on changes made to the final program and robot design. Incorporate justification in FIRST LEGO League robot design presentation.
			Reflecting on learning, evaluating processes and transferring new knowledge and skills to future design projects	Create timeline to sequence tasks for robot challenge. FIRST LEGO League Challenge or RoboCup Junior competition and organise group team and tasks roles. Reflect on plan justifying choices made, identifying future improvements to plan and group team and task roles.
	Collaborating and Managing	Develop project plans using digital technologies to plan and manage projects individually and collaboratively taking into consideration time, cost, risk and production processes (ACTDEP052)	Producing, explaining and interpreting drawings; and planning production timelines using digital technologies	
			Collaborating to develop production plans for equitable distribution of work	

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Digital Technologies GRADE 9 - 10

Strand		Content Descriptions	Elaborations	LEGO Education	Teacher notes
Knowledge and understanding	Digital systems	Investigate the role of hardware and software in managing, controlling and securing the movement of and access to data in networked digital systems (ACTDIK034)	Investigating the operation and use of robotic process control systems	**Design, Build and Program a NXT or EV3 robot car for FIRST LEGO League Challenge or RoboCup.**	Design, build and program robot incorporating motors and sensors.

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Digital Technologies GRADE 9 - 10

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Defining	Precisely define and decompose real-world problems, taking into account functional and non-functional requirements and including interviewing stakeholders to identify needs (ACTDIP038)	Developing a preliminary specification for an opportunity or a need that typically contains a problem statement, a set of solution needs expressed as functional and non-functional requirements, any assumptions or constraints to be considered and the scope or boundaries of the solution	Design, build and program a robot system for FIRST LEGO League Challenge. Define challenge and develop production steps. Create a Flowchart showing robot instruction. Use Flowchart to evaluate robotic system and incorporate flowchart in FIRST LEGO League robot design presentation.
	Designing	Design algorithms represented diagrammatically and in structured English and validate algorithms and programs through tracing and test cases (ACTDIP040)	Designing algorithms to solve real-world problems and describing algorithms using flow charts and structured English, for example START, END, IF and UNTIL	
			Developing test cases that correspond to the requirements of the specifications, for example validating program behaviour on a range of valid and invalid user input	
	Implementing	Implement modular programs, applying selected algorithms and data structures including using an object-oriented programming language (ACTDIP041)	Coding separate modules that perform discrete functions but collectively meet the needs of the solution	
			Considering different algorithms and selecting the most appropriate based on the type of problem, for example choosing appropriate algorithms for particular problems	

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Digital Technologies GRADE 9 - 10

Strand		Content Descriptions	Elaborations	Teacher notes
Process and production skills	Collaborating and managing	Plan and manage projects using an iterative and collaborative approach, identifying risks and considering safety and sustainability (ACTDIP044)	Managing and modifying the development of a solution, for example using software to record and monitor project tasks, responsibilities and timeframes and to organise continuous opportunities to review progress with collaborative partners and to conduct regular unit testing	Use EV3 Content Editor to document development of robot design process. Create timeline to sequence tasks for FIRST LEGO League or RoboCup and organise group team and tasks roles. Reflect on plan justifying choices made, identifying future improvements to plan and group team and task roles.
			Developing an evolutionary prototype iteratively and incrementally, for example regularly revising features of an application in response to user feedback and development decisions	Present robot prototype to class and encourage feedback. Test and make adjustments to prototypes to improve the robot build and program to complete the challenge.

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