Cedar, Cherry, Rowan
Switched On

Lesson	IPC Learning Goal	NC Coverage	Activities	Resources / Vocabulary / Personal Goals
Entry Point			Set up your own 'Robot Olympics' for the children to take part in. This will feature a number of different challenges that will test the children's ability to give instructions to a programmable floor robot. Because the challenges are quite generic, you can use any/all of the programmable robots that you have available – it doesn't matter if the robots are of different designs (that will make it more fun!), as long as they can be given a sequence of instructions to move forwards and backwards, and turn left and right. Suggestions include: Roamer or Roamer-Too (valiant-technology.com) Bee-Bot or Pro-Bot (bee-bot.us/bee-bot.html) Pixie and Pippin (swallow.co.uk) Divide the class into teams and provide each team with one of the programmable robots. Allow time for the teams to practise using their robot. Most of the children will already have experience of giving instructions to a robot, but some may need assistance to get started. If necessary, revise how to give instructions and recap the primary directional commands. Before your Olympic Games begin, hold your own special opening ceremony. Ask each team to give their team name and present their programmable robot, talking about how it receives and follows commands. Then introduce the challenges. What follows are some suggestions, but feel free to invent your own. **Slalom** Set up a line of beanbags, flags or other small obstacles for the children to navigate their robot around. To progress down the course, the robot will need to wind in and out of the obstacles to reach the end. Assign a start	Roamer Pixie Beebots Bean bags Skittles Cones

		and finish line. Teams should place their robot on the start line before programming their instructions. You may want to allow the best of three tries to get the robot from the start to the finish line. This task will test the children's ability to use left and right and angle commands ('Left 90', for example). It will also allow more confident children to practise using repeated commands. Which team can get nearest the finish line without hitting one of the obstacles? **Skittles** From a start line, teams will need to program their robot to hit as many skittles as they can in one try. Teams could score one point for each skittle that they knock over. **Touchdown** Set up a circle of card a certain distance away from a start line. The aim of the challenge is for each team to end their robot as close to the centre of the circle as possible. If you wish, the circle could have scoring areas (like an archery target) to award those who get the closest. You may want to allow teams to have two or three attempts to score the most points that they can – refining their commands each time. **Perfect Parking** The aim of this challenge is for each team to 'park' their robot inside a box or other marked area. There could be some obstacles to navigate around to reach the parking area. Teams could have three chances to program instructions, so they could start off their robot then give it further instructions to help it navigate and park in the box. Rotate the teams from one challenge to the next. Although there is a competition element to the games, try to encourage the children to help one another and offer suggestions on how to test and refine their instructions. Be sure to offer your own assistance to less confident children, helping them to understand how their instructions need to be planned in advance. End the session with a special closing ceremony. Award a prize to the team or teams with the most points. Then provide	

		some refreshments and allow time for the teams to relax after their trying challenges. Use this time to talk about the challenges that were the easiest/hardest. Did some types of programmable robot perform better than others? Recap the different ways that the robots could be given instructions. As an alternative – or if you do not have enough programmable robots for all the groups – you could set up challenges on computer using a LOGO tool such as MSWLogo (softronix.com/logo.html),FMSLogo (fmslogo.sourceforge.net/) or Terrapin Logo (terrapinlogo.com). These challenges might include navigating a maze in the fewest number of moves or using the pen tools to draw various shapes. For more information, see ICT & Computing Task 1.	
Knowledge Harvest		Divide the class into groups. Ask the question: what is a robot? Discuss. Work together to create a definition of the word 'robot?' Begin by mapping ideas as a word cloud using an application such as Wordle: wordle.net/create Encourage the children to talk about and challenge each other's perceptions of what a robot is. Can they give you any examples of a robot? Do they match with the children's definition? If not, can they still be considered a robot? Do they receive and follow instructions? Consider some everyday examples of technology, such as a kettle, toaster, television set, mobile phone, computer, Alexa and so on. Ask the children to consider how these items are given instructions (input) and how they might respond to these instructions (output). Does this make them a type of robot? Write the words 'Control Technology' on the whiteboard. Talk about what control technology is: it enables devices to be programmed to achieve goals. Ask the children if they know what a program is (a set of instructions). Who programmes these devices? What happens if there is a mistake in the program or the wrong commands are given? In their groups, ask the children to come up with a further examples of control technology.	

			As well as technology in the home, encourage the children to think about technology that they might use on the way to school or when they are shopping – such as ATM machines, self-service checkouts, pedestrian crossings and so on. Ask groups to share some of their ideas. Make a whole-class list of the different examples. Keep this list available to refer to throughout the course of the unit.	
Big Picture		Control technology enables devices to be programmed to achieve goals. These systems are automated – They can work on their own to meet the goals that they have been given. We are surrounded by control systems like this, from the kettle that switches off when the water boils to the washing machine that changes from one wash cycle to the next. Control systems are getting more complicated as technology develops. It is now possible to phone your home to both switch on the heating and set the thermostat. Some intelligent vacuum cleaners can be placed down in a room and left to clean – navigating using sensors, and returning to a docking station to recharge. Many modern cars are now fitted with intelligent technology that will switch the wipers on if water hits the screen, will use 'cruise control' to match the speed of other vehicles on the road, and even help with parking by using sensors to detect the proximity of nearby objects. Control technology can therefore be used for simple tasks, such as setting a DVD or Satellite HD system to record a programme, to the more complex operations such as the intelligent robots, which vary their behaviour according to external conditions. Control systems can be classified into four types: 1. Command systems that carry out commands to produce an output, such as a remote control that allows you to interact with a television set. 2. Programmable systems that follow a sequence of stored commands, like a floor robot. 3. Sensing systems that respond to external conditions, such as a burglar alarm that uses digital sensors to detect if a window or door is opened. 4. Conditional systems that vary their behaviour according to external conditions, like a central heating system which switches on when certain time and/or temperature conditions are met.		
ICT 1	Be able to design and write programs to accomplish specific goals, working with sequence, selection and repetition to control events	**Design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts.**	Remind the children about the Entry Point. Provide access to a paint package for the children to create their pictures. These can then be saved as a bitmap file in a suitable folder. Open up MSWLogo and select <-new-> from the Bitmap menu to load images onto the screen. Then, using the command window, each	iPads Laptops

			pair should give instructions to their onscreen robot to guide it from their chosen start location to their end point. Visit each group in turn and discuss the instructions that they are giving. At the end of the session, introduce the children to a robot/toy that uses infra-red sensing to allow it to move autonomously and avoid obstacles. Set up your own simple maze for the robot to navigate around. Ask the children to compare this robot with those that they have programmed using MSWLogo. How is this robot receiving its instructions? Invite the children to think of ways that this type of robot could help people. You might want to show the children the following examples: youtube.com/watch?v=bzDIJ6TTc6w – YouTube features footage of the robotic 'Guest Assistants' at the Santander Bank Visitor's Centre in Madrid; these small robots lead visitors to their chosen destination. (To watch a YouTube video in safe mode, scroll to the bottom of the page and click on the 'safety' tab which brings up the 'Safety mode' information. Under this section, select the 'on' option, then click 'save') irobot.com – the iRobot Corporation produce a vacuum cleaner that uses infrared sensors to avoid obstacles as it moves around the room. Later models can now sense when its battery is low and will move immediately to a docking station to recharge.	
ICT 2	Be able to select which programs or apps to use to present information or data in the most effective and appropriate way	Select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing,	Blindfold a child. Ask a volunteer to give the blindfolded child instructions to get from one side of the classroom to the other, while avoiding the desks and chairs. Afterwards, assess how well the instructions were given. Were they clear and precise? How might they be improved? Divide the class into groups. Challenge the children to write a set of instructions that would	Blindfold

		evaluating and presenting data and information	tell someone how to make a cup of tea. If necessary, recap or devise a list of criteria for giving effective instructions. Afterwards, ask the children to swap their list of instructions with another group's. Ask each group to follow their new instructions, to identify any areas where they might be improved. Allow the groups to add notes to the instructions before swapping them back. Invite groups to share their instructions. Compile a whole-class list, outlining each step in the process. Introduce the children to flowchart symbols, and ask them to re-format the instructions into a flowchart system. A program such as Flowol or Edraw Mindmap is ideal for this task: lowol.com – Flowol is available for both the PC and Mac, and a demo can be downloaded for free from the Flowol website. It allows children to create flowchart programs and provides a number of different simulations for the children to try out. edrawsoft.com/freemind.php – Edraw Soft produce a free presentation tool called Edraw Mindmap, which allows children to create their own flowcharts and mind maps using ready-made symbols and connectors. Talk about the how each of the shapes represents a different type of process. For example, the diamond shape is a 'decision box', which checks an input or condition before continuing. In the tea-making example, it might check whether milk or sugar is required. Check through the process for making a cup of tea. Ask the groups to create their own flowchart for another everyday task, such as boiling an egg or making a cake. Groups can create their flowcharts using one of the above software packages, or can draw them out using	

			paper and pens. When the flowcharts are complete, have each group present and talk through their process. Invite feedback to help improve each flowchart.	
ICT 3	Be able to design and write programs to accomplish specific goals, working with sequence, selection and repetition to control event	Use sequence, selection, and repetition in programs; work with variables and various forms of input and output.	Ask the children to talk about examples of control technology that is used for road safety. Examples might include the following: A pelican (Pedestrian Light Controlled) crossing features a set of traffic lights with a push button and two coloured lamps (red and green) for pedestrians. A puffin (Pedestrian User Friendly Intelligent) crossing has the input unit by the kerbside. It also uses detectors to change the lights when the pedestrians have finished crossing. Traffic lights at junctions and at crossings to regulate the flow of traffic. A level crossing stops traffic by lowering a barrier when a train is passing along the tracks. A zebra crossing often features flashing amber beacons. A speed check warning senses the speed of approaching vehicles and will flash a ‘slow down’ message if the vehicle is travelling over the speed limit. Choose one example, such as a set of traffic lights. Work with the children to devise a flowchart to operate two sets of lights. If you are using Flowol (see ICT Task 2), then the software has a ‘bridge lights’ activity that will allow the children to test their sequences in a virtual environment. To create the flowchart for one set of traffic lights, the children will need to work together to come up with the correct sequence – red, red amber, green, amber, red. See p25 of curriculum document In groups, ask the children to create a flowchart for a different system, such as a level crossing. If you are using Flowol, the software has a ‘level crossing’ activity that will allow the children to test their sequences in a virtual environment. You may wish to provide real-life models or let children use their own props to help them to think	

			about what will be involved in developing their level crossing system. Remind the children that there are several elements to a level crossing that they will need to consider: The approaching train will need to trigger a sensor (input 1), which will then tell the barrier to lower. As the train passes, it will trigger a second sensor (input 2), which will tell the barrier to rise. Traffic lights will need to let motorists know when it is safe to cross. When input 1 is triggered, a set of lights will turn to red. When input 2 is triggered and the barrier has lifted, the lights will turn to green. Encourage groups to focus on one process at a time and then to cross reference the flowcharts to ensure that they are operating correctly. Invite groups to share their flowcharts. Talk about any differences in the way that children have approached the task.	
ICT 4 ICT 5 ACTIVITY NEEDS 48 HOURS FOR READINGS	Be able to collect, interpret and present their findings	Select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information.	Demonstrate the use of a light sensor to take readings around the classroom. Ask the children to consider the possible uses for light sensor data. For example: Identifying poorly lit areas that could be hazardous Ensuring there is enough light to take a photograph Making sure there is sufficient light for a plant to grow Look together at a simple system that switches on a lamp when a meter records a certain level of light (If you have access to a Raspberry Pi computer you could create your own simulated system by linking a light sensor and an LED light to your Pi, and running a script through ScratchGPIO or Python. Visit raspberrypi.org for more information on Raspberry Pi.). Ask the children to identify the input and output devices and the system process. Tell the children that they are going to be conducting their own health and safety inspection of the school, in order to decide which areas would benefit from having automatic lighting like the model you have demonstrated.	

			Give pairs or groups a light meter and ask them to measure the light in locations around the school. If you wish, children could use a map to help them to record the locations that they have visited. Prompt the children to think about areas that might be hazardous in very lowlight conditions – particularly for someone, such as your caretaker, who might be working late in the evening or early in the morning. Back in the classroom, ask the children to create a presentation of their findings. This could be created using a program such as PowerPoint, to provide a simple plan of the school, with selectable locations or mouseover hotspots that will reveal the light data that was collected. Groups can also develop a simple flowchart system for how their lights would operate in each area – identifying the appropriate input levels for turning a light on and off. Have each group present to the rest of the class. Which area or areas did they feel would benefit from sensor lights the most? Encourage them to support their arguments by making reference to their data. Compare and contrast the different results and flowcharts that have been created.	
ICT 5 THIS ACTIVITY NEEDS 48 HOURS FOR READINGS	Be able to collect, interpret and present their findings.	Select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information.	Use a light and a temperature sensor to take readings of the classroom for a 48-hour period. Divide the class into pairs and provide each pair with a set of the results as a comparative line graph. Invite the children to talkthrough what the results are telling them. What is the 'story'? When was the temperature at its lowest and highest? At what time of day or night were these temperatures recorded? Challenge the children to find the average temperature for the whole 48-hour-period and the average daytime and night-time temperatures. Show the children the sensor that you used to collect the temperature data and the software package used to process and present the data. Ask the children to think of any examples of control technology thatmight use temperature sensors as a control device. For example: a	

			kettle (temperature sensors will tell the kettle to ‘switch off’ when the water is at boiling point); an oven (sensors will ensure that the oven stays at a chosen temperature); smoke alarm (sensors detect if there is a change in air, smoke particles are present); security systems (sensors can be triggered by changes in temperature, such as the body heat from human beings) and so on. Explain to the children that they are going to be using construction kits, motors and temperature sensors to create their own desktop fan. The fan motor will activate when the room temperature gets above a certain level, set by each group. Likewise, the fan will stop when the temperature drops below a chosen level. A typical program might work as follows: -> Start -> If temperature is >30 then switch on 1 -> If temperature is <30 then switch off 1 -> Repeat Allow time for the groups to plan their models before using the available materials, sensors and software to make and test their fans. If you have access to a Raspberry Pi computer, you can link it up to a DC motor (via a Breadboard) to control a fan. For more information and a tutorial, visit: tinyurl.com/m4clw34 – Tutsplus is a project and skills sharing website, which features a step-by-step guide to running DC motors via your Raspberry Pi. Ask each group to present their fan and explain how it works. What materials have they used for the blades and the support beam? What temperature range did they use to regulate when their fan switches on and off? Evaluate each design and how well it fits the brief. Do the children feel that the temperature sensor would provide added value to their product?	
ICT 6	Be able to evaluate and check the validity of their findings.	Select, use and combine a variety of software (including internet services) on a range of	Divide the class into groups. Pose the question: ‘what is sound?’ Ask each of the groups to mind map ideas on a sheet of paper. Establish that we hear things when	

		digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information.	vibrations from sound sources travel through a medium to reach the ear. Prompt them to consider what they think sound looks like. Invite the groups to share their ideas with the rest of the class. Ask the children if they know how we can measure sound. Why might measuring sound levels be useful? Demonstrate the use of a simple sound sensor and software. Take some readings from around the classroom and observe the data that was recorded. How is the sound measured? Talk through how the data can be processed and presented using the available software. Can the children think of any useful applications for a sound sensor? (Voice activated technology, such as computers.) Present groups with a challenge: a local factory employs workers who must operate very noisy machinery. The workers have been complaining about the noise levels. The groups have been tasked with investigating materials to create a suitable set of headgear that the workers can wear. Talk through the equipment and materials that the groups will have access to for their experiment. Each group will be responsible for devising their own set of experiments to test the sound insulation properties of the various materials. Each group will also be responsible for ensuring that each material receives a fair test, under the same monitored conditions. Equipment will include: A sound sensor and data software A microphone linked up to a computer or audio system Materials to test such as sponge, cotton wool, tissue paper, bubble wrap, cloth, polystyrene, tin foil, paper, plastic, fur and so on Junk and art materials (cardboard boxes and tubes, sticky tape, scissors and so on) Each group should begin by deciding how they will use the sound sensor, together with the materials, to record the data. How will they regulate the sound levels? How can the test be made fair? Have each group plan out	

			their experiments on paper first. Also ask each group to predict the outcome of their experiment, by ranking the materials in order of their sound insulation properties. These predictions can then be challenged and amended based on the recorded data. Let each group perform their experiment and collate their results. Remind them that they will be presenting their results to the factory management board, therefore they need to present their data in the form of a formal report. This report should combine graphs and data tables with an explanation of the experiment and a recommendation for suitable headgear, based on the findings. The children may wish to draw their proposed headgear, scan this into the computer and include it in their report. Have each group present their report to the rest of the class. Make a whole-class list of the materials that were tested and consider those that were able to block the sound the best. Ask the children consider why this might have been the case. Explore the science behind sound insulation. Solids conduct sound easier, whereas materials with lots of holes (which contain air – a gas) slow the movement of sound. A material such as a sponge, that is likely to have lots of holes, will muffle sound better than a solid, such as plastic or card. Ask the children to consider how the sound sensor data helped them to conduct this experiment. Could they have performed this experiment without it? Would the data have been as accurate?	
Science 1	Be able to choose an appropriate way to investigate a scientific issue.	Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.	Recap the traffic lights activity from ICT Task 3. If you wish, you could look at some examples of the children's flow charts that they created. Tell the children that they are going to be replicating their flow charts using a simple circuit system.	Bulbs Electrical wires Crocodile clips Coloured bulbs – red, amber, green

			Demonstrate a simple series circuit with a switch, three LED lights (red, amber and green) and a battery. Press the switch and observe what happens. (All the lights switch on at once.) Compare this with the traffic light sequence that you identified in ICT Task 3. Ask the children to work in groups to create an alternative circuit system that will use manual switches to operate each of the lights. The groups should plan out their circuits on paper before using the available equipment to build and test their idea. Encourage them to predict how their system will perform. Will all the lights shine as brightly? Look at the voltage of the bulbs and that of the battery. Can the children work out what voltage each bulb will receive in their circuit? The children should be able to compare and give reasons for any variations in how the components function, e.g. the bulb shines brighter when the voltage of electricity going to the bulb is higher. The groups should have realised that they need to create three parallel circuits – with a switch and light attached to each. Explore what happens when the switches are activated. Are there any problems with the children's designs? For example, can they switch the first light off but allow the last light to stay on? What sequence of 'presses' will need to be performed by an operator to ensure that the lights are shown in the correct order? Children can number their switches and work together to create a program of instructions. Depending on the equipment that you have available, the children could extend this work by making a timer circuit. These can be complicated to put together, but many electrical suppliers can provide ready-made systems for education use. With a timer circuit, the children can add a series of LED lights to the timer output and explore ways of controlling the number of pulses to each output, to control their light sequence.	Switches

			The children should be able to represent the circuit diagrams from these investigations using conventional symbols for the components.	
Science 2	Be able to vary an electrical circuit to change its effect.	Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches.	Demonstrate a simple circuit with a battery, a switch and a motor-driven fan. Place a tripod over the fan with a ping-pong ball resting on it. Switch on the fan and watch as the ping pong ball rises and hovers in the air. Add an extra battery or a higher voltage battery to the circuit (be sure to check the maximum voltage of your fan beforehand). Switch on the circuit again. The fan should spin faster – and the ball should rise further into the air. Explain to the children that they are going to be creating their own maze out of cardboard tubes. They will need to create circuits and fans to guide their ping-pong ball up and around the various tubes, selecting the power voltage each time to regulate their fans. Provide art materials for the children to create their maze. Cardboard tubes cut to various lengths are the best for this. These can then be slotted and taped together to create a pipe system. The children can then plan, as a whole class or in groups, how they will develop circuits to push the ball along each stretch of tunnel. They will need to consider fan speed and the voltage that will be required to push the ball along each length of tube. If tubes need to be suspended, then you can always tape them to a clamp stand or table. Once the design is complete, activate your circuits and see if you can guide the ping-pong ball around your fiendish maze. Identify any problem areas where the fan speed can be lowered or increased or the maze needs simplifying. See p41 of the document	Circuit resources
Technology 1	Be able to respond to identified needs, wants and opportunities with informed designs and products.	Generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes,	Plan a design for an electrical toy. Provide the children with some electronic toys to explore. If possible, these should feature a variety of different sensors and motors. For example, some dog toys will 'flip over' when you make a sound, such as a clap. Others might have movement or sound elements	Electrical toys

		pattern pieces and computer-aided design.	that activate when a button is pressed or a pressure sensor is touched. Examine each toy and look at the ways it uses technology to provide a fun play experience for younger children. Tell the children that they are going to be making their own innovative electronic toy product. They will need to think about its appearance (or appeal), the materials it will be made from, and how it will function and interact with its environment. You might want to recap the work you have done previously with sensors and/or construction kits that feature moving and sensing elements. The children will need to apply their knowledge of electrical circuits and components. For revision, you can refer to the Milepost 3 electricity unit, Full Power. Together with the children, you should agree on the specific design criteria for the product they will be making. For example, you might ask them to include the following: An electrical circuit A motor or sensor A moving part An innovative design An appealing exterior A clear purpose or function Etc. Follow the link for a useful video to support this work: open-video.org/details.php?videoid=697&surrogate=clip – the Open Video Project has a downloadable video showing how a team of six children designed and made a 'storyteller' robotic pet. Encourage the children to talk about their designs with neighbouring groups, inviting feedback and ideas. Each group should finish this session with a completed step-by-step plan that they can present to the rest of the class. They could draw annotated sketches with cross-sectional diagrams or use computer-aided design programs to model their ideas. For example, using Google SketchUp the children could create 3D models of their ideas on the computer.	

			Teachers can choose between Google SketchUp (free download) or Google SketchUp Pro (suitable for school use). See link below: sitescontent.google.com/google-sketchup-for-educators/Home/Google-Earth-for-MyClass – this page provides useful information about using Google SketchUp in your classroom, with links to free and trial versions. For more detailed information and advice on using Google SketchUp with your class, please refer to the Milepost 3 unit 3D Designers. The children should evaluate each other's ideas against the agreed design criteria and consider feedback to make improvements to their designs. They will also need to consider the materials, components and tools they are going to use, e.g. equipment for accurately cutting, shaping, joining and finishing their products. When looking at the designs, you might want to consider any materials that you or the children may need to provide for the next session, to help with the making.	
Technology 2	Be able to work with a variety of tools and materials with some accuracy.	Select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities.	Make your design p48 of the curriculum document The following websites are useful for research: culturestreet.org.uk/teachers/tintoy/notes_tintoy.php – CultureStreet features an activity on making a clockwork toy. The page includes diagrams and animated videos, providing examples of gear systems. explainthatstuff.com/pulleys.html – Explain That Stuff investigates one, two and four wheel pulley systems, using colourful diagrams to help demonstrate the individual systems. youtube.com/watch?v=LiBcur1aqcg – YouTube hosts this short cartoon animation explaining how a pulley system works.	Gears (or cogs) are wheels with teeth - if you link a large gear and a small gear together you can speed up or slow down movement, e.g. bicycles use gears in this way Pulleys are a rope and wheel mechanism that can be used for lifting and lowering objects, e.g. cranes use pulleys and levers to lift heavy loads
Technology 3	Be able to respond to identified needs, wants and opportunities with	Generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and	As the children enter the classroom, have a chunk of half-eaten cheese displayed on a table and some crumbs trailing away to behind a cupboard. Look	Cheese

	informed designs and products.	exploded diagrams, prototypes, pattern pieces and computer-aided design	surprised and a little annoyed that someone has been at your cheese! Tell the children that you suspect that the class has a new member – a mouse! How might they protect the cheese from any more late-night visits from their new guest? Devise a system to protect the cheese. Present your design to the class p51	
Technology 4	Be able to evaluate the effectiveness of simple products in everyday use.	Investigate and analyse a range of existing products.	Ask the children to consider how technology can change the world. For example, when the first mobile phone was created in 1973 by Motorola it was almost the size and weight of a house brick so no one at that time could have predicted how popular the mobile phone would become. Assess examples of control technology from a user standpoint. Provide groups with different products that meet the same objective. Ideal examples to focus on include: mobile phones; kettles; MP3 players; alarm clocks; remote-controlled toys and so on. As a whole class, work together to decide on a list of criteria to assess the products. If you wish, you could introduce children to the C.A.F.E.Q.U.E. system: Cost – How much does it cost? Is it good value for money? Aesthetics – Is it attractive? What features of the design make it appealing? Function – What does it do and how does it work? Ergonomics – How easy or comfortable is it to use? Quality – How well is it built? What materials have been used? User – Who is it for? Does it meet their needs? Environment – Is the product eco-friendly? What effect does the product's manufacture, use and disposal have on the environment? Take each product in turn and ask the groups to feedback their user evaluations. Explore any	Gadgets – mobile phone, iPod, DS, Kindle, iPad,

			differences of opinion. Did all groups decide on the same product/s as being the best? Did different products excel at different criteria? Rank the products based on each criteria to arrive at an overall winner.	
Society 1	Know that the study of society is concerned with learning about living as members of groups.		Consider some everyday examples of control technology that help people or provide a service. For example cash points/ATM machines, computers, telephones, security alarms, air conditioning systems, self-service checkouts and so on. Ask the children to think about how control technology might be used to help people with disabilities. In groups, allow time for the children to consider the technology that they have explored over the course of the unit, and think about how it might be applied to someone with a disability. Once the children have listed some ideas, provide access to the internet for the children to research examples of technology that has been developed for users with a disability. Examples might include: Dora – a motorised arm that can help people in wheelchairs to open doors. (YouTube has a video demonstration: youtube.com/watch?v=hF5hQf1MuqM) (To watch a YouTube video in safe mode, scroll to the bottom of the page and click on the 'safety' tab which brings up the 'Safety mode' information. Under this section, select the 'on' option, then click 'save') High-tech prosthetics – Christian Kandlbauer lost both arms in an accident. He now has two prosthetic arms which are wired to his nerves, allowing him to control them using his thoughts. Talk by Text systems – technology that allows deaf people to receive voice messages in the form of texts. Voice-activated software and systems – allow people who may have restricted movement or suffer from paralysis to interact with technology. Robotic shopping assistants –	

			technology is being developed to help blind people to shop in a supermarket. A laser-range finder helps the robot to avoid collisions, while an electronic tag system helps it to find products on the user's shopping list. Home care devices – technology built as a preventive aid, to detect fires, flooding and possible injury (if someone has fallen, for example). Infra-red controllers – provide a remote-control system for people who may suffer from restricted movement. At the press of a button, someone can control communications and security in their home, open windows or blinds, turn on the television or radio and so on. The Possum electronic assistive technology systems (possum.co.uk/eat) are a perfect example. Afterwards, invite the groups to share their ideas and their findings. How do they rate the different examples of technology? What do they think is the most interesting/most useful application that they have discovered? How do they compare with the children's original ideas? Based on their previous ideas and research, ask the children to design their own application to help someone with a disability. They will need to draw and label its features, focusing on how the technology helps someone to perform a task they may find difficult or impossible, due to their disability. When designing their product, the children should consider their end user. Will it be easy to use? What about comfort? What will be the methods of input and output for the product?	
Society 2	Understand that the behaviour of individuals has an effect on the lives of others.		Look at some footage of the Honda ASIMO robot in action: asimo.honda.com – the ASIMO website features videos of the human-like ASIMO robot performing various activities such as greeting visitors and serving refreshments.	

			Ask the children to respond with their thoughts. Do they think that the ASIMO robot is a useful tool/device – or do they feel it is more of a gimmick? How might such technology evolve? Also look at some examples of robots that work in hazardous situations. For example: jpl.nasa.gov/video/index.cfm?id=886 – the Nasa website has footage of the Mars Exploration Rover, an automated motor vehicle designed to explore the surface of Mars. youtube.com/watch?v=UpreV45c2l8 – YouTube hosts a documentary showing how the Talon robot helps bomb disposal teams in the United States. (To watch a YouTube video in safe mode, scroll to the bottom of the page and click on the 'safety' tab which brings up the 'Safety mode' information. Under this section, select the 'on' option, then click 'save') Again, ask the children to respond. For each example, ask them to consider the benefits of using robots. Do they carry out tasks that a human could perform as well? Why has a robot been used instead? Now present the children with an image of an assembly line, with robots performing the tasks. A good example can be found at: blog.autoworld.com.my/wp-content/uploads/2009/02/robots-1.jpg – AutoWorld is a Malaysian automobile portal, which features an excellent image of a robot assembly line in their news and blog section. The following videos contains footage of robots being used in the car industry: youtube.com/watch?v=gx9dlvr2Z_s – YouTube has this video of robots painting a car. youtube.com/watch?v=N8airWPhCEw – YouTube has this video of robots on a production line welding together the parts of a car. (To watch a YouTube video in safe mode, scroll to the bottom of the page and click on the 'safety' tab which	

			brings up the 'Safety mode' information. Under this section, select the 'on' option, then click 'save') Divide the class into groups. Ask the children to imagine that they run a factory that makes cars. They have the option of replacing their current staff with robots. The children should consider the advantages and disadvantages of changing their factory system. Invite each group to present a list of advantages and disadvantages for introducing a fully automated assembly line. Add each group's contributions to a whole-class list and explore the issues surrounding the decision. Will robots save money? If so, how? What about if something goes wrong with the machinery? What about the staff who are currently employed? How will they feel? End the session by asking the class to take a vote on whether robots should replace humans in their factory. Ask volunteers to explain why they voted in favour or against the change. Language Arts link: children can write their own news article, based on the outcome of their debate. Their story could include interviews (with fictitious members of staff and/or the factory owners), images and other related facts and figures to add further detail to their stories.	
International 1	Understand that there is value both in the similarities and the differences between different countries.		Ask the children to consider all the examples of control technology that they use on a daily basis. Work together to make a class list. Which of the examples do the children consider to be essential? Look at each one in turn and imagine what life would be like if that product/service was not available. Pose the question: is control technology essential or is it just a luxury? Ask the children to consider their peers in other countries across the world. Do they think that they have access to the same control technology as the children's host and home countries? What factors	

			might influence the availability of technology in other countries and regions? Are there some countries that might have greater access to control technology? Divide the class into groups and assign a different country to each group. Ask the children to research the availability/use of control technology in that country. How do they compare with the control technology in the children's host and home countries? Recording activity Ask the children to make a brief presentation on their findings to the rest of the class. Compare and contrast the availability of control technology in different countries around the world. Revisit your question from the research session – is control technology essential or is it just a luxury?	
International 2	Know about similarities and differences between the lives of people in different countries		Divide the class into groups. Explain to the children that they are part of an international crisis task force. It is their job to decide what measures could be taken to help prevent and/or deal with a disaster, such as a tornado, an oil spill, a tsunami, an earthquake, flood, hurricane, volcanic eruption and so on. Assign a different disaster scenario to each group. These could be fictitious or based on real events, such as Hurricane Katrina, the Gulf of Mexico oil spill or the eruption of the Icelandic volcano at Eyjafjallajökull. For each scenario, ask the children to consider: How control technology is used to measure and record these events. For example, tornados are recorded using an anemometer, which measures wind speed. The Fujita scale is used to classify the size and speed of tornados. What examples of control technology they can think of that might help a community that is affected by a disaster. For example, scientists in the United States have developed a pipe-crawling robot that can enter collapsed buildings to look for survivors. What lessons, if any, have been learned from similar disasters. Are there new preventive measures in place	

			to stop or warn people of a similar event? How is control technology being used? Ask each group to present their findings to the rest of the class. If you wish, this could be a multimedia display, incorporating news reports and footage, images, data, maps and so on. For each disaster scenario, ask the groups to talk about how they would use control technology to prevent and/or deal with a future crisis. If groups have looked at similar events, then you can compare and contrast their findings, and look at ways that different countries have responded to a disaster.	
Exit Point			Share designs and products with parents made over the term.	
Reflection				