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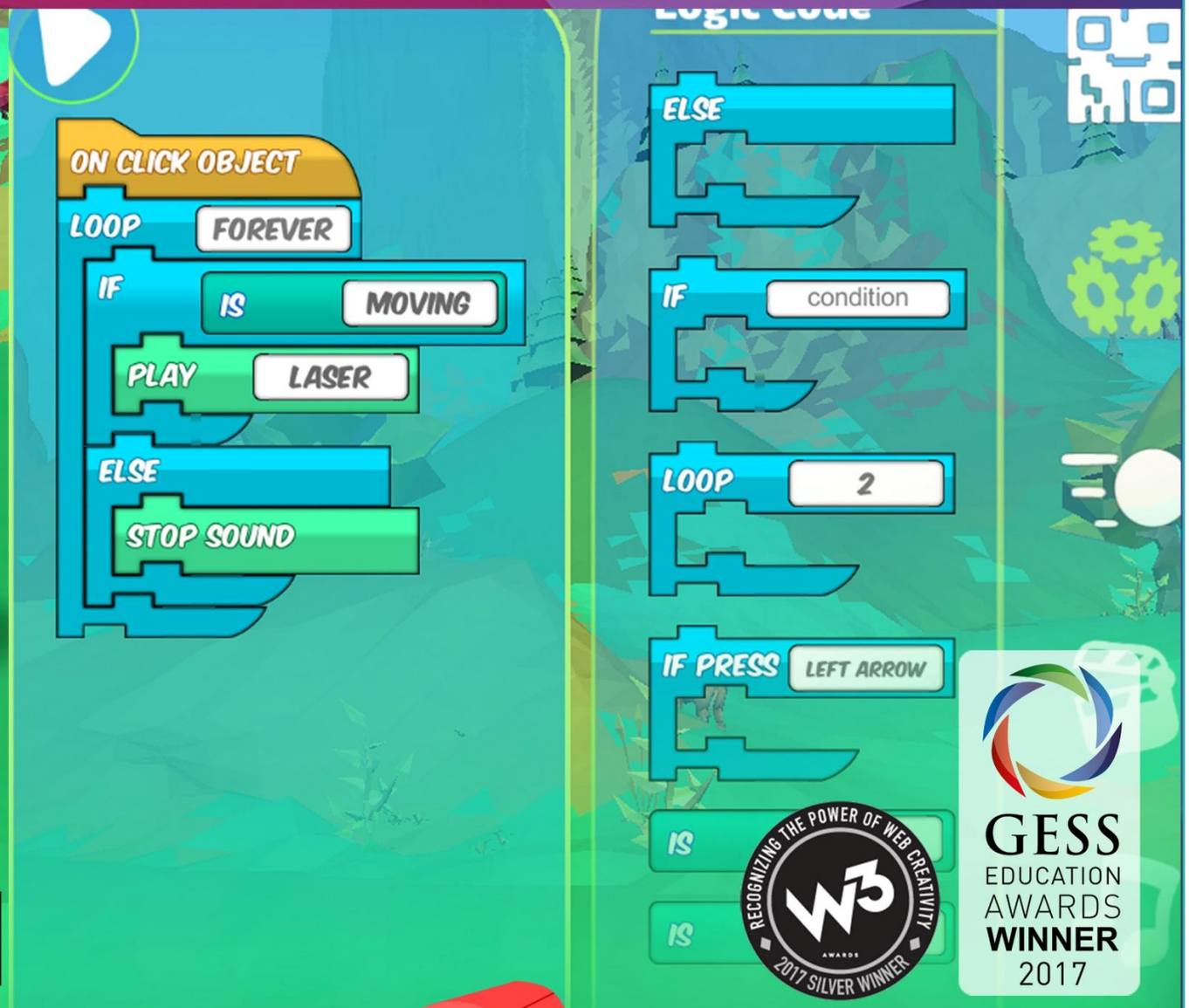
SERIOUS GAMING IN THE CLASSROOM



Blockly Coding Curriculum
Teachers Guide

PLANETEERS - BLOCKLY CODING CURRICULUM

About.

The Planeteers Blockly Coding Curriculum is a series of laddered block code lessons that aim to develop learners programming skills from basic to advanced using blockly. The curriculum has been designed by educational experts and is delivered in a guided fashion as part of the Planeteers game quests. Initial skill building provides the foundation of background knowledge necessary in order to begin learning skills at the next level. The learning skills are cumulative and learners develop block coding skills in 3D, from understanding the basics, to coding their own games in Planeteers 3D blockly sandbox.

How to Read the Curriculum

The infographic below illustrates how the coding lessons are organised into the laddered curriculum. There are four levels of complexity, with an extra credit or fifth level encouraging game design projects that are a culmination of the skills built in previous levels. Learners earn experience points (XP) towards badges based on completing quests mapped to key learning objectives.

Quest Code — *Learning Objectives mapped to level* — *STEAM connections* — *Quest Introduction* — *Fun Facts related to quest concept* — *Badges earned from completing quests with %XP weighting*

LEVEL 2 BLOCKLY QUESTS

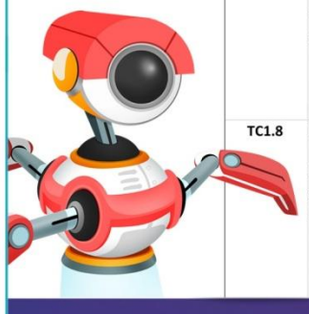
STEAM pillar → TECHNOLOGY

Quest Code	Learning Objectives	STEAM Integrations	Quest Summary	Quest Introduction	Example Quest Fun Fact	Example Quest Fun Fact	Badge Achievement	% XP	Badge Achievement	% XP
TC2.1	**Debugging & Sequencing** Modifies sequential steps to change behaviour	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Systems Analysis)	Ghost Base Camp!	Spooky! We've discovered a deserted Base Camp! Wondering what's inside? Hack the door control panel to gain entry and explore.	Hacking sounds nasty but is really just trying to look into, understand and modify something like a machine. You can hack just about anything, even your own human brain!. Have anything you'd like to change about yourself?	An expert programmer can "hack" their way through the security levels of a computer system or network. System Alert!	Systems 101	25%	Components	25%
TC2.2	**Looped Conditionals** Uses looped IF/ELSE statements to update behaviours	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Systems Analysis) Technology (Power and Energy)	Upgrade Base Camp Systems!	"Upgrade the base camp's internal and perimeter lights so they work. Connect to and upgrade the Camp's Systems Computer to turn light on/off using day/night."	Upgrading means means to make the 'grade' or the quality of something higher. Adding a feature to save power by turning it off during the day is a great upgrade! Sign me up!	Loops are commands that trigger actions to happen over and over again, usually for a set number of times. The Base Camp's AI controller can be programmed to use loops and conditions to turn lights on each evening. Cool!	Blockly Code 101	25%	Basic Commands	25%
TC2.3	**Nested IF Statements - Part 1** Uses Looped nested IF statements to update complicated behaviours	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Science (Biological Sciences)	Upgrade your Bot's AI	Let's give this Bot some personality! It's hard to 'see' intellgience so let's upgrade the Bot's AI to give feedback so we know what your Bot is thinking.	Try creating some statements while the Bot is patrolling versus when night falls. For example when the sun goes down, your Bot could say: "High Alert Mode" or "Switching to Night Vision!" Try using Use different types of text boxes to convey different emotions.	Combining conditionals and loops allows your robot to do many different, but simple tasks. Now that AI is getting more advanced robots are doing complex things like making music, recognising illnesses and exploring the galaxy!	AI Designer	25%	Robotics Coder	25%
TC2.4	**Automation Introduction** Automates simple AI behaviours	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Art (Colour and Style) Science (Biological Sciences)	Upgrade Base Camp Security	Base Camp security needs upgrading. Build a high wall for extra protection and set to invisible. Trrigger it to appear when the Aliens invade. Its sure to keep them at bay!	Automation means to make something happen 'Automatically'. Most of what your body does is automated. When was the last time you made your own heart beat?	Did you know that there are types of computers called 'quantum' computers? For a Qantum computer's AI,something can be TRUE and FALSE at the same time! This sounds wierd but means these computers can process very difficult problems. Whoa!	Systems Engineer	25%	Construction 101	25%
TC2.5	**Feedback** Programs simple user feedback	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Art (Music and Sound FX)	Craft & Integrate Music Player	Planeteers can't always be exploring! Craft a music player for Base Camp and add a playlist with Block Code. Try coding it to auto start when we enter the room, then auto off when we leave!	Automating your shelters can make them more energy efficient and convenient to use! You can program light, music, and defenses to follow your instructions, even when you're not here!	Did you know that music is the creative organisation of sound, and that rhythm is the beginning of that organisation? It is the arrangement of sounds as they move through time and is usually a strong, regular repeated pattern. Cool Huh!	Components	25%	Coding Cadet	25%

TECHNOLOGY

LEVEL 1 BLOCKLY QUESTS

Quest Code	Learning Objectives	STEAM Integrations	Quest Summary	Quest Introduction	Example Quest Fun Fact	Example Quest Fun Fact	Badge Achievement	% XP	Badge Achievement	% XP
TC1.1	**Basics of coding & Block Code** Identify parts of the coding UI: commands, scripts area, stage Creates sequence of steps (an algorithm) for a bot to follow.	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation)	Create a Code Sequence	Wow you've discovered a space relic! Seems like this bot is not working? Do a systems check and then try to restor the bot by fixing the bugs in its blockly code.	Robots like me and this bot here only follow instructions we're given. Programming is giving a sequence of instructions to a computer to follow. Luckily for you I'm programmed to be helpful!	Sometimes a bot can go haywire, kind of like if bugs got into its wiring. Most 'bugs' are just problems with its code which are found and fixed by 'DE-BUGGING' which is when you try to fix the code.	Debugger	25%	Robot Repairer	25%
TC1.2	**Connect/Fix Block Codes** Explain and validate the importance of sequencing codes to create algorithms. Introduce and emphasize the concept of debugging	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation)	Debug the code to fix the robot	This planet has strong magnetic fields, which seem to have messed up this robot? It cannot be remote controlled anymore. Try debugging the blockly code to fix it.	All robots need instruction, coded as detailed STEPS that are programed in their robot brain or CPU. Take notes! There are lots of words coming your way! The program's code has steps called ALGORITHMS. The instructions are called COMMANDS.. A LOOP is a sequence of commands repeated a number of times.	If you have a bug, no problem! A simple way to debug in blockly is to use the PLAY button so the code RUNS while observing your robot. Look for broken code as the program runs or for problems with the robot trying to complete its task. Compare the two to check if the sequence is correct or where it needs fixing.	Debugger	25%	Remoting 101	25%
TC1.3	**Simple Events & Triggers** Program a bot to respond to external or internal changes (triggers). using OnClick and OnActive.	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Science (Biological Sciences)	Add sound FX to your robot!	The old bot is so quiet? Use TRIGGERS to ugrade it's code so the bot can express itself with beeps when ACTIVE and when SELECTED.	Wow tinkering the bots already huh? Just stay away from my systems ok! An **EVENT** is an action that causes something to TRIGGER or happen in code. Events like **ONACTIVE** trigger commands to run when the robot is active. **ONCLICK** triggers commands when the robot is clicked.	To trigger sound effects when the bot is active, use the **ONACTIVE** event code with sound code scripts. You can use the **instrument** block code to play different notes, or cheat and use the **play sound effect** code!	Blockly Code 101	25%	SoundFX	25%
TC1.4	**Events & Loops** Differentiate events from loops Use loops to simplify repetitive code	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Systems Analysis)	Debug the Sentry Drone	Somethings up with the drones systems, it keeps changing color when moving. It should be playing a motion sound instead. Check the code and fix?.	Have you ever felt like your stuck, and going around in circles? That is because you were in a LOOP. These can be great when you have to do something repetitive but don't want to write LOTS of code. Sometimes bots or drones can get stuck in a LOOP and need debugging to help it do what it is supposed to.	**LOOPS** are commands that trigger actions to happen over and over again, usually for a set number of times. This sentry bot's AI uses loops to replay sound while in motion. Check the code inside the loop to debug whats wrong.	Blockly Code 101	25%	Basic Commands	25%
TC1.5	**Simple Shapes, Sequencing &Loops** Code robots to form shapes and angles using repetition and loops Create loops to create complicated repetitive behaviour	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Mathematics (Calculating) Mathematics (Shapes and Representation)	Fix the Drone's navigation code	This Sentry Drone isnt navigating as it's supposed to. It should be scanning a square area. Check its **MOTION CODE** and debug the issue so its back on track.	LOOPS are great! If you think about it, ALL shapes are just lines joined together at angles. If you wanted to move in a square you could just move forward, turn left 90 degrees and repeat (loop) those steps three more times to close the shape! This bot's navigation uses LOOPS to draw its square path by repeating move and turn steps.	In coding a **SEQUENCE** means the ordered steps in a program. Seems like there Is something wrong with this bots sequencing since it seems to be making the right moves, but not in the right order! Check the code inside the LOOP to debug whats wrong.	Debugger	25%	Robot Repairer	25%
TC1.6	**Learn about Conditional Logic** Use conditional IF statements to control a bot.	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation)	Fix the Glitch!	Wowzers! Seems there has been a glitch in your drone's code, the REMOTE CONTROL is not longer working. The code has been lost and needs to be reprogrammed!	A CONDITIONAL, is a statement that only runs if something else happens first. Checking conditions is very important in coding. If you ask yourself, "Am I hungry?" and reply, "No!" and then never ask again, you'll never know if you should get food. IF conditional statements are great in loops if you need to check for something over and over again and can't use a trigger.	So basically, us robots ask a lot of questions! The CONDITION is the response to those questions. If the response is YES, the condition is TRUE. If the response is not yes, then the condition is FALSE and the program will not do anything. IF statements like this are called CONTROL STRUCTURES because they control the flow of a program. Cool Huh!	Basic AI	25%	Blockly Code 101	25%
TC1.7	**Toggle variables** Use toggle switch code to change a setting from 1 to 0 or TRUE to FALSE	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Art (Photography)	Bring Camera systems online!	Getting data from your drone is certainly useful, but seeing what it sees is even better! Add code to TOGGLE its camera systems on-off so you can take pictures!	Down deep computers only know about 1's and 0's, On and Off or TRUE and FALSE. 'TOGGLING' means to change a value from what it currently is to the other option. e.g. From TRUE to "FALSE" or from "OFF" to "ON"	Did you know that CONDITIONS that can either be TRUE or FALSE are called BOOLEAN blocks?. If the condition is set to TRUE, then it is ACTIVE, if set to FALSE then it is NOT ACTIVE.	Basic Commands	25%	Remoting 101	25%
TC1.8	**IF/ELSE Statements** Use a single conditional IF-ELSE statement to create reactive bot behaviour	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation)	Enable Night Vision!	Sensors for sound, touch, temperature and navigation give robots information about their environment. Activate the drone's night sensors so its lights turn on automatically.	Here are those useful IF statements again! Sometimes you need your Drone to do something if the IF statement is TRUE and something else if it is FALSE. We can do this by adding an ELSE to the IF statement. Now our Drone can perform one action if the condition is TRUE, and a different action if the condition is FALSE!	Night vision is being able to see in the dark. Some animals, like cats, are esspecially adapted to see well in the dark. Humans do not have good night vision. Robot use special sensors to see in low light. The three main types of night vision technology are low-light imaging, thermal imaging and near-infrared illumination!	Basic AI	25%	Robotics 101	25%



TECHNOLOGY

LEVEL 2 BLOCKLY QUESTS

Quest Code	Learning Objectives	STEAM Integrations	Quest Summary	Quest Introduction	Example Quest Fun Fact	Example Quest Fun Fact	Badge Achievement	% XP	Badge Achievement	% XP
TC2.1	**Debugging & Sequencing** Modifies sequential steps to change behaviour	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Systems Analysis)	Ghost Base Camp!	Spooky! We've discovered a deserted Base Camp! Wondering what's inside? Hack the door control panel to gain entry and explore.	Hacking sounds nasty but is really just trying to look into, understand and modify something like a machine. You can hack just about anything, even your own human brain!. Have anything you'd like to change about yourself?	An expert programmer can "hack" their way through the security levels of a computer system or network. System Alert!	Systems 101	25%	Components	25%
TC2.2	**Looped Conditionals** Uses looped IF/ELSE statements to update behaviours	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Systems Analysis) Technology (Power and Energy)	Upgrade Base Camp Systems!	"Upgrade the base camp's internal and perimeter lights so they work. Connect to and upgrade the Camp's Systems Computer to turn light on/off using day/night."	Upgrading means means to make the 'grade' or the quality of something higher. Adding a feature to save power by turning it off during the day is a great upgrade! Sign me up!	Loops are commands that trigger actions to happen over and over again, usually for a set number of times. The Base Camp's AI controller can be programmed to use loops and conditions to turn lights on each evening. Cool!	Blockly Code 101	25%	Basic Commands	25%
TC2.3	**Nested IF Statements - Part 1** Uses Looped nested IF statements to update complicated behaviours	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Science (Biological Sciences)	Upgrade your Bot's AI	Let's give this Bot some personality! It's hard to 'see' intellgience so let's upgrade the Bot's AI to give feedback so we know what your Bot is thinking.	Try creating some statements while the Bot is patrolling versus when night falls. For example when the sun goes down, your Bot could say: "High Alert Mode" or "Switching to Night Vision!" Try using Use different types of text boxes to convey different emotions.	Combining conditionals and loops allows your robot to do many different, but simple tasks. Now that AI is getting more advanced robots are doing complex things like making music, recognising illnesses and exploring the galaxy!	AI Designer	25%	Robotics Coder	25%
TC2.4	**Automation Introduction** Automates simple AI behaviours	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Art (Colour and Style) Science (Biological Sciences)	Upgrade Base Camp Security	Base Camp security needs upgrading. Build a high wall for extra protection and set to invisible. Trrigger it to appear when the Aliens invade. Its sure to keep them at bay!	Automation means to make something happen 'Automatically'. Most of what your body does is automated. When was the last time you made your own heart beat?	Did you know that there are types of computers called 'quantum' computers? For a Qantum computer's AI,something can be TRUE and FALSE at the same time! This sounds wierd but means these computers can process very difficult problems. Whoa!	Systems Engineer	25%	Construction 101	25%
TC2.5	**Feedback** Programs simple user feedback	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Art (Music and Sound FX)	Craft & Integrate Music Player	Planeteers can't always be exploring! Craft a music player for Base Camp and add a playlist with Block Code. Try coding it to auto start when we enter the room, then auto off when we leave!	Automating your shelters can make them more energy efficient and convenient to use! You can program light, music, and defenses to follow your instructions, even when you're not here!	Did you know that music is the creative organisation of sound, and that rhythm is the beginning of that organisation? It is the arrangement of sounds as they move through time and is usually a strong, regular repeated pattern. Cool Huh!	Components	25%	Coding Cadet	25%
TC2.6	**Nested IF/ELSE Statements** Uses loop Nested IF/Else statements to update complicated behaviours	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Systems Analysis) Science (Biological Sciences)	Sentry Bot AI Upgrade	Upgrade your Sentry Bot's AI and sensing so that it responds to changes in its environment.	This bot aint too bright! Let's give it some more things to think about. Add code so it knows when we are within 7m of its position, trigger a greeting using a speech bubble and voice. Enhance the code so the bot will react to us moving closer, if we come within 4m the bot should flash a light, and within 3 meters, make it change color.	Nesting' some IF-ELSE statements inside other IF-ELSE statements helps your bot think in ways more complicated than a single TRUE and FALSE question.	Robotics Coder	25%	AI Designer	25%
TC2.7	**Complicated Feedback** Programs complicated user feedback	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Systems Analysis) Science (Biological Sciences)	Sound the Alarm!	Mission Control has sent plans for an automated Alien Alarm. Use the Builder and Block Code to impliment their designs at Base Camp. Start with an Alarm Tower so it can be seen from a distance.	One the tower is up, use Block Code to set proximity sensors to detect the Aliens. Once the proximity sensors are activated trigger an Alarm sound and a flashing light that cycles between orange and red. Extra credit if you can turn the perimeter lights on!	Automating something is great. But how do you know it's working if you're not watching it? Making machines give visual and sound feedback helps you to know what's going on when you're not close by.	Automation	25%	Construction 101	25%
TC2.8	**Nested IF Statements - Part 2** Programs reactive visual Effects	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Art (Colour and Style) Science (Biological Sciences)	Use Cloaking to Foil Aliens!	Did you know "Cloaking" means to hide or disguise something? Use Block Code to camouflage your vehicles when the Aliens are close by triggering a camo texture change!	Your mathematics skills really come in handy when coding! Instead of checking for exactly how far away an Alien is you can just do a check if it is "Less than" < a certain distance away. Hey guess what, that is another binary TRUE/FALSE thing that can be checked. That stuff is everywhere...	Proximity means "how near something is". Proximity sensors will trigger if Aliens are near. Some may trigger alarms, others may activate strategies like cloacking. Proximity sensing is very handy indeed!	Coding Cadet	25%	AI Designer	25%

TECHNOLOGY

LEVEL 3 BLOCKLY QUESTS

Quest Code	Learning Objectives	STEAM Integrations	Quest Summary	Quest Introduction	Example Quest Fun Fact	Example Quest Fun Fact	Badge Achievement	% XP	Badge Achievement	% XP
TC3.1	**Debugging Logic** Debugs code with multiple logical errors	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Systems Analysis) Technology (Power and Energy)	Repair the Broken Drone	Woot! Looks like we found another relic bot. My scanners are reading no battery charge. Fix the battery charge controller so the Drone's systems come online.	Hacking can be used for both good and bad! This Drone is in need of fixing so you'll need to understand and hack it to make it work again.	If you have a bug, no problem! A simple way to debug in blockly is to use the play button so the code runs while observing your robot. Look for broken code as the program runs or for problems with the robot trying to complete its task. Compare the two to check if the sequence is correct or where it needs fixing.	Hacker	25%	Drone Technician	25%
TC3.2	**Optimizing & Reusing Code** Applies the same logic structure in different situations. Refer to TC2.6	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Systems Analysis) Science (Biological Sciences)	Fix the Drone's Sentry Systems	Diagnostics are running, and guess what? This Drone is an Alien Sentry Bot! Fix the Drone's sentry code, it should grow bigger and turn lights on when Aliens are detected. Woot!	Those alien invaders have their own inbuilt "IF statements" too! If it is bright they run away! I wonder if we can use this to our advantage?	Robots that can function on their own are called "autonomous" and are very useful in remote exploring, space flight, and even dangerous missions! Advanced autonomous robots have lots of sensors and an AI system can learn from the environment, experience, and build on what it can do.	Robotics Coder	25%	Drone Technician	25%
TC3.3	**Variables** Modifies a single variables' value Note: Inbuilt variables are actually introduced earlier	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Systems Analysis)	Upgrade & Remote Your Drone	The Desert is super hot! Mission Control suggest we use the Drone to help explore. Upgrade its anti-gravity capacitator so it can hover while performing scans. Then enable remote control so you can pilot the Drone.	Hi there! If something can change then it is described as 'variable'. How are you feeling today? A variable such as your emotion could be a word such as 'happy' or a number like 1-10. I hope your human variables are good today!	Almost everything is variable. The weather can be sunny or rainy, a score can be any number, and the power can be on or off. Remember toggles from an earlier mission? That is a 'binary variable' , which means it can only be two different things like ON or OFF.	Drone Technician	25%	Coding Cadet	25%
TC3.4	**Programmed Variables - Part 1** Modifies multiple variables using complex logic	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Art (Colour and Style) Science (Biological Sciences)	Add Stealth Tech!	Being able to blend in with the environment makes surveys easier. Use Block Code to upgrade the Drone with Stealth mode. Program its systems to change color to match the terrain its exploring. Chane to color brown to blend with the desert terrain and blue when in water.	An object or bot can have lots of variables to describe it. Things such as colour, size and texture are all different variables you can modify with code. So you don't have to keep changing variables yourself how about you try putting them in some IF/ELSE statements so that they change on their own?	Advanced stealth technology uses mirrors or holograms to make objects invisible. Mirrors reflect an image of the environment to blend the object into its surrounds, while holograms recreate an image of the surrounds and project it around the object. Hey! You just disappeared!	Drone Technician	25%	Hacker	25%
TC3.5	**Debugging Loops** Debugs loop errors	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Art (Photography)	Fix the Drone's Camera	Woot! The Drone has had some serious upgrades and is almost mission ready. I'm detecting a glitch with its camera systems. Fix the Drone's camera, and take some test photos to check its working properly.	Loops are great to check something repeatedly without alot of code. Looks like something is wrong with how long the Camera Systems loop is running for. Can you figure it out?	Aerial photos are usually taken with a camera mounted on the bottom of a drone or aircraft. An aerial photo allows a whole area to be observed rather than a portion of it. This way we can see survey resources, measure the length of rivers or size of land masses, and see patterns including how things might change over time.	Coding Cadet	25%	AI Designer	25%
TC3.6	**Nested Loops** Codes solutions using nested loops	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Systems Analysis)	Build a Signal Tower	Heads up! Mission Control report our comms seem offline whenever the Aliens invade. The Professor thinks they are jamming our communications!	Let's build a signal tower with a green and red light. Add a proximity sensor to activate the lights when the Aliens arrive. Give it a wide sensor radius so we have advance warning before they reach Base Camp!	Though we are receiving a communication signal there is too much other radio 'noise' to understand it. It's like listening to one speaker in a room full of people yelling. A clear and loud signal with little noise is called a high "signal to noise ratio". That is what we need!	Components	25%	Coding Specialist	25%
TC3.7	**Functions Introduction** Makes pre-made function calls	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Power and Energy)	Add a Flashing Signal	Upgrade your lights so they flash on and off so the tower Alarm is easily noticed. Flash the green and red lights on and off, one after the other.	A FUNCTION is a piece of code that you can easily call over and over again. Functions are great! Like loops they can save time so you don't have to write the same code many times over.	You might have a FUNCTION to describe how you get food. It would be something like "Find food container, open container, grab and eat food until full!" It doesn't matter what type of container or what type of food, this FUNCTION still works!	Systems Engineer	25%	Electronics 101	25%
TC3.8	**Applying Functions** Applies a pre-made function to a similar situaton	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Technology (Power and Energy)	Transmit a Secret Code	Use Morse Code to send a secret SOS alarm signal to Mission Control's satellites. Flash SOS with the red and green lights, using delays in Blockly. Try three short flashes using he red light, then three long flashes, using the green light, then three short red flashes again.	Nowadays, wireless communication is something that we use all the time. But years ago, we used Morse Code to send messages. Morse code is a sequence of dots and dashes that form the letters and numbers of a message. When messages are sent by Morse code, dots are short beeps or clicks or flashes, and dashes are longer ones. Cool Huh!	Did you know you can call a FUNCTION however many times you like using one line of code? This is called a FUNCTION CALL and tells the program to run the code inside the FUNCTION at a certain time.	Hacker	25%	Coding Specialist	25%

TECHNOLOGY

LEVEL 4 BLOCKLY QUESTS

Quest Code	Learning Objectives	STEAM Integrations	Quest Summary	Quest Introduction	Example Quest Fun Fact	Example Quest Fun Fact	Badge Achievement	% XP	Badge Achievement	% XP
TC4.1	**Programmed Variables - Part 2** Modify bot attriubtes/variables in code	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Art (Photography)	Build a Satellite	Mission Control want us to build and launch a low orbit satellite to take pictures of the planet and its moon. Modify your drone's chasis and re-code its CPU to enable the relay link for photos using blockly.	The bird's-eye view that satellites have allows them to see large areas of a planet all at once. This point of view allows satellites to use a variety of scans, including imaging, to collect more data, quicker and easier than instruments on the ground. Since they are above the clouds, Satellites can also see into space better than telescopes at Earth's surface.	Escape velocity is the speed needed for a rocket to escape the gravitational pull of a planet. The escape velocity needed to escape the Earth's gravity is about 25,000 miles per hour. Now that's fast!	Components	25%	Systems Engineer	25%
TC4.2	**Incrementing/Decrementing** Increments or decrements a variable in a loop Applies to the countdown aspect of the code	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation)	Launch Your Satellite	Woot! Time for launch! Build a rocket with enough thrust to carry the satellite into orbit. Then add more blockly to create a launch code that counts down to blast off and triggers the rockst engines to fire. Be sure to add code to suspend Gravity when the rocket reaches a certain altitude!	Here are those useful variables again! You could waste time and energy counting down (decrementing) manually in code but if you make a 'countdown' variable you can subtract 1 away from it each second and do it automatically. Nifty hey?	Some variables not only change superficial features like colour or size but can change physical rules too! Try turning your satellites gravity variable to 'Off' so it can simulate zero gravity.	Coding Specialist	25%	Physics	25%
TC4.3	**Simulations** Simulate complex animal behaviours	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Engineering (Food Production) Science (Biological Sciences)	Code a Cattle Drone!	Looking after your animals is hard work! Make it easier by coding a Drone from your inventory to round up farm animals. Pick a target like a shelter or barn, then send your Drone out at sun down to round up your furry friends and lead them home before nightfall.	Did you know that a drone is a type of robot that is classified as an Unmanned Aerial Vehicle (UAV) controlled by an autopilot through a remote control or computer program?	Like all robots, drones are made up of many components. Some of the main components include, a frame, propellers, motors, landing gear, battery, flight controllers, power distributer, remote control, electronic speed controllers (ECS) and camera. Sensors, transmitters and receivers can also be fitted. Phew!	Robot Maker	25%	Farming Tech	25%
TC4.4	**Creating Functions** Creates a function	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Engineering (Food Production) Science (Biological Sciences)	Build a Farming Bot!	Using Bots to automate stuff sure makes life easier! Code another farm bot to tend to a crop area. Instruct your robot helper to water and feed the crop.	Time to apply your knowledge of variables and functions. It's a bit of extra work now but will save you time in the future when you have to solve similar problems.	Arms, sensors, and wheels, oh my! Robots can have them all. A robot has four essential characteristics: sensing, movement, energy and intelligence. Artificial Intelligence (AI) comes from the instructions stored in the robot's central processing unit or CPU.	Automation	25%	Farming Tech	25%
TC4.5	**Code Re-use - Part 2** Applies player-made code chunks/functions to solve similar problems	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Engineering (Food Production) Science (Biological Sciences)	Farming Bot Upgrade	Upgrade your farming Bot to feed your animals. In your previous mission you made code that can be used to solve different but similar problems. Now you can easily repeat the farming bot's behaviour in similar ways without wasting time re-coding everything.	Some robots don't need someone to control them! Cool! They're called an autonomous robot. Robots that can function on their own are very useful in remote exploring, space flight, and even dangerous missions in place of people!	Advanced autonomous robots have lots of sensors and an AI system can learn from the environment, experience, and build on what it can do.	Robot Maker	25%	Coding Specialist	25%
TC4.6	**Automation - Part 1** Automates simple farming tasks	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Engineering (Food Production) Science (Biological Sciences)	Automate Crop Harvests!	Ok lets take our farming automation to the next level! Build a harvesting Bot using the builder, then add block code so it's able to harvest crops and fill your refigerator unit.	Automating your farm lets you spend time doing more exciting things like exploring, building and learning. You're harvest Bot can even do the job better than you if you program it well enough!	Food spoils when it gets old. This is because bacteria, yeasts and fungi feed on the food and break it down. These micro-organisms grow much slower at lower temperatures, so the cooler you can keep your food, the longer it will last. Thats where a refridgerator, or in space explorer terms: cooler unit, can help!	Automation	25%	Robot Maker	25%
TC4.7	**Automation - Part 2** Automates simple farming tasks	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Engineering (Food Production) Engineering (Natural and Built Environments) Science (Biological Sciences)	Build a Water Reserve	Its way too dry in the Desert, we need water reserves. Build a water tank and connect an automated pump and pipe system that draws water from below ground to keep it full.	Uh Oh! Looks like it's not raining enough to help your crops absorb nutrients and grow. Luckily there is an underground source of water nearby, called **groundwater** for you to use - you just need to combine some materials and technology to bring it to the surface!	Automating something helps you really understand a problem and its solution. Every decision you make without even thinking about it has to be programmed.	Systems Engineer	25%	Farming Tech	25%
TC4.8	**Complex Automation** Automate complex farming tasks	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation) Engineering (Food Production) Engineering (Natural and Built Environments) Science (Biological Sciences)	Greenhouse Project!	Super! Now that we've tapped the underground water supply, lets try growing some plants in the Desert! Build Greenhouse attached to your water system.. Plant some plants, and maybe even add a farming bot to automate your crop grow and harvest.	There are alot of decisions that need to get made to solve even simple problems. Try to re-use code and make functions that can be called to keep your code as simple and understandeable as possible.	Plants need light, warm temperatures, air, water, and nutrients to survive and grow. Greenhouses work by letting light in, converting it to heat and then stopping it escaping. Entire farms can exist in greenhouses!	Farming Tech	25%	Automation	25%

TECHNOLOGY

EXTRA CREDIT BLOCKLY QUESTS - GAME DESIGN

Quest Code	Learning Objectives	STEAM Integrations	Quest Summary	Quest Introduction	Example Quest Fun Fact	Example Quest Fun Fact	Badge Achievement	% XP	Badge Achievement	% XP
TC5.1	**Game Making** Sensors and traps	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation)	Maze Runner	Build a maze then lay hidden traps. Code the traps so they can be shot with the gauntlet to defuse! Invite your friends to do a maze run and try and reach the exit.	Self Discovery	Self Discovery	Game 101 	25%	Construction 101 	25%
TC5.2	**Game Making** Looping moving objects. Targets and game counters. Using sound effects.	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation)	Moving Target!	Create a simple moving target using the Builder. Code the target to move left and right using loops. Add a a simple counter that counts up each time the target is shot using your Gauntlet's light gun. Add some sound effects for when you hit the target!	Self Discovery	Self Discovery	Game 101 	25%	Physics 	25%
TC5.3	**Game Making** Target goals and game counters. Timers and time limits.	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation)	Hide & Seek	Add some code to your target so that it appears and disappears. Try using random numbers so the rate of appear versus disappear varies each time. Add a time limit and a target goal, for example 30 seconds and 20 target hits.	Self Discovery	Self Discovery	Game 101 	50%	Games Guru 	25%
TC5.4	**Game Making** NPCs and AI. Targets and timers.	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation)	Goal Kick Challenge	Create a goal kick game with an AI goal keeper, timer and score. Code an NPC bot to protect the goals while your player avatar takes shots at scoring using a block ball. Keep score against a timer. Add sound and effects.	Self Discovery	Self Discovery	NPCs 	100%	Physics 	50%
TC5.5	**Game Making** NPCs and AI. Collision effects, targets and timers.	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation)	Robot Sumo	Create a robot Sumo game using two bots. Create a mat or ring, add controls to your bots and collision sound effects. Play against a friend, the first bot to be bounced out of the ring loses!	Self Discovery	Self Discovery	Games Guru 	50%	Blockly Master 	50%
TC5.6	**Game Making** Remote controlled Characters. Targets and timers.	Technology (Making) Engineering (Simple and Complex Machines) Engineering (Design Process for Innovation)	Ready Set Go!	Create a racing game with a track and an end target or finish line. Use bots controlled by players, or build remote controlled cars in builder. Set the rule that the first bot to reach the target and cross the finish line wins!	Self Discovery	Self Discovery	Games Guru 	25%	Blockly Master 	50%

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