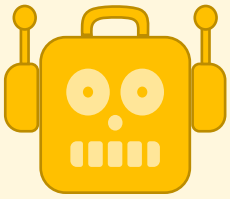
Spirit of Innovation STEAM Resources



Technology

Year Two

Algorithms & The Internet

Exploring and Programming

Links

- Understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions
- Create and debug simple programs
- Use logical reasoning to predict the behaviour of simple programs
- Use technology purposefully to create, organise, store, manipulate and retrieve digital content
- Recognise common uses of information technology beyond school
- Use technology safely and respectfully, keeping personal information private; identify where to go for help and support when they have concerns about content or contact on the internet or other online technologies.

Resources

- Balls
- Boxes
- Chair
- Chalk
- Coloured pens or pencils
- Large piece of paper with 15cm x 15cm grid
- Bee-Bots
- Blank Bee-Bot mat
- Stopwatch
- Whiteboard pens
- Coding Sheet (Download)
- Debugging Sheet (Download)
- Whiteboards
- Bee-Bot jacket (Download)
- Presentation Program
- Internet

Skills

- Working in a team
- Working as a pair
- Discussing ideas
- Writing own simple code
- Follow/write instructions
- Program a Bee-Bot
- Record an algorithm
- Use internet research with increasing independence
- Able to structure and organise digital content
- Can collect, manipulate and present findings

Questions

- What do we call computer instructions?
- What does an algorithm designer do?
- What does a coder do?
- How could you write go forwards 3, turn left?
- What is debugging? Why is it important?
- What do the buttons on the Bee-Bot do?
- Where will the Bee-Bot start?
- What order will you be visiting each picture? Why?
- Do you know how to stay safe on the internet?
- Can you inset pictures?
- How would you change the font?
- Can you edit the text? Correct spellings?

Activity

Activity One
Whole Class/pairs
(20 -30 mins)
In the classroom/Outside area/Hall

Start by taking the class outside, to a few pre-prepared chalk grid (5x5). This will be the basis for their introduction to algorithms.

Teacher to explain that computers have to follow instructions; these instructions are called algorithms. Explain to the pupils that today they are going to be learning about programming and algorithms.

Describe how algorithms are step-by-step instructions to make something happen.

Divide the class into pairs; explain that one will be called an *algorithm designer,* the one that thinks of the instructions; whilst the other one will be a robot.

The algorithm designer will provide the robot with basic verbal instructions (forwards/backwards/turn left/turn right/stop); e.g. move forwards 3, turn left, move, backwards 5. The algorithm designer needs to place three items on the 5x5 grid; e.g. a ball, box and chair. The designer's role is to instruct the robot, using simple algorithms. These instructions need to get to the robot to a chosen object, without leaving the grid or bumping into other objects.

Swap roles.

This is a fun game and can be repeated during playtime or as a fun 5-minute filler.

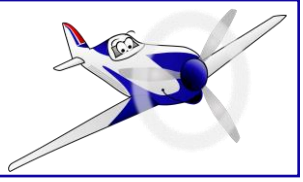
Explain that robots/computers and other similar technology will only do what the algorithm need it to do. Therefore, the instructions (algorithms) need to be clear, simple and correct.

Activity Two
In small groups/mixed ability pairs
(40 – 50 mins)

This activity involves planning algorithms and using them to program a Bee-Bot. It is expected that pupils have already had experience of Bee-Bots and have some ideas about how they work. (If not allow pupils to experiment with the Bee-Bots first before starting this activity.)

Ask the pupils if anyone can remember what the person who writes instructions for a computer is called? (algorithm designer) Explain that the person who programs the algorithm, pushes the buttons on the Bee-Bot, is called a *coder*.

In pairs and using the 15cm x 15cm gridded paper; pupils design their Spirit of Innovation Flight Test Map. This could include images such as: a charging station, a group of team members, a tree, another plane, person with a stop watch, starting and finishing posts. Or think of their own themed airport locations.



In the same pairs, plan a route for the Bee-Bot to navigate. Draw this route on the map, it needs to guide the Bee-Bot to specific points on the Spirit of Innovation Flight Test Map. Create a sequence of instructions (an algorithm) and record them on a whiteboard.

Create another route that starts and ends in the same place, but is different than the first one? Draw this route on the map in a different colour. Also record this algorithm on a whiteboard.

Ask the pupils which is the best route out of the two routes and why? Allow time for them to discuss in their pair. Here, the pupils need to be evaluating their two routes by comparing the different algorithms. They need to be making decisions that may involve the number of instructions (less is better) and the distance it might need to go (shorter is better) as of course it needs to break a record!

Using the chosen route and the algorithm, program the Bee-Bot.

Before pressing start on the Bee-Bot, ensure that their partner has a stopwatch at the ready. On a 'countdown from 3,' press the stopwatch and Bee-Bot 'Start' button at the same time.

Watch the Bee-Bot as it travels, does it take the route as planned? If not, what needs to be altered? Any corrections are called *Debugging*. Debugging is the process of detecting and correcting the errors in a program.

Once the *algorithm designer* and the *coder*, are happy with their route and there are no bugs, record the time on their Spirit of Innovation Flight Test Map.

These times can be recorded on a class Bee-Bot time sheet (Download)

Activity Three
Whole class followed by individual/mixed ability pairs
(20 - 30 mins)

Demonstrate to the class how to use a search engine to find information, pictures, sounds and answers to many questions. (Recap the school's staying safe on the internet rules' or follow this link https://www.youtube.com/watch?v=LLWH2KzIVDk)

Teach the class how to retrieve significant information, video, pictures or sound from various internet searches. Demonstrate how to copy and paste these relevant materials into a presentation program, such as PowerPoint. Explain how to condense text into important information only, align images and generally how to present all of their findings in a clear and organised way. Animation and transitions optional.

Give individual/pairs a specific area to research, these will form part of a larger class topic. (E.g. The History of Flight, Aircraft and Pilots: - the first flying machine, the first person to achieve flight, famous aircraft inventors, famous women pilots, famous men pilots, wing development, do all aircraft have wings, famous planes, fastest plane in history, oldest plane, planes in warfare)

Once all pupils have had chance to research and present their part of the overall presentation, the teacher could piece it all together as one slide show. Pupils may wish to produce slides at home too.

Option: Invite parent/carers to see 'the show.' Link literacy

Tip: Explore the STEAM value of popcorn in preparation for the whole class presentation! The pupils could always design and make their own containers too, based on their knowledge of volume from kernel to popped corn.