Year 2 Algorithmic Evaluation through Bee-Bots

KS1 Programs of study covered
Pupils should be taught to:

- 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

Computational Thinking
Algorithm is a precise set of instructions or rules to achieve an outcome or solve a problem.
Algorithmic Evaluation is how we look at algorithms and determine how useful they are, how adaptable, how efficient, how correct. There may be many algorithmic solutions to a problem, evaluation asks which one was best and why?

- Assessing that an algorithm is fit for purpose
- Assessing whether an algorithm does the right thing (functional correctness)
- Designing and running test plans and interpreting the results (testing)
- Assessment whether the performance of an algorithm is good enough
- Comparing the performance of algorithms that do the same thing
  (Adapted from Computational Thinking framework)

A six lesson module for Year 2 which follows reception guided play activities in reception and a 6 week module of algorithm creation in year 1

Using Bee-Bots

Before you start the module

Decide on a context which links to a project you are doing. Geography or local history are popular but it could be anything.

Have pupils had lots of opportunities to create algorithms and convert these into Bee-bot code in Year 1. If they haven't go back and create algorithms using the symbol cards. Planning on the Year 1 document.

Drawing Bee-Bot World (1 lesson)

Draw a grid of 15cm^2 squares across a large sheet of sugar paper before the lesson.

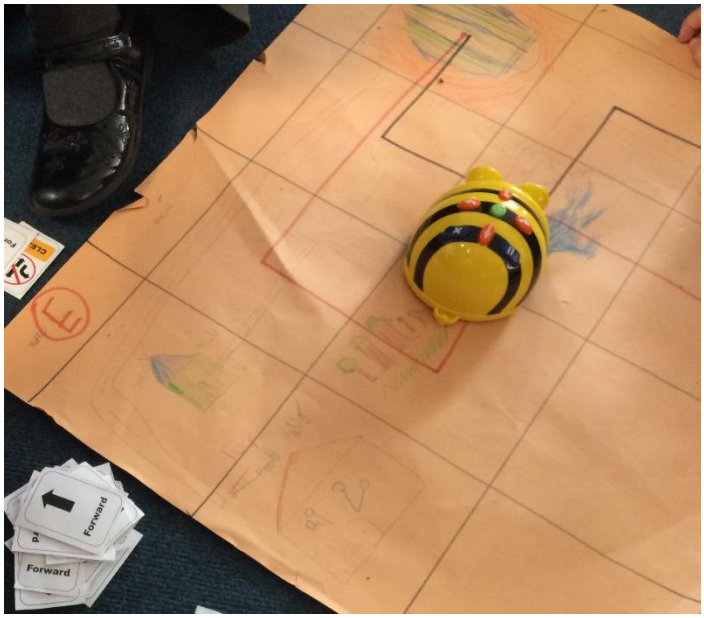
Use the Bee-Bot World slides to help pupils design and create their own world. Use your own theme locations, not the ones of the slides.

Pupils work in pairs to design Bee-bot world.

The Best Route (3 lessons)

Preparation before the lesson

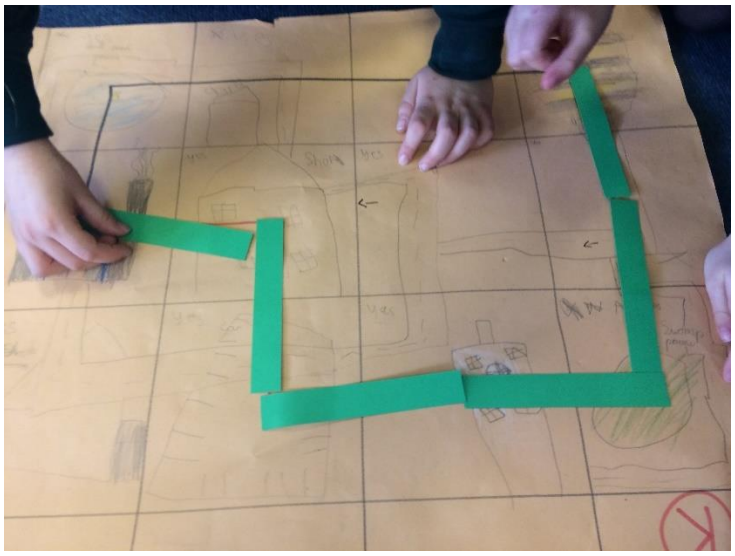
Draw two routes from A to B on the Bee-bot world maps. Draw them in different colours (red & Black). Make sure each map route is different.



Ask pupils which route is best out of the two routes and why it is best and allow them time to discuss it in their pairs.

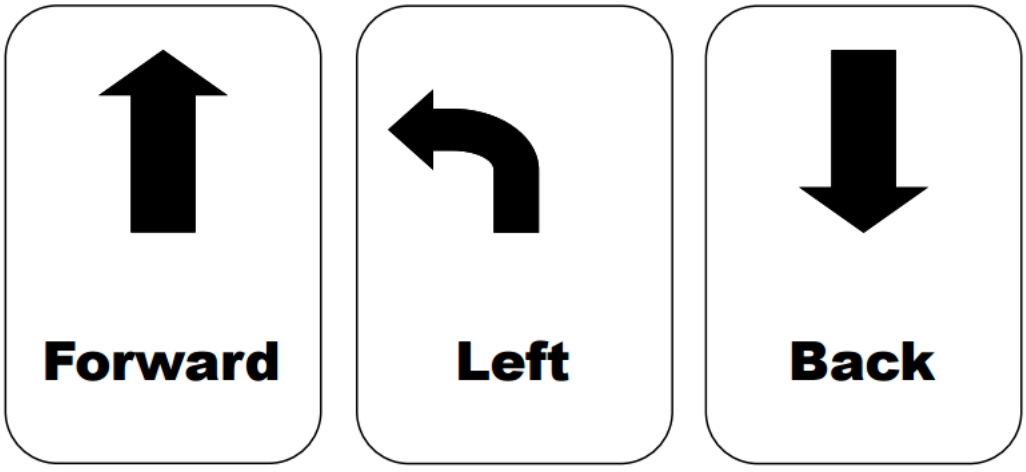
As pupils engage with this task they are evaluating their algorithm by comparing different algorithms that do the same thing. They are making value judgements that may involve the number of instructions (less is better) and the distance it might need to go (shorter is better) or the time it might take (less is best). Some pupils may suggest factors that are not obvious such as the route that visits the most landmarks. These are all valid and can be investigated.

Choose three of these to investigate. Alphabetise each map. It is easier to investigate one factor with all of the class. Pupils rotate round each map, testing it for distance, time, number of instructions or whatever other criteria they thought was best and you selected to test.



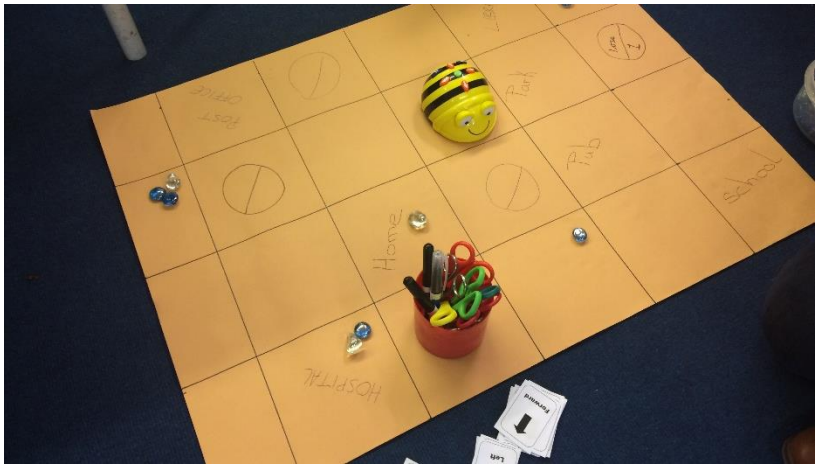
Strips of 15cm long card are great for distance.

Stopwatches or whiteboard timers can be used to investigate time. The algorithm symbol cards are useful for investigating the number of instructions.



There are recording sheets for these activities.

Collect the most amount of counters with a limited number of cards (1 lesson)



The task here is to design an algorithm to pick up the most counters with a set number of cards starting from the same starting point and same Bee-bot facing. Complexity could be added by having squares that turtle could enter but would cost a pause card or by increasing or decreasing the number of cards.

Collect the highest number of with a limited number of algorithm symbol cards (1 lesson)

A variation of the idea above is to write numbers on all grid squares and challenge pupils to reach the highest total using a limited number of symbol algorithm cards. They can only visit a square once.