Links with other learning areas extra explanation text

English

Strand: Language (Text structure and organisation)

Content Description: Understand that different types of texts have identifiable text structures and language features that help the text serve its purpose (ACELA1463).

Explanation: It is not only the order of instructions, but also the specificity of the instruction that needs to be explored. Consider the potential ambiguity in the following sets of instructions:

- 'Go left' could mean any of the following:
  - Step sideways to your left but keep facing in the same direction.
  - Turn to your left (changing the direction you are facing), then take a step forward.
- 'Open the door' lacks necessary information such as:
  - Does the door have a handle? If so, is it a lever or a knob?
  - Does the door push or pull? Is it a roller door that needs to be lifted, or a sliding door? Does it slide left or right?

Computers do not have access to additional data that will identify the intended meaning of an ambiguous instruction. So, when providing instructions to computers (usually in the form of a programming language), the alphabet, vocabulary and syntax of the language used must all be very clearly defined, and significantly smaller/stricter than a human language such as English would be.

Mathematics

Strand: Measurement and Geometry (Location and transformation)

Content Description: Interpret simple maps of familiar locations and identify the relative positions of key features (ACMMG044).

Explanation: Unlike absolute references (such as a street address or coordinates on a grid), relative terms allow us to define how one item or destination can be located with respect to another. However, to be able to provide reliable and correct instructions about movement between two known locations, direction alone is not enough. The magnitude of movements that we make needs to be measured in quantitative terms, and this provides an opportunity to explore measurement and location through navigation.

When a unit of measurement is defined (in this activity by the distance travelled by one "forward" movement of a robot, but it could also be by one stride or some other agreed measure), students can use this unit of measurement and simple directional instructions (such as turning) to identify relative distances between two points. Understanding that something is "2 forward, right, then 4 forward" from the current position introduces the concept of a vector in a context that students can relate to.

Challenges associated with simple changes can then be explored. If we take those same instructions but change the direction we are facing at the start, what does that do to our instruction? What could we do to prevent that? And what happens if a tall person measures out the number of steps they need to take, then gives those instructions to a short person whose steps aren't as big? What tools do we have at our disposal to overcome these types of issues?

When working with robots, other variables such as battery power, the surface the robot is moving on and a range of other factors can all contribute to the complexity of the problem. However, all of this can be solved if we use a standard unit of measurement (for example the centimeter) and define our distances in these terms.

Development of an appropriate algorithm that lays out the steps the program will take in a clear sequence is the fundamental understanding that informs the creation of more complex algorithms in the future. A good analogue for exploring the concept of an algorithm is through recipes for cooking, where placing dry ingredients in an oven before adding wet ingredients – putting things in the wrong sequence – does not yield expected results. Another example is to take a mundane task, such as getting dressed in the morning, and explore with students what would happen if they attempted to complete the steps in an incorrect order. In a similar way, pressing the Forward button on a robot before pressing the Turn Left button does not yield the same result as pressing the buttons in the reverse order, and defining the algorithm incorrectly often means the intended behaviour of the program is not observed when it is executed.