Computational thinking for digital technologies: Exemplar 11

PROGRESS OUTCOME 4

Beat the Goalie

Annotation

Kiri and Ben can analyse a computer application, identify the functional requirements for a game and create an algorithm for each functional requirement.

They develop a computer program that shows they can:

- use variables for representing and storing data (“timer” in the screenshot from Scratch)
- sequence (“wait 1 sec, change timer by -1”)
- use selection and iteration via a repeat block with conditional logic (“repeat until timer = 0”).

They are able to test and debug their code to ensure it functions correctly. Their response demonstrates their ability to apply logical reasoning to a programming problem.

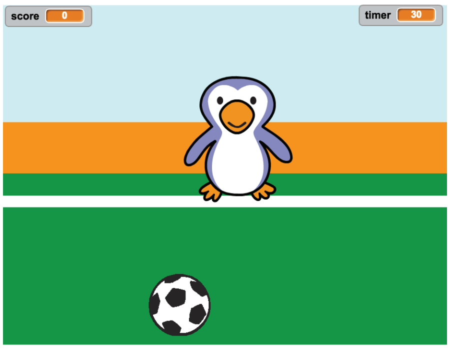
Background

The students in this learning space have had prior experience with developing programs in a block-based integrated development environment (IDE).

The task below is one part of an activity for developing the “Beat the Goalie” game in a block-based coding language. Other parts of the activity involve students writing, implementing and testing algorithms for all the functional requirements of the game.

Task

Students are shown a game called “Beat the Goalie”. They are unable to view the code for the game, so can only see the final game in action. Based on what they can see, they are asked to develop a set of functional requirements that describe the game’s objectives and how a player would interact with the game.



Working in pairs, the students are then asked to develop an algorithm for the functional requirement “The countdown timer should count down from 30 and stop the game when time is up”.

They are then asked to create the programming code to implement and test their algorithm for the countdown timer.

Mr Stuart provides a template for the students to record their response to each part of the task.

Student response

Kiri and Ben develop functional requirements for the game and an algorithm for the countdown timer.

Functional Requirements for the Beat the Goalie Game

After playing the "Beat the Goalie Game" write down the informal instructions here:

1. Timer counts down from 30 to 0 seconds until game is over.
2. Use left and right arrow keys to move the goalie.
3. The ball will move from left to right automatically.
4. Use spacebar to shoot at the goal and then you get a point.
5. The goalie will say goal or save depends on if you score or not.
6. Score as many goals as you can in the time limit.

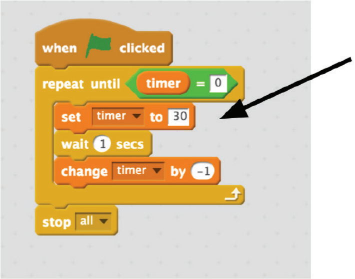
Algorithm for a countdown timer

1. Make a timer variable
2. Set timer to 30
3. Start at 30 seconds
4. -1 every second until timer= 0
5. Stop the game

They test their algorithm by creating a program in Scratch that uses sequence, selection, iteration, and variables. They realise through testing that their program code is in the wrong sequence, preventing the program from working as they intended. They correct the bug in their logic and get the program to work correctly.

Computer Program in Scratch for a Countdown Timer

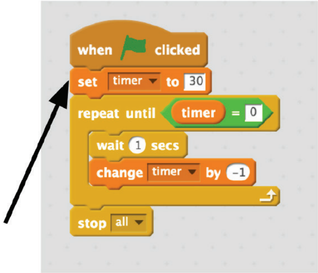
Add a screenshot of your computer program here. If it did not work the first time, add that code and write why it didn't work.



```
when [flag] clicked
repeat until <(timer) = 0>
    set timer to 30
    wait 1 secs
    change timer by -1
stop all
```

The first code didn't work because we had the "set timer to 30" inside the repeat block. It just kept resetting every time it did the repeat and it never counted down.

We moved it out of the repeat so it only sets the time once at the start.



```
when [flag] clicked
set timer to 30
repeat until <(timer) = 0>
    wait 1 secs
    change timer by -1
stop all
```

Downloaded from http://technology.tki.org.nz
Scratch is developed by the Lifelong Kindergarten Group at the MIT Media Lab (http://scratch.mit.edu).

ISBN: 987-1-77669-205-7

MINISTRY OF EDUCATION
TE TĀHUHU O TE MĀTAURANGA