PRIMO

Coding with Cubetto - Unit 1

Year 1, Age 5 to 6, UK National Curriculum

Subjects include:

English

PSHE

Maths

Art & Design

Science

Materials Needed:

6x Cubettos

6x Boards

6x Sets of Blocks

6x Standard Maps

Resources provided:

Diary template

Face template

Storyboard template

Primo Boards template

Introduction

The Cubetto Playset is a Montessori inspired coding toy that allows children ages 3 to 6 to program a friendly wooden robot without screens and is powered by a programming language you can touch.

New technology can sometimes be overwhelming to understand and adopt. The activities contained in this guide were created by educators for educators.

We want to make it simple for you to integrate the Cubetto Playset and its tangible programming language into your teaching.

Development and learning in other key areas

Beyond coding

The collaborative nature of Cubetto makes it an extremely versatile tool for the classroom. Cubetto fosters learning in key development areas that go beyond programming.

Communication

Children practice listening through a range of stories and narratives in relation to Cubetto, accurately anticipating key events and responding with comments, questions or actions. They also develop their own narratives and explanations.

Dexterity

Children develop coordination in large and small movements around the playset. They negotiate the placement of obstacles around the world map and place blocks on our tangible interface.

Social-Emotional

Children become confident by trying new, open-ended activities that remove “wrong” outcomes, and easily encourage group work. The open nature of the maps allows them to choose the resources they need for their play session.

Mathematics

Children add and subtract blocks to a sequence. They solve problems, including doubling and halving to get Cubetto from A to B. They discuss size, shapes and patterns, distance, position, and time to solve problems.

Logical reasoning

The blocks allow children to create and debug simple programs with their hands. They use technology purposefully to create, organise, store, manipulate and retrieve meaningful sequences.

Introducing the Playset

Introducing Cubetto

Introduce Cubetto as a friendly robot that children can program. Children should be told that Cubetto cannot think for himself, and can only move as programmed by the child, just like any other machine. If in a group setting, sit children in a circle, and allow them to pass Cubetto around to one another, saying hello or acknowledging the presence of the object.

Doing so forms a bond with Cubetto, in the same way they would with a stuffed animal, or a toy, and solving problems through narratives later on is more engaging.

Introducing the Board

Introduce the Board as a remote control that children can use to send instructions to Cubetto.

Without the Board, there is no way of sending Cubetto his instructions.

It is important for children to understand Cubetto is only able to move with a human's command. This is not only empowering, but also key to understanding computing.

Encourage children to also explain what other objects in their homes and lives function within a similar paradigm. A television needs a human to change its channels for example, or a washing machine needs a human to select its settings.

These examples, like Cubetto, are machines that need human programming to do their job.

Introducing the Blocks

Introduce the Instruction Blocks as the directions Cubetto follows when inserted in the Board and sent by pressing the action button.

Different Blocks represent different instructions, and an unambiguous, distinct command. These Blocks are what make up Cubetto's hands on coding language, and are key in the learning of computational thinking.

When each block is inserted in the Board, a child should be encouraged to predict what Cubetto will execute before pressing the "Go" button.

This is key in understanding concepts like program design, and it helps develop abstraction.

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Unit 5 Overview

Year 1

By the end of the unit pupils will be able to:

- Understand what an algorithm is, how it is implemented on devices, and that programs execute by precise instructions.
- Pupils will also be able to create and debug a simple algorithm and use logical reasoning to predict the behaviour of simple programs.

	Lesson 1	Lesson 2	Lesson 3	Lesson 4
NC Computing Objectives	To control a digital device	To use logical reasoning to predict behaviour of simple programs	To create a simple program	To debug a simple program
Outcomes	• I can make Cubetto move • I can say one thing that Cubetto can do and can't do	• I can predict what a block will do • I can say how Cubetto feels and what its face will show	• I understand that an algorithm is a set of instructions in order • I can write a simple storyboard	• I can debug a simple algorithm • I can identify 2D shapes
Cross-curricula Subject	English	PSHE	English	Maths
Computational Thinking	Tinkering	Logic, Creating	Decomposition, Collaborating	Algorithms, Debugging
Main Activities	Cubetto's Diary 1. Open Cubetto Unit (with support) and explore their insides. Talk about what you can see. 2. Meet Cubetto and find out what it can and can't do, and what surprises you. Write down in a simple diary.	Cubetto's Feelings 1. Move Cubetto to somewhere it feels happy then sad, changing its face when it arrives. Use: "If I use the _ block, Cubetto goes _". 2. Discuss emotions for Cubetto. Finish the sentence: "If Cubetto is in the _ square, then it feels _".	Cubetto's Holiday 1. Discuss importance of storytelling in order to learn algorithms. Draw a storyboard in three parts to tell a holiday story. 2. Write a simple algorithm to tell Cubetto's holiday story and test out each other's programs.	Cubetto's Dance 1. Debug a series of algorithms in a group to reach a chosen square containing a shape. 2. In pairs one writes an algorithm to make Cubetto 'dance' to a square with a 2D shape. Hiding one step, the other debugs it.
Challenge	Talk about how Cubetto moves	Can you talk about what the blue block does? Why is it helpful?	Can you take a longer journey to get to the castle? Write the algorithm.	Can you write an algorithm to make Cubetto dance in a circle?
Creative play	Make Cubetto a costume.	Role play a time when you are happy or sad.	What happened next to Cubetto? Role play the story.	Draw a castle or boat using 2D shapes.
Resources	Diary template, 2p coins / play screwdrivers	Face templates, Sticky tack, Coloured pens, Mini whiteboards	Storyboard template, Primo board template, Whiteboard pens	Primo board template, Algorithms to debug, 2D shapes , Music (optional)
Assessment	Diaries, Photos, Verbal statements, Observation	Face templates, Photos, Verbal statements, Observation	Storyboards, Photos, Verbal statements, Observation	Photos, Verbal statements, Observation

	Lesson 5	Lesson 6	Lesson 7	Lesson 8
NC Computing Objectives	To create a simple program	To use logical reasoning to predict behaviour of simple programs	To understand that programs execute by precise instructions	To create and refine a simple program
Outcomes	• I can write a simple algorithm • I can make new parts for a game	• I can predict what a program will do • I can draw a treasure map	• I can spot patterns in algorithms • I can spot patterns in nature	• I can use the function block to make my algorithm simpler • I can evaluate an algorithm
Cross-curricula Subject	Art & Design	Art	Science	English
Computational Thinking	Algorithms, Creating	Logic, Perseverance	Patterns, Collaborating	Evaluation, Collaboration
Main Activities	Cubetto's Game 1. Turn the map into a new Snakes and Ladders game. Make new rules e.g. on the tree, go down a ladder. Throw the dice and write the algorithm to move Cubetto. 2. Draw, cut out and stick on snakes and ladders to your map.	Cubetto's Quest 1. Draw your own treasure map for Cubetto to explore. Mark on where the treasure is. Write an algorithm to get there. 2. Work out where the teacher hid the treasure by predicting where the algorithms will take Cubetto.	Cubetto's Patterns 1. In pairs, write an algorithm to get to the same patterned square. Join another pair and talk about similarities in the programming. 2. Talk about patterns you can see on the map and in nature. Compare sets of two algorithms.	Cubetto's Consequences 1. Break down an algorithm into smaller parts. Evaluate what it would do and if it could be better. Show & Tell. 2. Write a random algorithm, using the game of Consequences as a model and evaluate.
Challenge	Can you talk about what Cubetto can do, using 'algorithm' and 'debug'?	Can you say the coordinates of where the treasure is hidden?	Can you use someone else's ideas to make your algorithm better?	Can you evaluate someone else's algorithm, using two stars and a wish?
Creative play	Create a 3D snake or ladder.	Make or find some treasure for Cubetto to discover!	Make a collage of natural patterns.	Play Consequences by drawing a friend for Cubetto.
Resources	Big dice, Craft materials and scissors, Masking tape	Primo maps, A4 squared paper	Primo board template, Pictures of patterns, Whiteboard pens	Algorithms to evaluate, Evaluation Qs, A3 paper
Assessment	New game parts, Photos, Verbal statements, Observation	Treasure maps, Photos, Verbal statements, Observation	Primo boards, Photos, Verbal statements, Observation	Presentations, Photos, Verbal statements, Observation

Lesson 1: Cubetto's Diary (1 of 2)

Cross-curricula Area: English

NC Objectives	Outcomes	Resources Needed	Prep Needed	Resources Provided	Key Vocabulary
To control a digital device	• I can make Cubetto move • I can say one thing that Cubetto can do and can't do	• Children's screwdrivers or 2p coins	• Check batteries • Photocopy diary templates	• Diary template	• Diary • Blocks • Board • Left and Right turn

Computational thinking concept

Evaluation

Decomposition

Computational thinking approach

Collaborating

Persevering

Teacher-led Introduction

1. Ask the class to close their eyes and think about their first day of school. What did it feel like? Who did you meet?
2. Ask: When we meet people for the first time, what should we say and do? . Emphasise: to be polite and find out about them.
3. Introduce Cubetto to the class (try not to give anything away other than its name). Ask: What would you like to find out about Cubetto? Collect the pupils' questions on the board to refer back to at the end.
4. Explain that their task is to find out what Cubetto can and can't do, and write (or draw) what they find out in a diary.
5. Show the diary template and model completing the boxes about you (e.g. I can write my name. I can't fly!)
6. Introduce the board and the blocks. Ask for a volunteer to come to the front and to explore what Cubetto can do. Based on what they discover, model completing a box in the diary.
7. Ask the class to stand up and do a left turn. Repeat for right turn. Explain that they will need to remember these to use Cubetto.
8. Emphasise that the class need to respect and be kind to Cubetto just as they respect each other. Refer to class rules.

Lesson 1: Cubetto's Diary (2 of 2)

Creative Play

Make it a costume.

Challenge

Can you talk about how Cubetto moves?

Guided Activity

1. Ask the group if they would like to see inside Cubetto. Ask: What do you think we will see? Collect answers.
2. Ask the group if they can work out how to open Cubetto. Allow time for them to explore and discover what the screws are for.
3. Show the screwdrivers and allow time for group to use them. Remind the children to be very careful!
4. When open, give the group time to discuss what they can see. Ask: What do you think this is for? What is it made from? How do you think this helps Cubetto move? What colour wires can you see? Explain that the circuit board is Cubetto's brain.
5. Ask: Can Cubetto move on his own? Ensure the group understands that Cubetto, like all computers, can't do anything unless a human tells it to.
6. Introduce the Board and repeat the steps to open and explore its insides carefully.

Independent Activity

1. Work in small groups to explore Cubetto in the classroom. Why are the Blocks different colours? Why do you need the Board?
2. Find out one thing that Cubetto is good at and one thing that it can't do.
3. Write down or draw what you have found out in your diary.
4. Finish your diary by writing or drawing one thing that you are good at and one thing you can't do.

Plenary and Assessment

1. Show the list of questions from the start of the lesson and ask: What do we now know about Cubetto? What have we learnt?
2. Let the children be creative when answering less practical questions such as what it likes to eat!
3. Ask: What surprised you about Cubetto? Was there anything you thought it couldn't do, but found out it could?
4. Ask: What sounds does Cubetto make? What does each sound mean?
5. Recap what each block does: Green = forward; Yellow = left turn; Red = right turn; Blue = backpack (up to four blocks in one!).

Lesson 2: Cubetto's Feelings (1 of 2)

Cross-curricula Area: PSHE

NC Objectives	Outcomes	Resources Needed	Prep Needed	Resources Provided	Key Vocabulary
To use logical reasoning to predict behaviour of simple programs	• I can predict what a block will do • I can say how Cubetto feels	• Sticky tack • Mirrors (optional) • Coloured pens/ pencils • Mini whiteboards	• Check batteries • Photocopy face templates onto coloured paper	• Face template	• Predicting

Computational thinking concept

Logic

Computational thinking approach

Creating

Teacher-led Introduction

1. Tell the class that you think that the sky will be green tomorrow. Collect their reactions. Ask: Why don't you agree?
2. Explain that we use what has happened before to tell us what will happen in the future. This is called predicting.
3. Ask: Can you think of something you can predict will happen? (E.g. If you are hungry and you eat, then you will feel better.)
4. Show the board with one red block to the class. Ask: What do you think will happen when we press the action button?
5. Ask a volunteer to complete the sentence based: "If I use a __ block, I predict that Cubetto moves __."
6. Today the class will be thinking about feelings: what makes us feel certain things and how our face shows our feelings.
7. Introduce the map. Ask: Where on the map do you think Cubetto feels happy? Collect ideas e.g. Cubetto feels happy in the desert because it's quiet. Repeat for where it feels sad e.g. Cubetto feels sad in the mountains because it's cold.
8. Decide as a class on how Cubetto feels in the sea, in the grass, in the city and in the desert, and why.
9. Write these up, modeling drawing the happy/sad face next to the relevant square e.g. sand = sad; grass = happy. (Optional: use mirrors to explore what pupils' faces look like with different feelings, including your eyebrows, mouth and eyes).
10. Explain that their task is to move Cubetto around the map to the places it feels happy or sad. When it arrives, change its face!

Lesson 2: Cubetto's Feelings (2 of 2)

Creative Play

Role play a time when you are happy and a time when you are sad.

Challenge

Can you talk about what the blue block does? Why is it helpful?

Guided Activity

1. Choose a square where we agreed Cubetto feels sad.
2. Adult chooses the starting point by placing Cubetto on the nearest letter (R, G, B, Y, P) to the square chosen by the child.
3. Use the Board and Blocks to make Cubetto move to the square. Point out the lights which show whether it will work and what stage Cubetto is at.
4. Allow the children to use trial and error, and to help each other, to work out which blocks they need.
5. When it gets to the square, change Cubetto's face to a sad face.
6. Children finish the sentence: "If I use a __ block, I predict that Cubetto will __."
7. Repeat for other squares chosen. Encourage problem solving by allowing them to decide what doesn't work and why.

Independent Activity

1. Using the template, draw different faces for Cubetto (e.g. upturned smile with rosy cheeks or downturned smile with tears.)
2. Put some sticky tack on your paper faces and give them to the group moving Cubetto (you can use them later yourself!).
3. On your whiteboard, finish the sentence: "If Cubetto is in the sea, then it feels __." "If Cubetto is in the sand, then it feels __."

Plenary and Assessment

1. Ask: How does Cubetto feel in the sea? How does it feel in the grass? What does Cubetto's face look like when it's sad? Or happy?
2. Show a series of simple blocks (e.g. green, green, red.) Ask pupils to finish the sentence: "I predict that Cubetto will ".
3. Repeat for other simple sets of blocks.
4. Ask pupils to tell their partner one thing that they learnt about Cubetto today and add it to the list begun in Lesson 1.

Lesson 3: Cubetto's Holiday (1 of 2)

Cross-curricula Area: English

NC Objectives

To create a simple program

Outcomes

- I understand that an algorithm is a set of instructions in order
- I can write a simple storyboard

Resources Needed

- Coloured whiteboard pens (to match the coloured blocks)

Prep Needed

- Check batteries
- Photocopy storyboard templates
- Prepare algorithm to tell story (for reference)

Resources Provided

- Storyboard template
- Primo Boards template

Key Vocabulary

- Order
- Algorithm
- Storyboard
- Breaking down

Computational thinking concept

Decomposition

Computational thinking approach

Collaborating

Teacher-led Introduction

1. Read the following story to the class (turn the lights off when in the dungeon): Cubetto was so excited! It was the first day of its holiday. Cubetto had arrived in Scotland the night before and couldn't wait to see all the beautiful lakes and castles. Cubetto left the Bed & Breakfast (B) and followed the map to St Andrew's Castle. When Cubetto saw the castle for the first time it couldn't believe its eyes – it was beautiful! It was actually quite broken and was falling apart but still beautiful, perched on the cliff overlooking the wild sea. As Cubetto rolled around the castle ruins it saw a sign for the Bottle Dungeon. "What's that?", it wondered. Cubetto rolled slowly along the dark, damp tunnel. It turned left and right, trying to see in the shadows. Cubetto could hear drips and strange rattling sounds. Suddenly, there was a BANG. Cubetto turned around and the tunnel was blocked off! Cubetto was trapped in the dungeon.
2. Ask: Can someone tell me three things that happened in the story? Write random on the board. Ask: Have we got the three important things that happened? Refine together, until you have: Went to castle; Got trapped inside; Left B&B/Went on holiday.
3. Ask: Can we order these three things so that the story makes sense? Ask volunteers to order them 1, 2, 3.
4. Explain that when using a computer, it's very important that you tell it what to do in the right order, just like when telling a story.
5. Introduce the word algorithm to describe a set of instructions in the right order.
6. Model using the simple storyboard in three parts to tell Cubetto's holiday trouble. Explain that this is the story's algorithm.
7. Model writing the start and end point of the algorithm on the board (leave up for reference): Start on B, end on the castle.

Lesson 3: Cubetto's Holiday (2 of 2)

Creative Play

What happened next to Cubetto? Role play or tell the story to a partner.

Challenge

Can you take a longer journey to get to the castle? Write the algorithm.

Guided Activity

1. Recap the coloured Blocks and what they do, especially the blue 'backpack'.
2. Explain that when writing an algorithm, it's important to break down the steps first, like using a storyboard to plan a story.
3. Plan an algorithm on the board to tell Cubetto's holiday story using the coloured pens. Start on B (for B&B), end on the castle.
4. Write the algorithm to make Cubetto move by putting the blocks onto the real board.
5. Does your algorithm work? What could you do to improve it? Can you use fewer Blocks to tell the story?

Independent Activity

1. Talk to your partner about a holiday you have been on where something went wrong. It can be a big or small thing, for example getting lost in the car on the way or getting ill on holiday.
2. Write down or draw three things that happened.
3. Make sure the parts are in order. For example: Got in the car > Got lost > Had to drive all night!
4. In the storyboard template, write or draw the three parts of your story in order.
5. Tell your story to a friend.

Plenary and Assessment

1. Ask for a volunteer to program Cubetto to move from B to the castle. Ask for another pupil to narrate the story as it moves.
2. Ask: What is an algorithm? Why is it important to put things in order? Why do we use algorithms with computers?
3. Ask pupils to share their storyboards with the class. Ask: Does the story make sense? Is it in order?
4. Ask: How do we break things down? Emphasise importance of thinking about the most important parts and ordering.

Lesson 4: Cubetto's Dance (1 of 2)

Cross-curricula Area: Maths

NC Objectives	Outcomes	Resources Needed	Prep Needed	Resources Provided	Key Vocabulary
To debug a simple program	• I can debug a simple algorithm • I can identify 2D shapes	• Coloured whiteboard pens • 2D shapes • Music (optional)	• Check batteries • Set up algorithm example on Primo Board	• Primo Boards template	• 2D shape names • Algorithm • Debugging • Prediction

Computational thinking concept

Algorithms

Computational thinking approach

Debugging

Teacher-led Introduction

1. Ask for volunteers to make different 2D shapes using their bodies (e.g. puff up face and make a big circle with their arms.)
2. Show the map and ask pupils where they can see a circle, triangle, square and rectangle. Ask: Can you see other shapes?
3. Explain that today the pupils will write algorithms to make Cubetto dance to places on the map that have different shapes in them. BUT there are problems with the algorithms!
4. Show the first algorithm example on the Primo Board and ask: Will this work? Why/why not? If not, how can we fix it?
5. Model pressing the action button (won't work). Model working out what is wrong and how you can fix it. Model trying again.
6. Explain that when we try to fix an algorithm that doesn't work, this is called debugging.
7. Ask: What is it called when we use what has happened before to tell us what will happen in the future? Recap prediction.

Lesson 4: Cubetto's Dance (2 of 2)

Creative Play

Draw a castle or boat using 2D shapes.

Challenge

Can you write an algorithm to make Cubetto dance in a circle? Can you make it dance forever?

Guided Activity

1. Choose a place on the map that has circles in it: this is your starting point.
2. Choose another place on the map that has squares or rectangles in it (not too far away): this is your end point.
3. On the Primo Boards and with coloured pens, write an algorithm to make Cubetto dance from the start to the end.
4. Check your algorithm works by testing it on Cubetto.
5. When you have made sure your algorithm works, rub out one of your blocks. It now needs debugging!
6. Find a partner who has finished their algorithm too.
7. Swap Boards and debug the algorithm.
8. Discuss with your partner what was missing and how you worked it out.

Independent Activity

1. Look at the first algorithm that needs fixing (e.g. Start on the boat, end on a triangle.) Ask: Where on the map can you see triangles? Where on the map does Cubetto want to get to? (In this example: start on the boat, end on the mountains).
2. Ask: Can you predict if this algorithm will work? If it won't work, what's wrong with it?
3. Ask: How can we debug this algorithm? Discuss until the group agrees on what to do.
4. Test out the algorithm with Cubetto.
5. Repeat for the other algorithm examples.

Plenary and Assessment

1. Ask: What does debugging mean? What kinds of problems did we find today? How did we debug them?
2. Children share the algorithms they fixed (or created).
3. Ask: What was wrong? How did you work out what was wrong? How did you fix it?
4. Ask: What 2D shapes did we find on the map? What shapes can't we see?

Lesson 5: Cubetto’s Game (1 of 2)

Cross-curricula Area: Art & Design

NC Objectives	Outcomes	Resources Needed	Prep Needed	Resources Provided	Key Vocabulary
To create a simple program	• I can write a simple algorithm • I can make new parts for a game	• Big dice • Craft materials and scissors • Masking tape	• Check batteries	• N/A	• Algorithm • Program

Computational thinking concept

Algorithms

Computational thinking approach

Collaborating

Creating

Teacher-led Introduction

1. Ask the pupils to share their favourite games to play. Collect on the Board.
2. Ask the children to think of a time when they learnt how to play a new game. Ask: How did you know how to play it? (Rules).
3. Ask: What word do we use to describe a set of instructions or rules in order that we give to a computer? Algorithm.
4. Tell the children that today they will turn the Primo map into your favourite game: Snakes and Ladders!
5. Ask: Can Cubetto move on his own? Reinforce that computers cannot think for themselves and children control Cubetto.
6. Introduce the word program to describe what the children are doing when they put in their algorithms to make Cubetto move.
7. With the map, ask: What do we need to do to make the map into a Snakes and Ladders board game? Elicit that the children need to choose squares to put Snakes on (where Cubetto will move down) and Ladders on (where Cubetto will move upwards).
8. Model starting at the bottom left hand corner and moving along until you reach the end, then turning left to move along the second row.

Lesson 5: Cubetto's Game (2 of 2)

Creative Play

Create a 3D snake or ladder for the map.

Challenge

Can you talk about what Cubetto can do, using 'program', 'algorithm' and 'debug'?

Guided Activity [two Cubettos and boards will be needed per game]

1. With your partner, find another pair to play the game with.
2. Choose where the on the map the game will finish [this should be no higher than row 3].
3. Start on the bottom left square (A6).
4. Decide which pair starts first and roll the dice.
5. With your partner, program Cubetto to move the number on the dice.
6. Pairs take it in turn to roll the dice and write the algorithm to program Cubetto [support may be needed with which way to move at the end of a line].
7. If you land on a snake, program Cubetto to move down one square. On a ladder, program Cubetto to move up one square.

Independent Activity

1. Draw a snake on a piece of paper.
2. Cut it out carefully.
3. Stick some masking tape on the back of your snake.
4. Place your snake onto the Primo map on one of the squares the class decided on earlier.
5. Repeat for a ladder.

Plenary and Assessment

1. Ask: What did we program Cubetto to do today?
2. Ask pupils to share an algorithm they wrote which included a turn (red or yellow block).
3. Ask: Did anyone have to debug their algorithm? What did you do to fix it?

Lesson 6: Cubetto's Quest (1 of 2)

Cross-curricula Area: Art

NC Objectives	Outcomes	Resources Needed	Prep Needed	Resources Provided	Key Vocabulary
To use logical reasoning to predict behaviour of simple programs	• I can predict what a program will do • I can draw a treasure map	• A4 paper with large squares (3x3)	• Check batteries • Choose a square for the treasure to be buried in and mark it on a laminated map (keep it secret!) • Write the algorithm needed to get there	• Primo maps	• Predicting • Algorithm • Clue • Program

Computational thinking concept

Logic

Computational thinking approach

Perseverance

Teacher-led Introduction

1. Ask the children to close their eyes and think about the most precious thing they own (it doesn't have to be an object!).
2. Tell the children that Cubetto has lost something very important to him and is very sad.
3. Explain that today the children will be trying to help Cubetto find it by predicting where an algorithm will take you.
4. Tell the children that you know where Cubetto's treasure is hidden and show the clue (the algorithm) to find it.
5. Ask: Looking at the algorithm, where do you think the treasure is? Why do you think that? How are you predicting where it is?
6. Ask for a volunteer to program Cubetto with the algorithm you showed the class.
7. Encourage the children to discuss whether they predicted correctly and why. Explain that computing often involves trying things lots of times before we get things right and this it is very important to be patient.
8. Model marking on a map where the treasure was buried with a cross.

Lesson 6: Cubetto's Quest (2 of 2)

Creative Play

Make or find some treasure for Cubetto to discover.

Challenge

Can you say the coordinates of where the treasure is hidden?

Guided Activity

1. On squared paper, make your own map like Cubetto's.
2. Draw different pictures in each square. You might want to choose a theme such as school, sport, music or a game.
3. Decide where on the map your treasure is buried. Mark on the back of your sheet where it is (to keep it secret).
4. Write down where to start on your map.
5. Write an algorithm for where your treasure is hidden: this is your treasure hunt clue.
6. Find a partner and ask them to predict where your treasure is buried by looking at your map and working out the algorithm.

Independent Activity

1. Look at the first treasure hunt clue. Where do you predict the algorithm will take you?
2. Put a cross on the map where you think the algorithm will take you.
3. Program Cubetto using the algorithm clue and press the action button.
4. Did you predict the right place? Why? Why not?
5. If you weren't right, try to work out which part you got wrong.
6. Repeat for other algorithms.

Plenary and Assessment

1. Ask for a volunteer to share their treasure map with the class.
2. The class predicts where the treasure is hidden and programs Cubetto to test it out.
3. Ask: Could we make the algorithm simpler or use fewer blocks? Reinforce the importance of making things simpler.
4. Ask: Which clues did you find harder to work out? Why do you think this was?
5. Ask: What does predict mean? What is an algorithm? What does program mean?
6. Ask the children to think about today and what they did. Ask: What skills do people who work in computing need to have? Collect and display. Elicit: try again and again/perseverance; make sure it's correct/be exact/precise; make it better each time/more efficient.

Lesson 7: Cubetto's Patterns (1 of 2)

Cross-curricula Area: Science

NC Objectives

To understand that programs execute by precise instructions

Outcomes

- I can spot patterns in algorithms
- I can spot patterns in nature

Resources Needed

- Images of patterns in nature
- Coloured whiteboard pens (to match the coloured blocks)

Prep Needed

- Check batteries
- Ask pupils to bring in something they find outside that has a pattern on it (remind not to pick flowers)
- Prepare images of patterns in nature
- Pairs of algorithms worksheet

Resources Provided

- Primo Board template

Key Vocabulary

- Pattern
- Algorithm
- Computer Programmer

Computational thinking concept

Patterns

Computational thinking approach

Collaborating

Teacher-led Introduction

1. Ask the pupils to share something they have found outside, in nature, that has a pattern on it. Discuss the different patterns.
2. Show images of patterns in nature with the class (leopard/giraffe, leaves, feathers, inside kiwi fruit, sand dunes, cobwebs etc.)
3. Encourage the class to group or organize the different patterns they can see (allow them to choose the groupings).
4. Ask: How would you describe what a pattern is? A design or shape that is repeated.
5. Ask: Can you see any patterns in the squares on Cubetto's map? Collect the pupils' ideas.
6. Show two algorithms that differ by one block and ask: Can you spot any patterns? What do you notice that is the same?
7. Model circling the parts that are the same.
8. Explain that today pupils will be spotting patterns in algorithms. Tell the class that people who work in computing (Computer Programers) do this to help them make their work better. Computer Programers often borrow parts of other programs.

Lesson 7: Cubetto's Patterns (2 of 2)

Creative Play

Make a collage of patterns you see in nature.

Challenge

Can you use someone else's ideas to make your algorithm better? How could you use the blue block to improve it?

Guided Activity

1. Find a partner to work with today.
2. On your Primo Board, write an algorithm to move Cubetto: start at the Green G and end at the boat.
3. Check your algorithm is correct.
4. Find another pair and put both your algorithms on the table in front of you.
5. Looking at the two algorithms, talk about: Are they the same? Are they different? How? What patterns can you see?
6. Which algorithm uses the most Blocks? How could you improve your algorithm?

Independent Activity

1. Find a partner to work with today.
2. Look at the two algorithms on the worksheet.
3. With your partner, talk about: What patterns do you see in the two algorithms? Will they both work? Could you improve either of the algorithms?
4. Circle the patterns you can see in the algorithms.
5. Repeat for the next sets.

Plenary and Assessment

1. Ask children to volunteer to share the algorithms they were working on today. Ask: What patterns did you spot?
2. Discuss the similarities and differences between the algorithms used to get to the same square. Ask: Did you use the same number of blocks? What else is the same or different?
3. Ask: What is a pattern and how does it help us in Science, computing and Maths?
4. Ask: What does a Computer Programmer do? Why does spotting patterns help Computer Programmers in their jobs?

Lesson 8: Cubetto's Consequences (1 of 2)

Cross-curricula Area: English

NC Objectives	Outcomes	Resources Needed	Prep Needed	Resources Provided	Key Vocabulary
To evaluate and refine a simple program	• I can use the function block to make my algorithm simpler • I can evaluate an algorithm	• A3 paper	• Check batteries • Write up evaluation questions on the board • Algorithms to evaluate	• N/A	• Consequences • Evaluate • Efficient

Computational thinking concept

Evaluation

Decomposition

Computational thinking approach

Collaborating

Persevering

Teacher-led Introduction

1. Model drawing an arrow at the top of an A3 piece of paper. Fold the paper over and pass it to a pupil.
2. Ask them to draw a different arrow underneath, fold the paper down and pass it on. Repeat until you have six arrows.
3. Ask for a volunteer to unfold the paper and hold it up. Introduce Consequences and clarify meaning.
4. Ask: What do you think of our algorithm? If we start at the [choose starting point], where do you predict it will take Cubetto? Could we use the function (blue) block to make it simpler? Remind the children that the function block works like a backpack.
5. Show the list of questions that the class will be using today to evaluate different algorithms:
6. Does it work? ☺/☹
7. Is it easy to understand? ☺/☹
8. Can you do it with fewer blocks? ☺/☹ How?
9. Could you make it quicker? ☺/☹ How?

Evaluation questions

10. Model answering these questions using words/smiley faces and discuss how they could use the function block to improve.
11. Model programming Cubetto using the original algorithm and ask a pupil to count the number of blocks they have used.
12. Then, re-program Cubetto using the function block as the class decided. Ask a pupil to count the blocks used this time.
13. Ask: Which algorithm was better? Why? Reinforce that the fewer blocks that are used, the better a program is, or more efficient.

Lesson 8: Cubetto's Consequences (2 of 2)

Creative Play

Play 'Drawing Consequences' by creating a friend for Cubetto.

Challenge

Can you evaluate someone else's algorithm, using two stars and a wish?

Guided Activity

1. In a group of four, look at the algorithm together.
2. How could you break the algorithm into smaller parts to help you? (Explain that spotting patterns helps us to break it down)
3. Look at four evaluation questions and talk about what you think is good and what you could improve to make it more efficient.
4. Decide on who will answer each question in front of the class.
5. Practice talking about the algorithm and get ready to present.

Independent Activity

1. In a group of four, take a piece of A3 paper.
2. One person draws a block - top of the paper (not a blue one!), then folds the paper and passes it to the person next to them.
3. The next person draws a block, folds the paper and passes it on. Repeat until you have six blocks in your algorithm.
4. Open up your paper and look at your algorithm. Where do you think it will take Cubetto?
5. Test it out by programming Cubetto.
6. Talk about how you could use a blue block to make your algorithm more efficient by using fewer Blocks.
7. Try out your improved algorithm.

Plenary and Assessment

1. Ask groups who have prepared a presentation to come to the front of the class.
2. Ask each evaluation question in turn and encourage a different person to speak each time.
3. Ask: How did we use the function block today? How did the block make our algorithms more efficient?
4. Ask: How did it help to work together? How did you use other people's ideas?

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