Scratch Professional Development Day 2

Designed and led by

Phil Bagge

Educator & Computing Inspector HIAS

Online Resources

http://code-it.co.uk/alex

Quick Quiz

Session One

Phil Bagge @baggiepr

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Playing rather than working

https://scratch.mit.edu/explore/	Finding scratch projects
https://scratch.mit.edu/projects/	Individual projects
https://scratch.mit.edu/ideas/	Tutorials

Students with accounts would be able to find their favourite project and play it in their own time

Students without accounts would find it much harder to find games

OR Use the offline editor

Scratch Practical, Conditions

Session Two

Phil Bagge @baggiepr

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Scratch Practical Conditions

Red	Little knowledge
Amber	Some knowledge
Green	Good knowledge

Aim	At start	At end
I know what conditional selection is and how it works in algorithm and programming		
I can introduce conditional selection to pupils in ways that reduces cognitive load and promotes planning before coding		
I know how to extend the conditional selection concept with students who are ready for more complexity		

Everyday condition-starts-action

If you are rude again

I am taking away your Gameboy

If you work hard

You can have a treat

Have you heard things like this?

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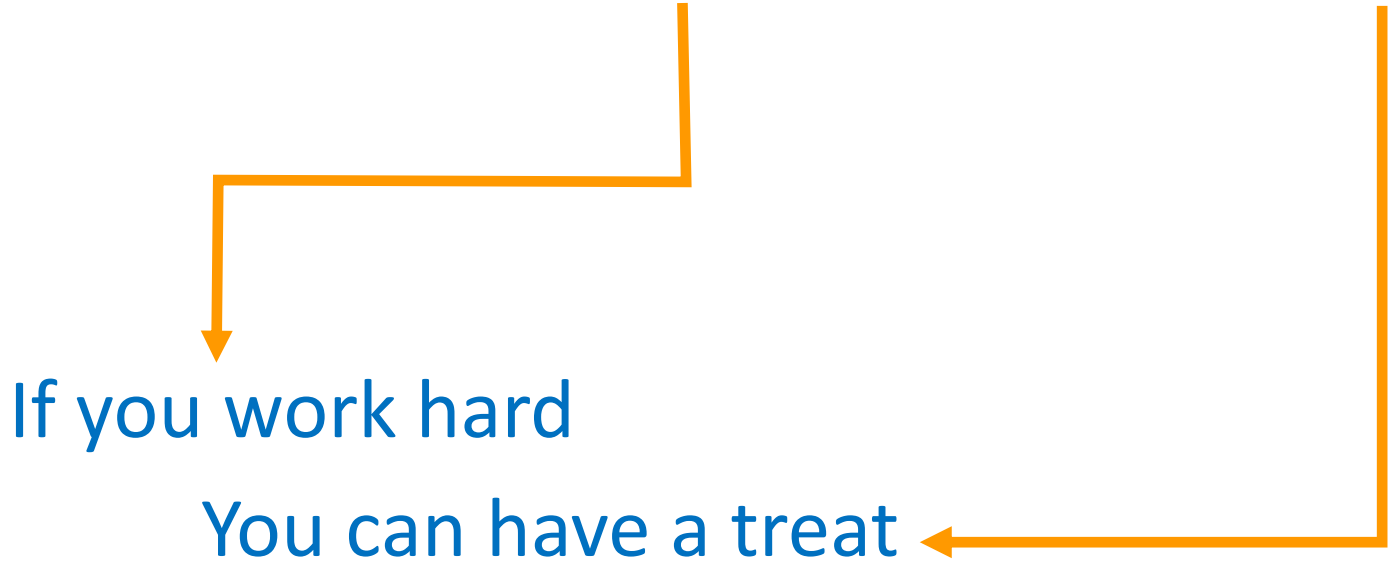
Everyday condition-starts-action



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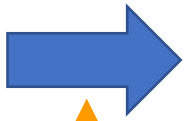
Everyday condition-starts-action

If you are hungry



rub your tummy

The action is indented to show that the action only happens if the condition is met / true

Everyday condition-starts-action

Smile
Frown
If you like cooking
    wave your hand once
Tap head once

Roleplay this everyday algorithm

Everyday condition-starts-action

Smile
Frown
If you like cooking
    wave your hand once
Tap head once

What actions are affected by the condition

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Everyday condition-starts-action

Smile
Frown
If you like cooking
    wave your hand once
Tap head once

What actions are affected by the condition

Because it is indented

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Everyday condition-starts-action

Smile
Frown
If you like cooking
    wave your hand once
Tap head once

What actions are not affected by the condition

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Everyday condition-starts-action

Smile

Frown

If you like cooking

    wave your hand once

Tap head once

What actions are not affected by the condition

Because they are NOT indented

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Everyday condition-starts-action

Smile
Frown
If you like cooking
    wave your hand once
Tap head once

How many times is the condition checked?

Everyday condition-starts-action

Smile
Frown
If you like cooking
    wave your hand once
Tap head once

How many times is the condition checked?

Once only

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Everyday condition-starts-action

Smile
Frown
If you like cooking
    wave your hand once
Tap head once

One mark if it makes sense
One mark if each section is on a new line
One mark if you indent the actions

Now write your own everyday algorithm that uses condition-starts-action

Can your neighbour act it out?

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Flow of control

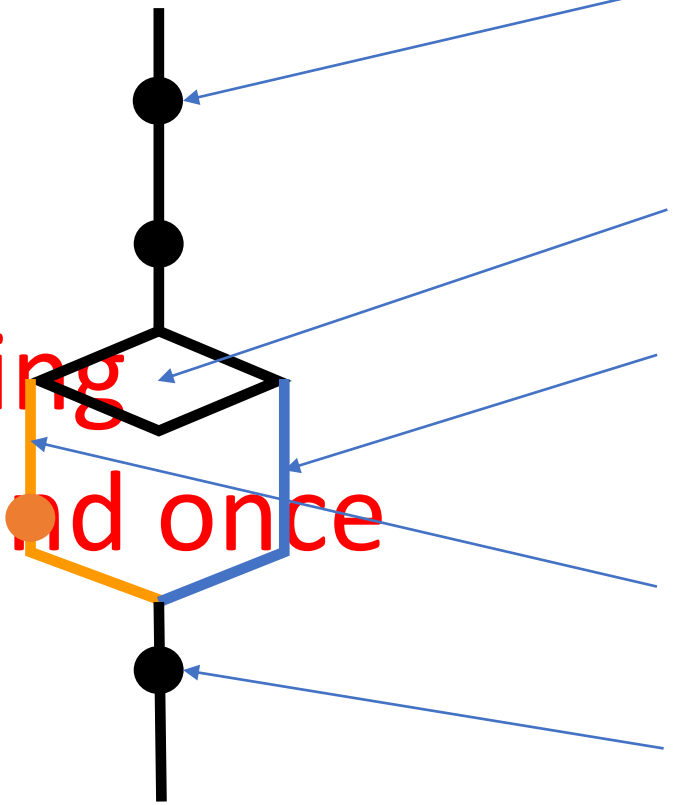
Smile

Frown

If you like cooking

wave your hand once

Tap head once



Dots show actions

Diamond shows the condition

Blue path is one you take if you do NOT like cooking

Orange path is one you take if you do like cooking

Everyone taps head once at the end

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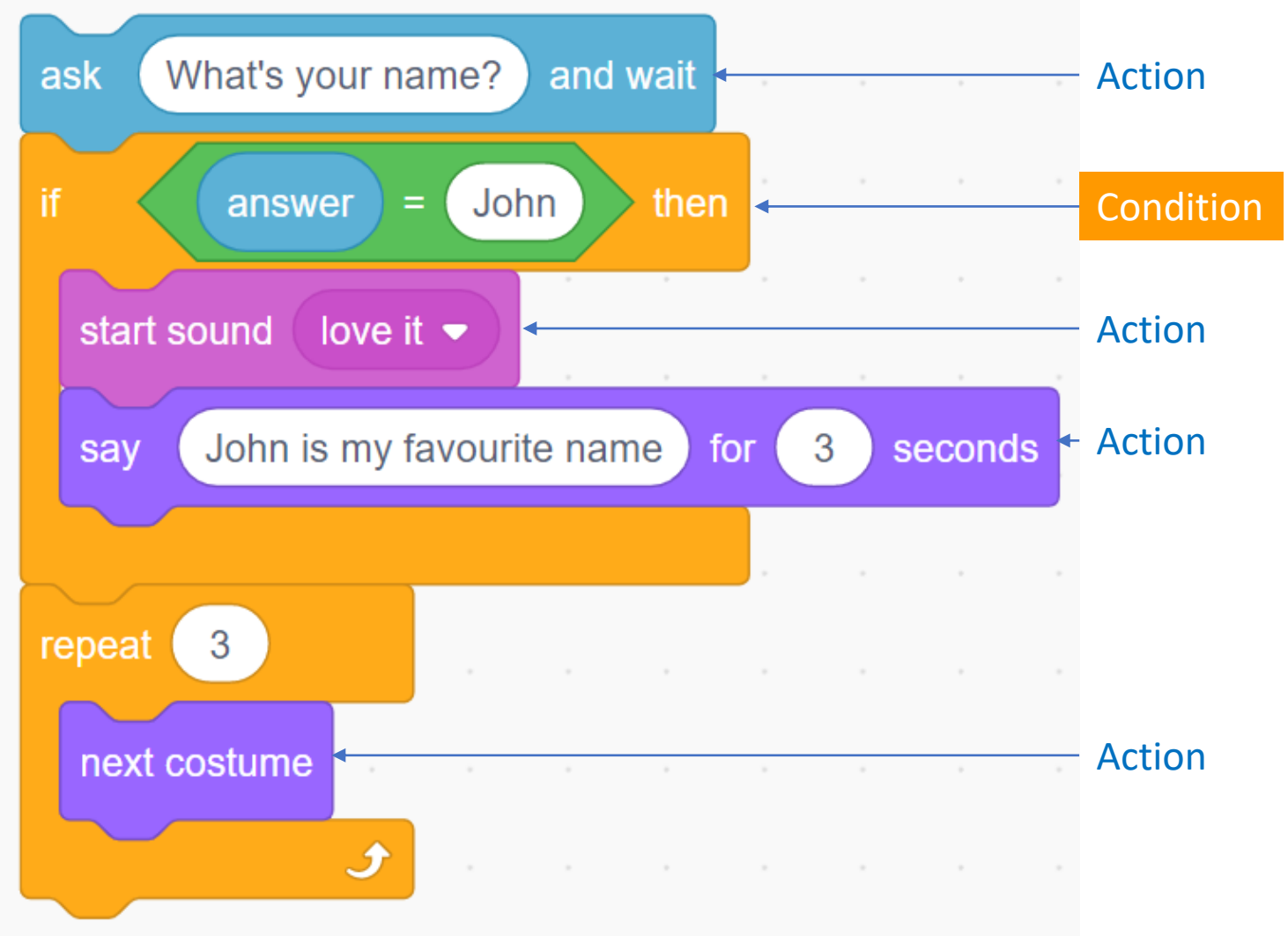
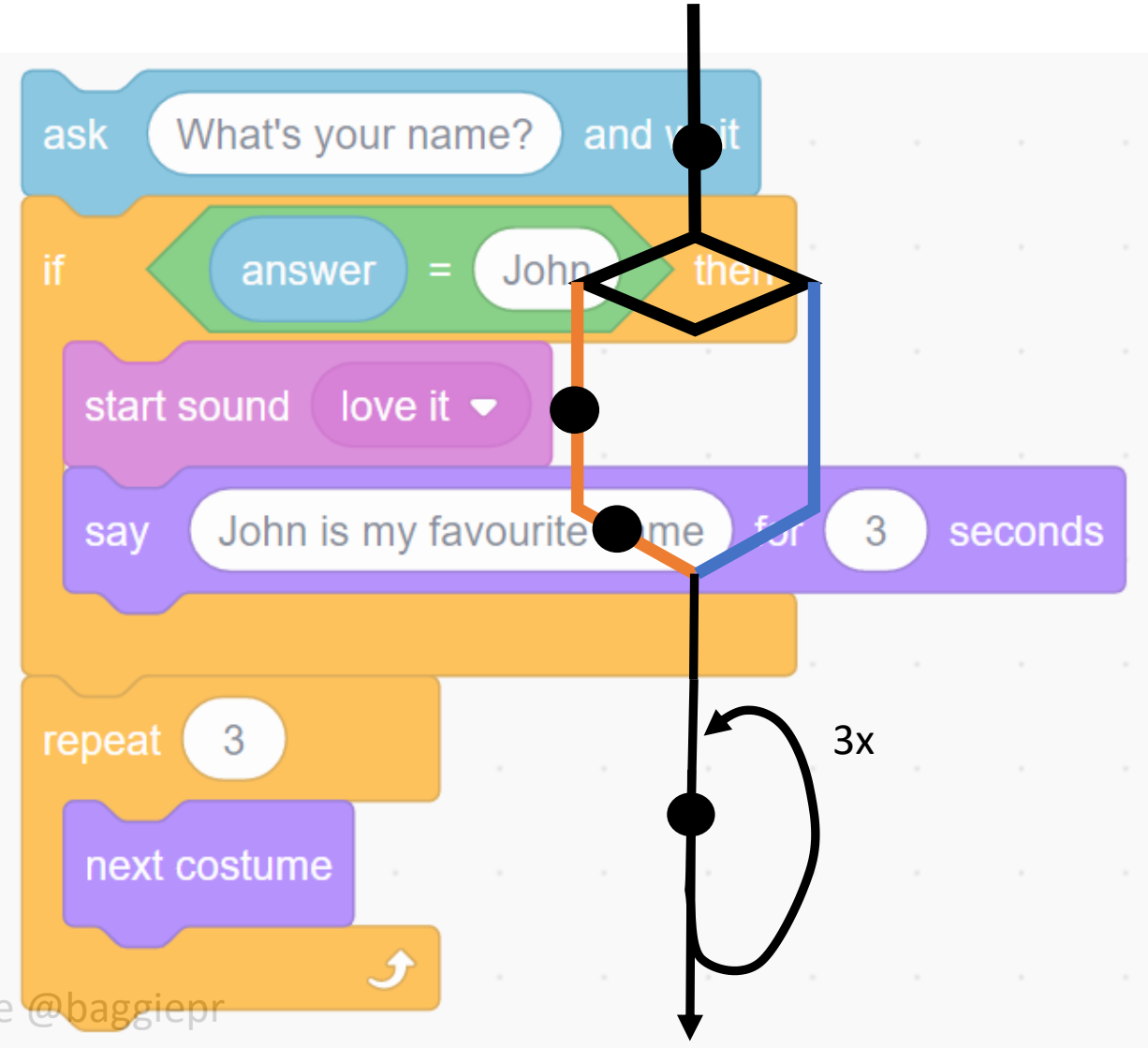
Condition-starts-action in code



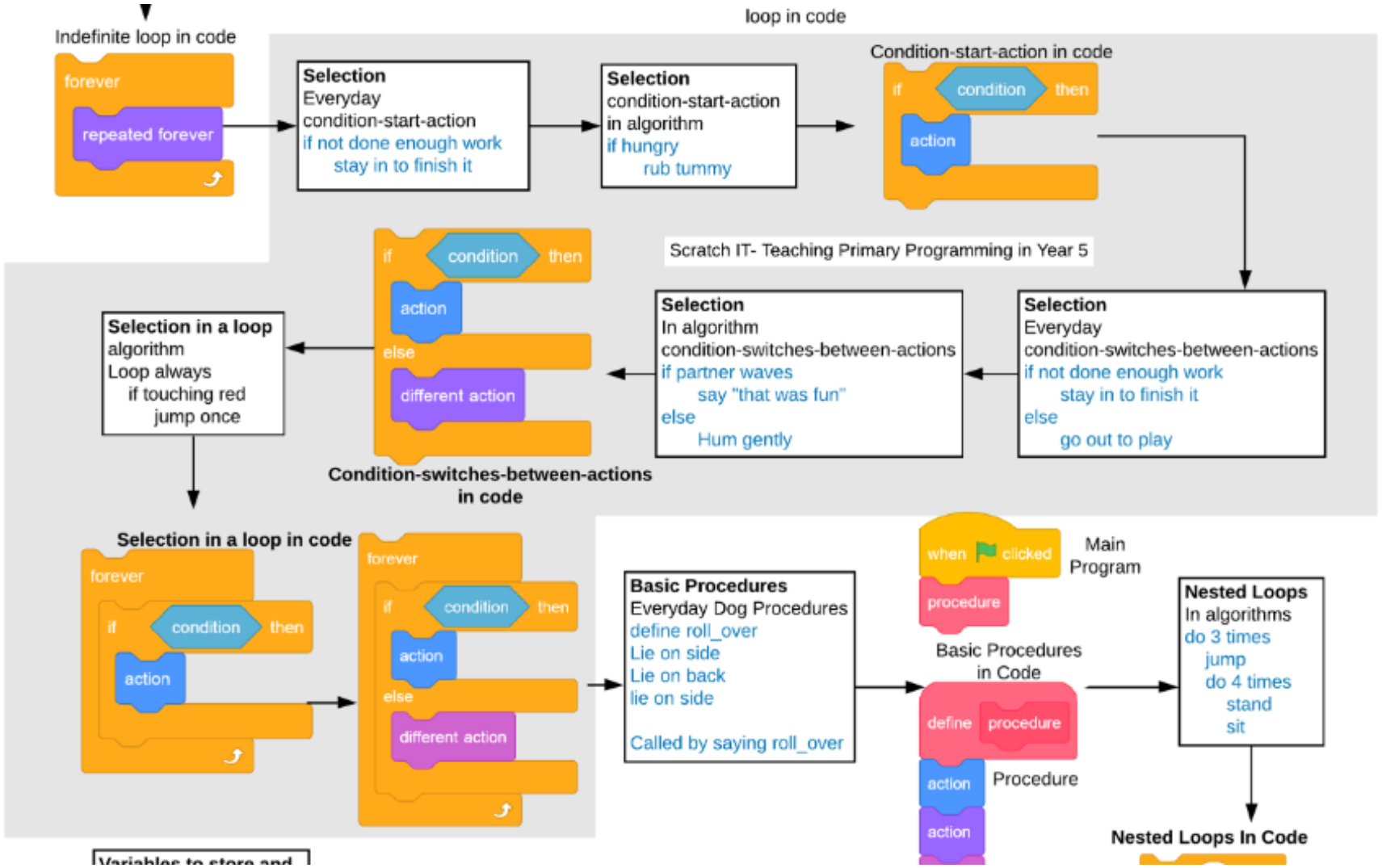
Flow of control in code



PRIMM Challenge

1. Predict Sheet first without your PC
2. Load Making choices on one computer between two teachers
3. Work together on Run, Investigate & Modify before marking these challenges
4. Finally on a computer each, Make

Progression



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Key Knowledge

Conditional selection knowledge

- Conditions can be met (true) or not met (false) there is no middle option
- A true of false condition branches outcomes into two paths
- A condition is only checked when it is reached in the flow of control

Extension

- *Conditions can be combined using AND or OR (Secondary)*
- *Conditions can be inverted using NOT (Secondary)*

Declarative knowledge

Static facts or knowledge stored in your memory (what)

Procedural knowledge

How to perform a specific skill or task (how)

Conditional Knowledge

When to use declarative and procedural knowledge (when & why)

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Key Knowledge

Declarative knowledge

Static facts or knowledge stored in your memory (what)

Procedural knowledge

How to perform a specific skill or task (how)

Conditional Knowledge

When to use declarative and procedural knowledge (when & why)

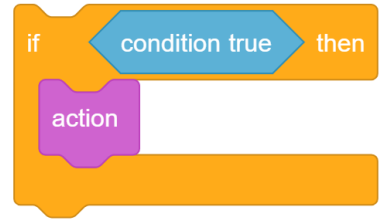
Conditional Selection Algorithmic Knowledge

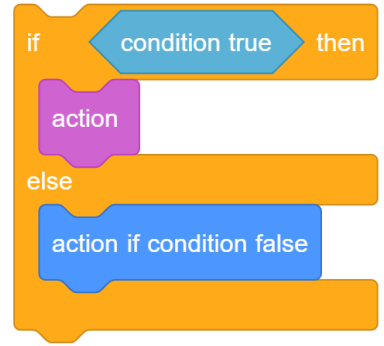
- I can indent actions that result from a condition being met or not met to separate them from actions not affected by selection
- I can use if to indicate that a condition will follow in my algorithm
- I can draw a flow of control diagram to show how a condition branches and what actions are on each branch

Conditional Selection Programming Knowledge

- I can use a **condition-starts-action** selection block to run code where a condition is true
- I can use a **condition-switches-between-actions** selection block to run code where a condition is true or false
- I can combine multiple **condition-starts-action** selection blocks to create multiple branches
- I can use a selection block within a forever loop to check a condition over and over again

Condition starts action





Condition switches between actions

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Understanding conditions start actions

Conditional selection

Abstract & complex meanings

A condition is anything that can be answered with true or false (yes or no)

Questions that have only two outcomes

Selection is about two pathways

Everyday conditions that start actions in wider world

Acting out teachers' everyday algorithms

Concrete and simpler meanings

Pupils introduced to condition starts action flow of control (notional machine)

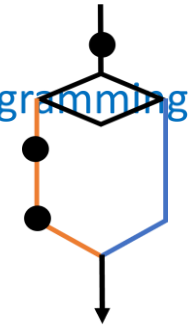
Pupils write own everyday algorithm that uses a condition starts action

Condition only checked when reached in flow of control

What a condition starts action looks like in code

Computers have a limited number of conditions we can use

Wave once
If you like programming
smile
tap head



Semantic Wave K Maton

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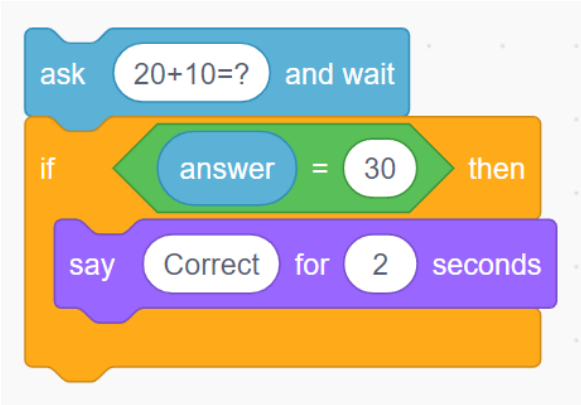
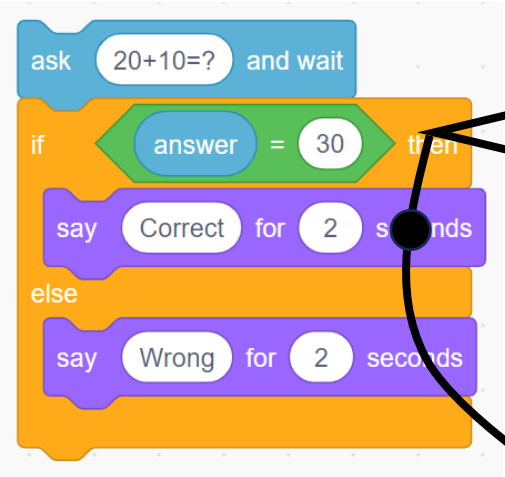
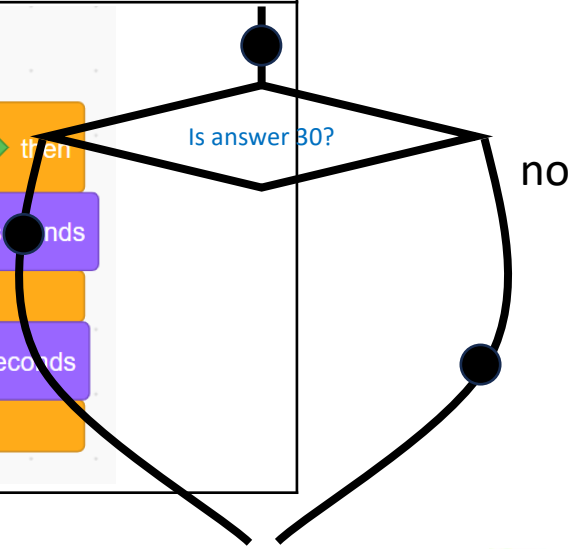
Conditions compared

	Condition start actions	Condition switches between actions
Algorithm	**If like chocolate** **say yum** **lick lips**	**If like chocolate** **say yum** **lick lips** **Else** **shake head**
Code		



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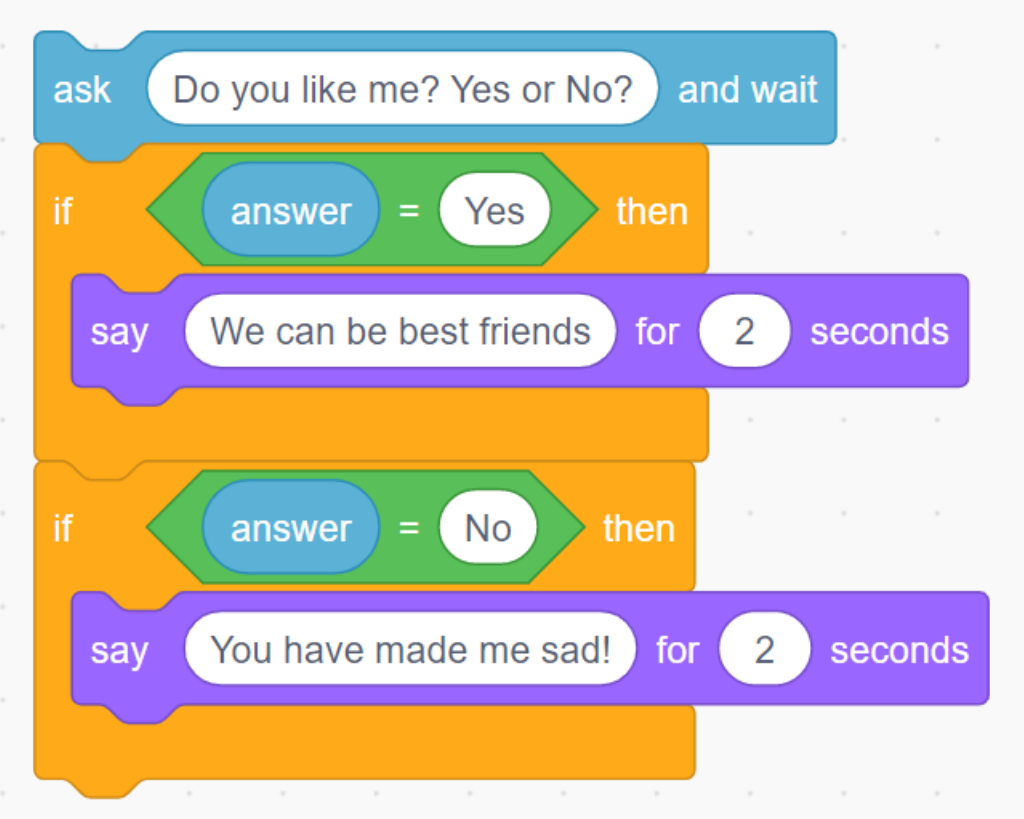
Conditions extended

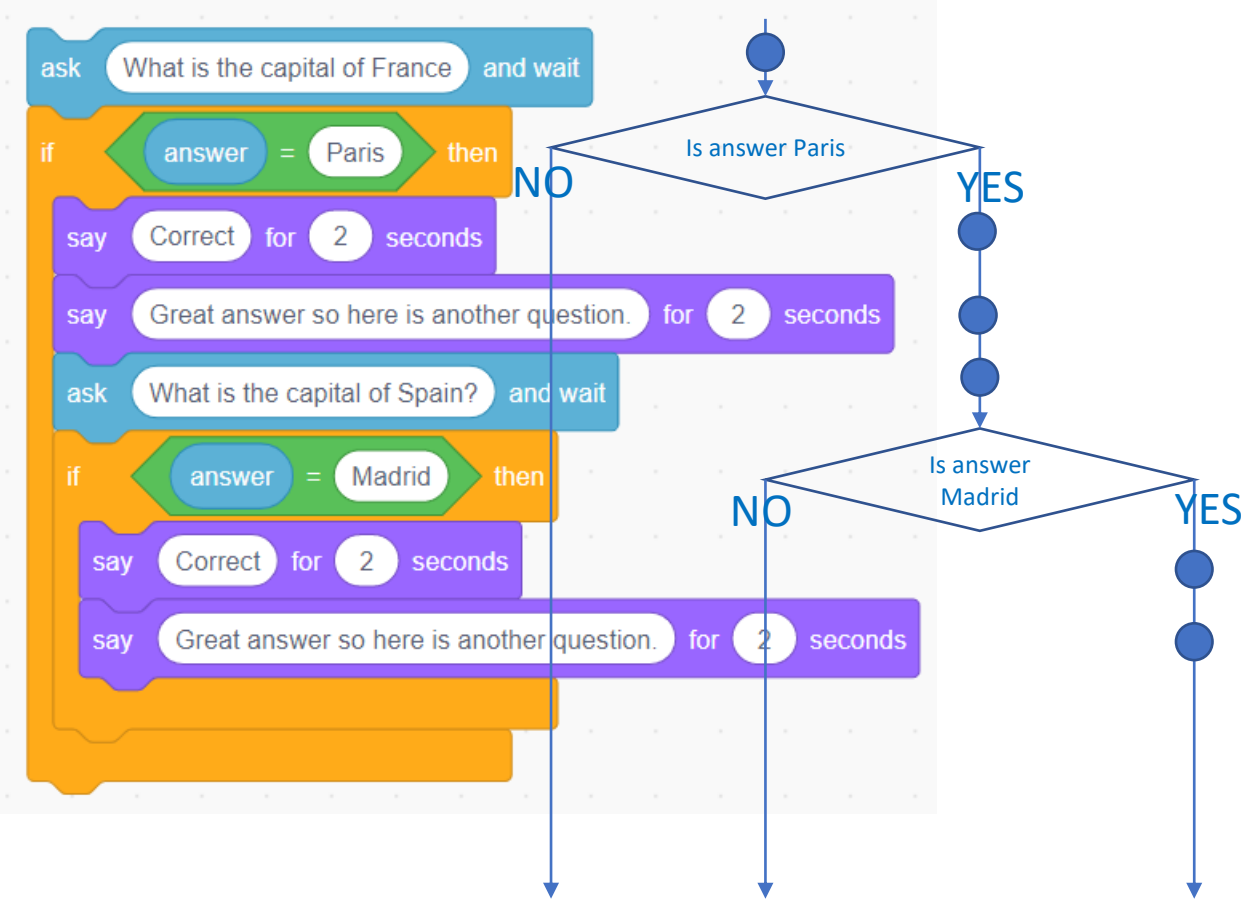


Data is checked by more than one condition

Is the answer the same as yes?

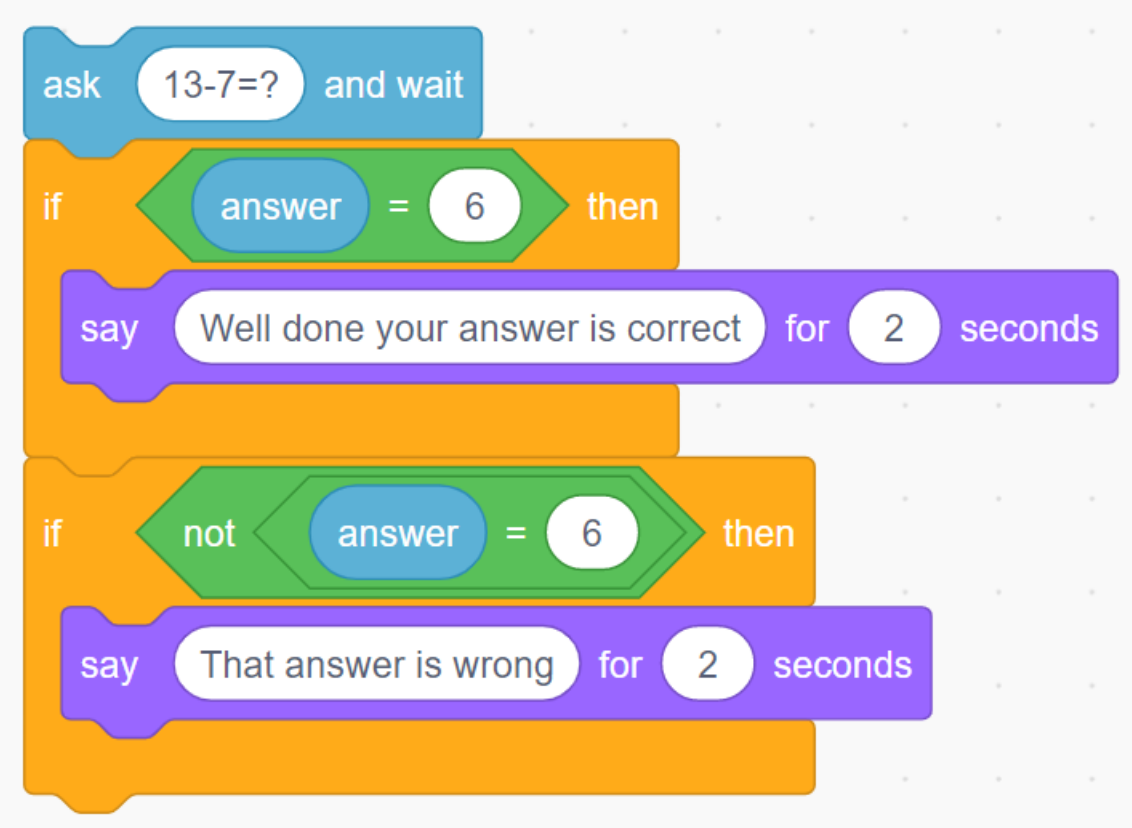
Is the answer the same as no?

Conditions extended (nested)



The second question is only asked if the first question is answered successfully

Conditions extended

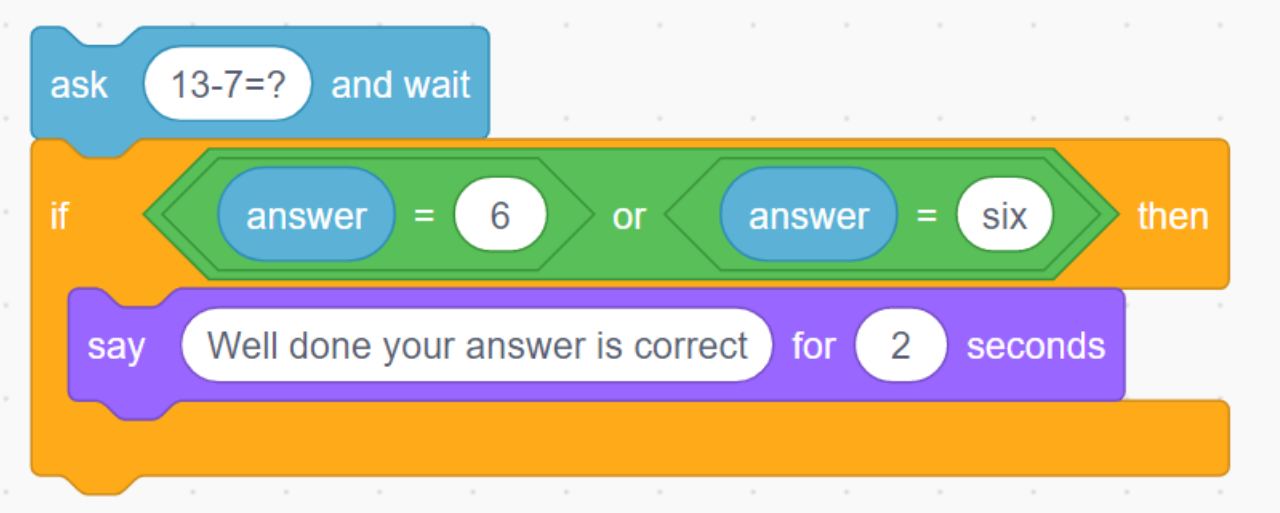


Not is used to reverse the condition

If the answer is NOT the same as 6

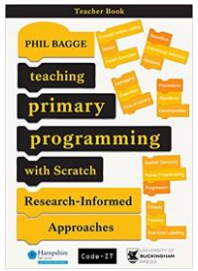
Acts like else

Conditions extended



OR is used to create multiple conditions where any condition OR any other condition can lead to action

Useful reading
Conditional
Selection p25



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Scratch Practical Conditions progress

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Aim	At start	At end
I know what conditional selection is and how it works in algorithm and programming		
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I know how to extend the conditional selection concept with students who are ready for more complexity		

Utilizing Memory Theory

Session Three

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Utilizing Memory Theory

Red	Little knowledge
Amber	Some knowledge
Green	Good knowledge

Aim	At start	At end
I know how I can utilize retrieval practice to aid student knowledge retention in programming		
I understand how the ‘levels of processing theory’ can be used to make programming more memorable		

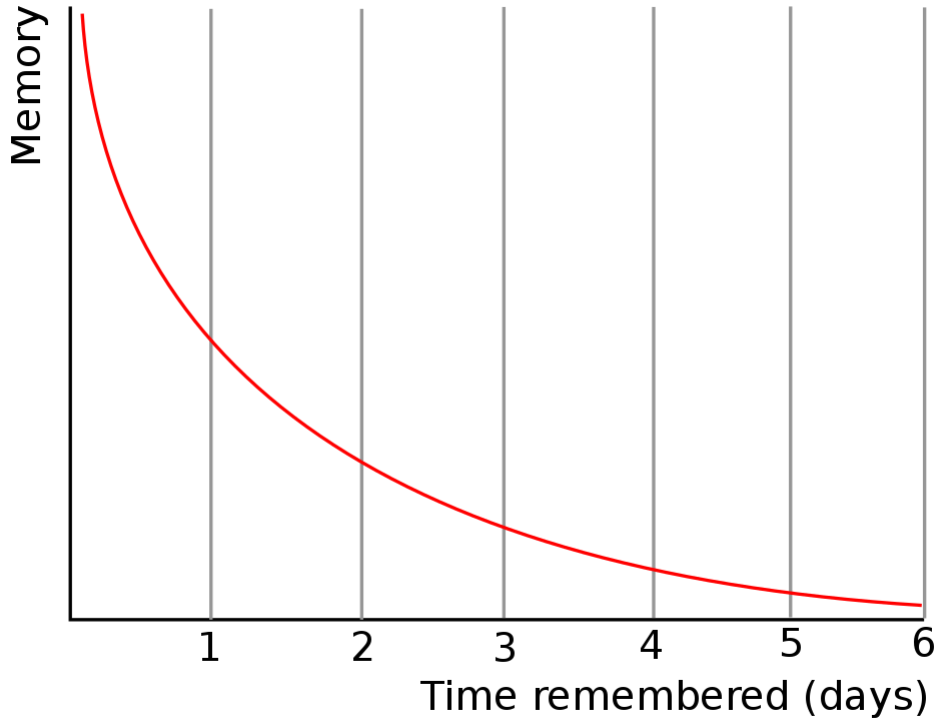
Ebbinghaus (1885) A Beginning

Memory decays over time

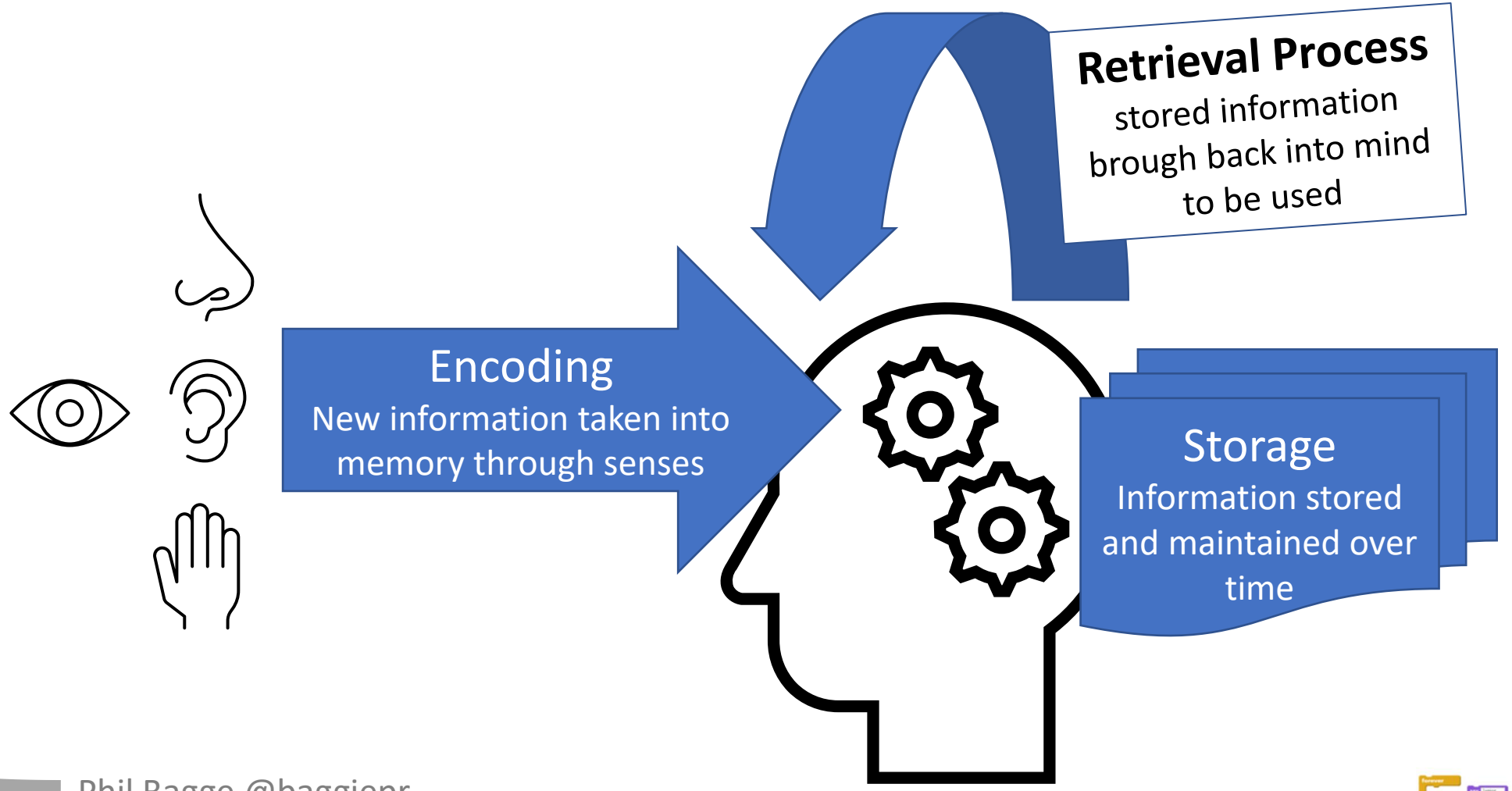
Speed of forgetting can be influenced by

- How meaningful material is
- How it is represented
- Stress
- Amount of sleep
- *Spaced retrieval*
- Mnemonics

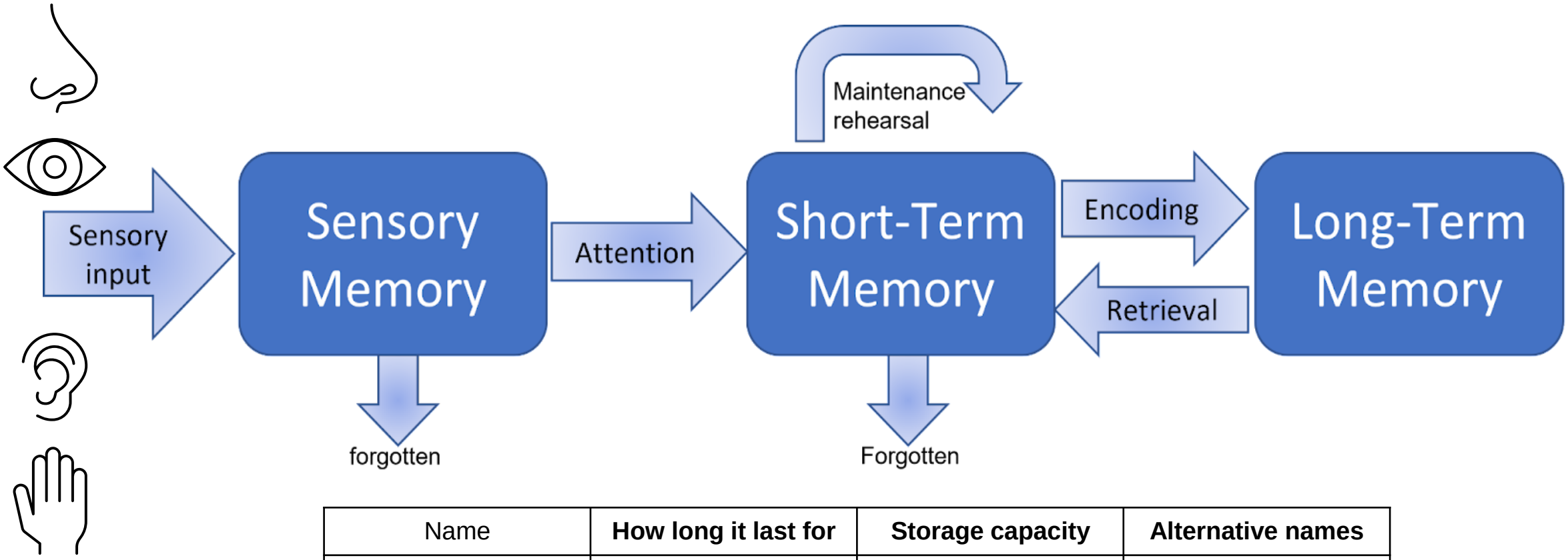
Forgetting Curve



General Memory Process Theory



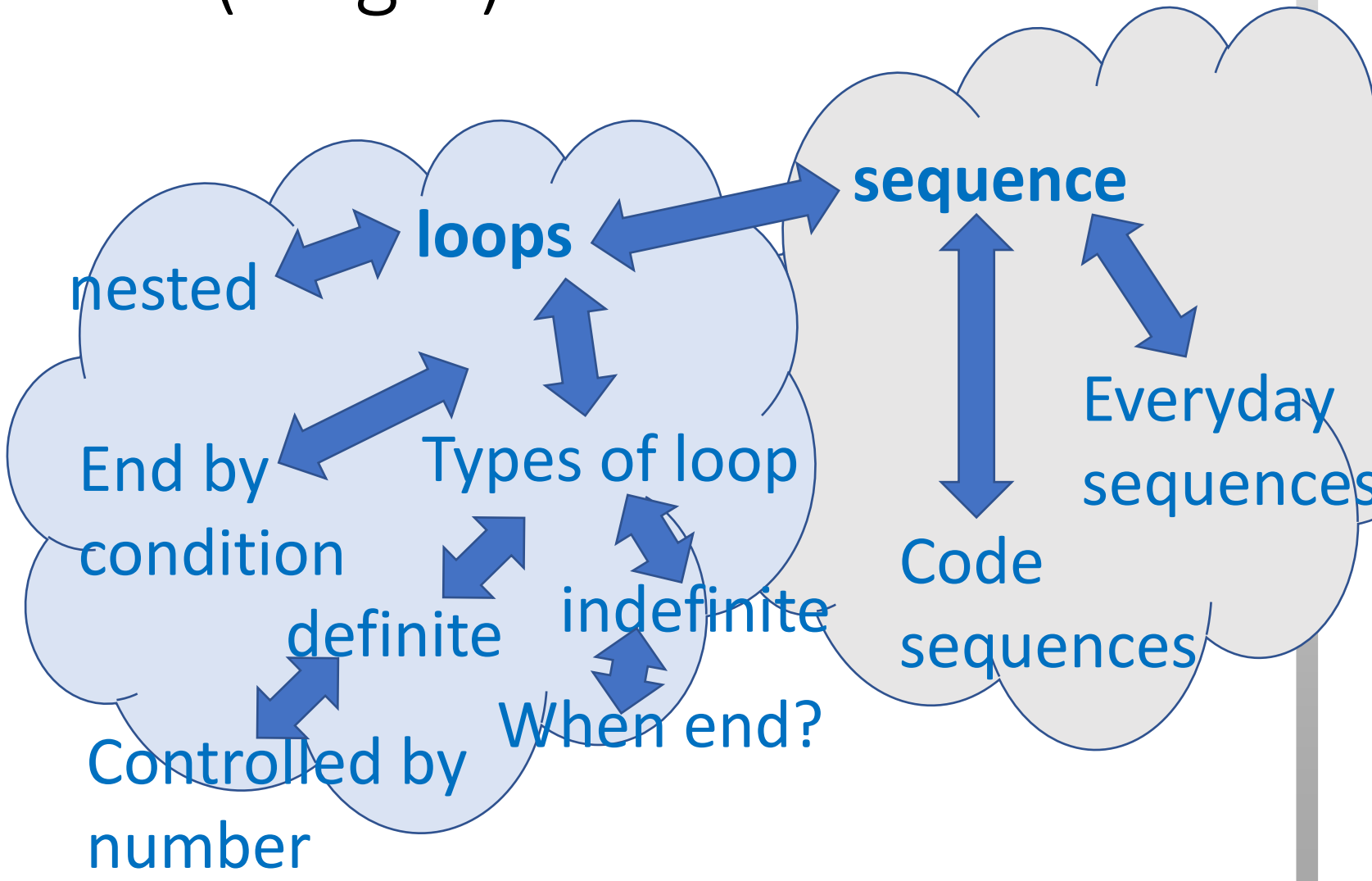
Atkinson-Shiffrin Model 1968+



Name	**How long it last for**	**Storage capacity**	**Alternative names**
Sensory memory	0.25-4 seconds	Very large	Sensory register
Short term memory	5-20 seconds	Between 5-9 items only	Working memory
Long term memory	Possibly until death	Unlimited but with operating restrictions	

Memory Schemas (Piaget)

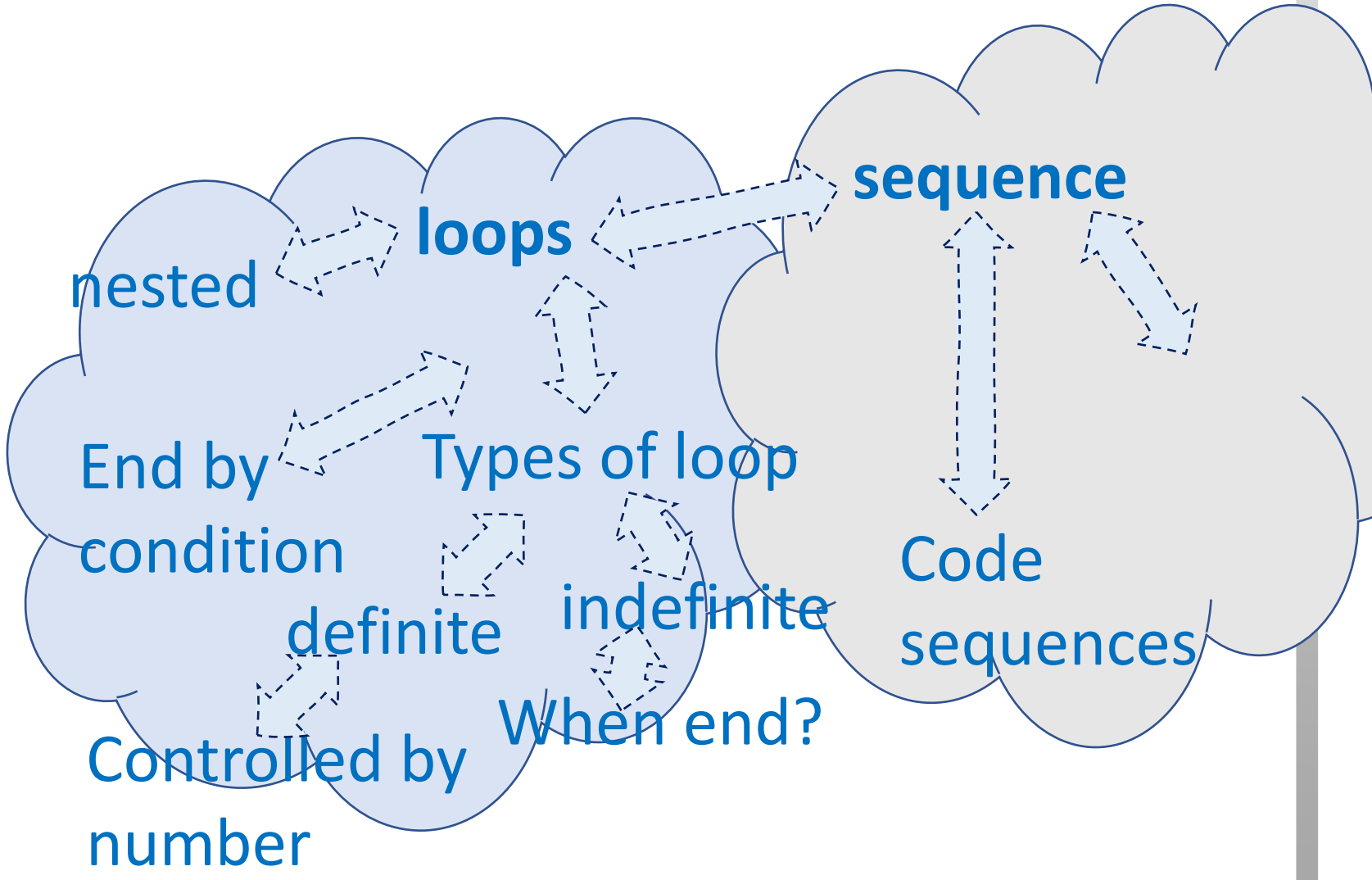
An organised group of past experiences and associations, which help inform decisions and make predictions



Ghosh and Gilboa, 2014; Hebscher et al., 2016)

Memory Loss

Thought to be the breaking down of the associations between items

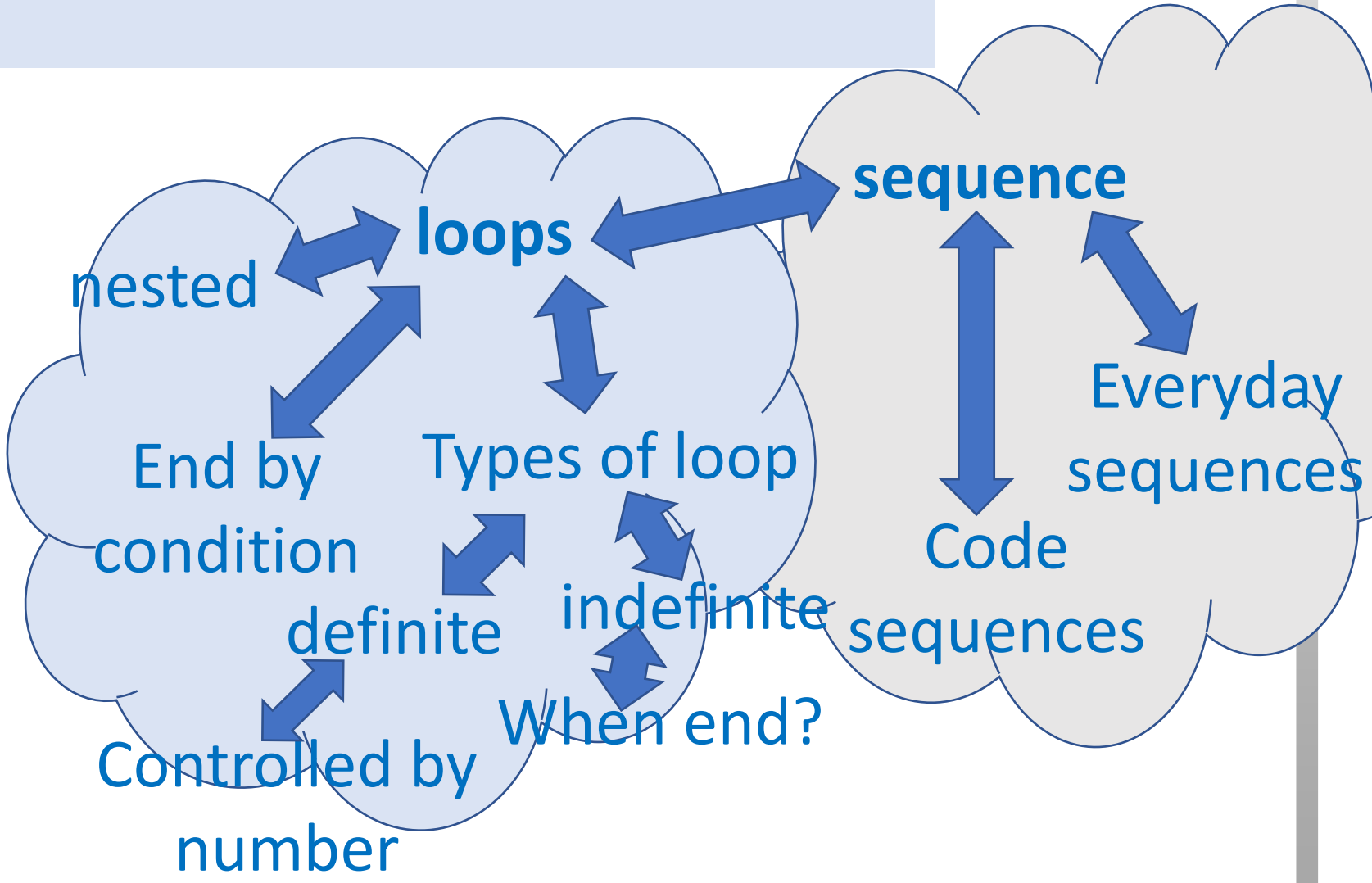


Ghosh and Gilboa, 2014; Hebscher et al., 2016)

Making it Memorable

When we can connect something old to something new it helps us better understand the new.

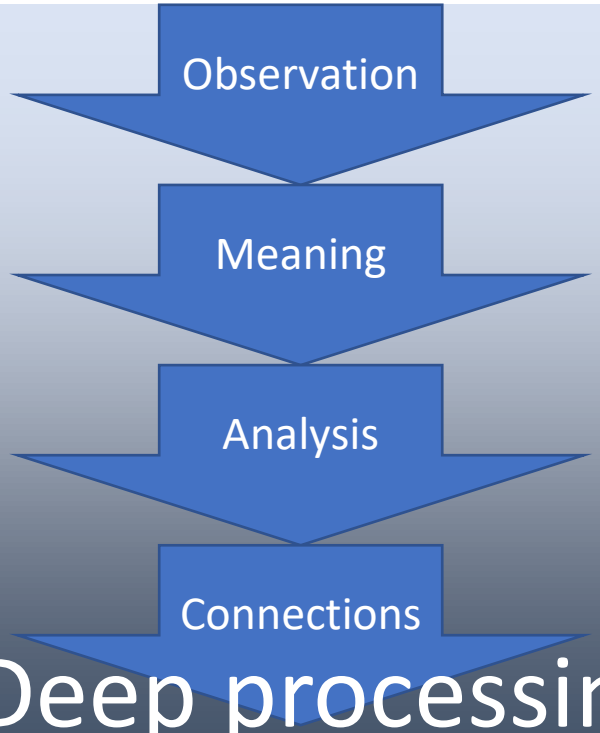
Piaget



Levels of Processing Theory

The ability to remember depends upon the depth of information processing. If the information is processed at a superficial and shallow level we forget things quicker. If the information is processed at a deeper level we will remember information for longer.

Shallow processing



Deep processing

Craik & Lockhart 1972

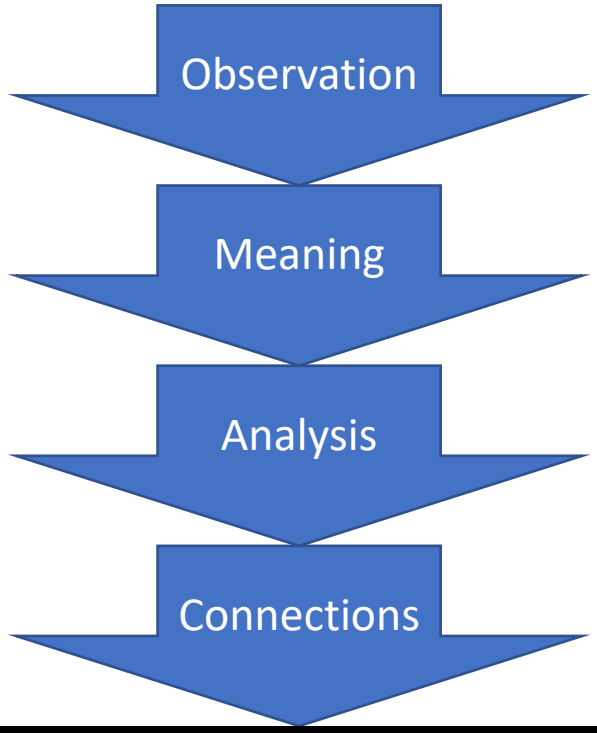
Making it Memorable

When we provide analysis of why we do things (conditional knowledge) we are strengthening memories.

Flow of control

Definite and indefinite loops

Speed of programming instructions



Deep processing

Craik & Lockhart 1972

SYNTHESIS PROMPT: WHAT DID I LEARN?

A synthesis prompt asks students to articulate the new connections, or new insights, that have helped expand their existing schema (knowledge/concept base). An indicator of synthesis is the ability to extend to successfully transfer new learning to a different context or problem (Donovan & Bransford, 2005).

Generalized questions...

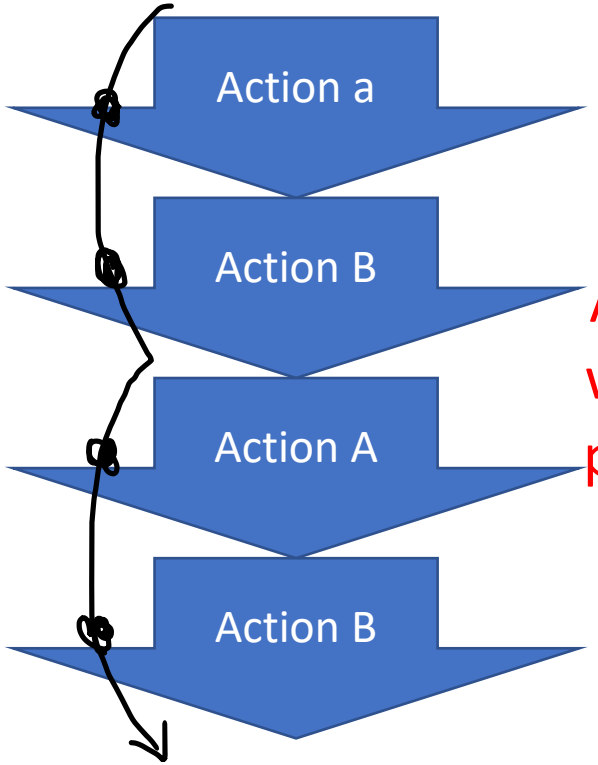
- How do I summarize the big ideas in my new learning?
- How do I connect the big ideas in my new learning to one another?
- How does my new learning connect to my old learning?
- What do I understand about my old learning because of my new learning?
- What did I learn? Why does it matter?
- What new questions do I have?

Explicitly prompts students to ...

- Distil and summarize the big ideas and concepts as the first step of synthesis
- Connect big ideas and concepts to one another
- Develop expert schema by integrating prior learning about concepts and topics with new learning
- Answer existing inquiry questions and generate new inquiry questions.
- Describe how our thinking about concepts and topics has changed as a result of new learning
- Predict how our new learning about concepts, skills, and topics will be helpful in the future, or for the next stage of learning

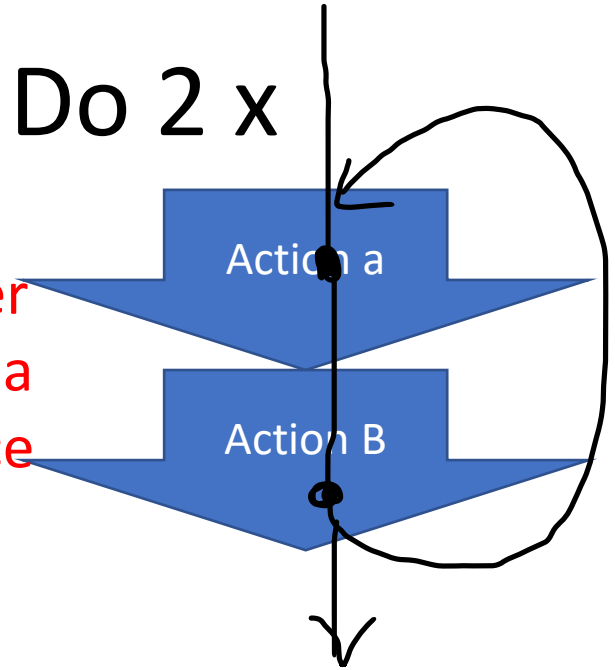
How does my new learning connect to my old learning?

Sequence

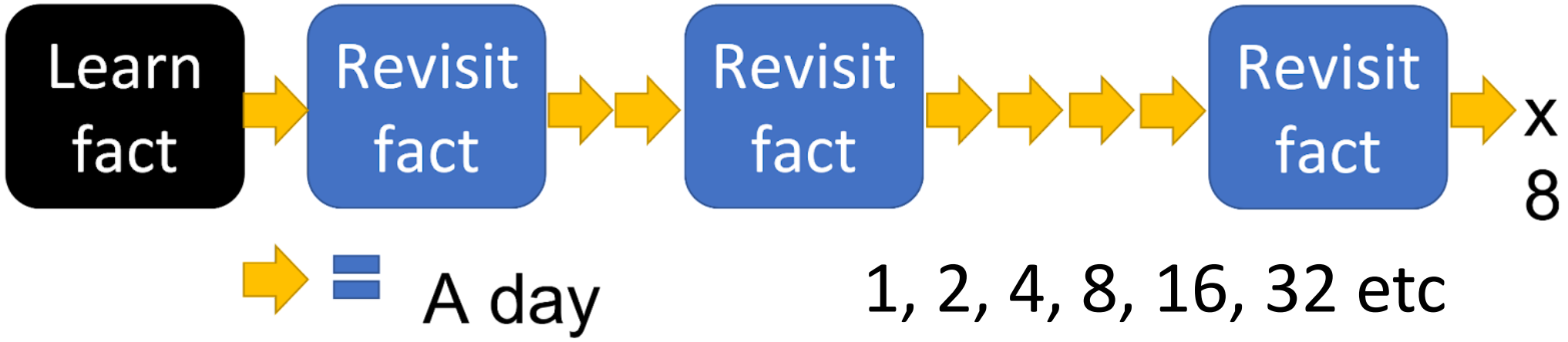


A loop is just another way of representing a pattern in a sequence

Loop



Spaced Retrieval



Memory decay can be stopped by spaced retrieval

Ebbinghaus

Modern Retrieval Practice Theory

Learned knowledge is there in long term memory but it is hard to recall it when we need it. **Retrieving knowledge regularly** helps us remember it

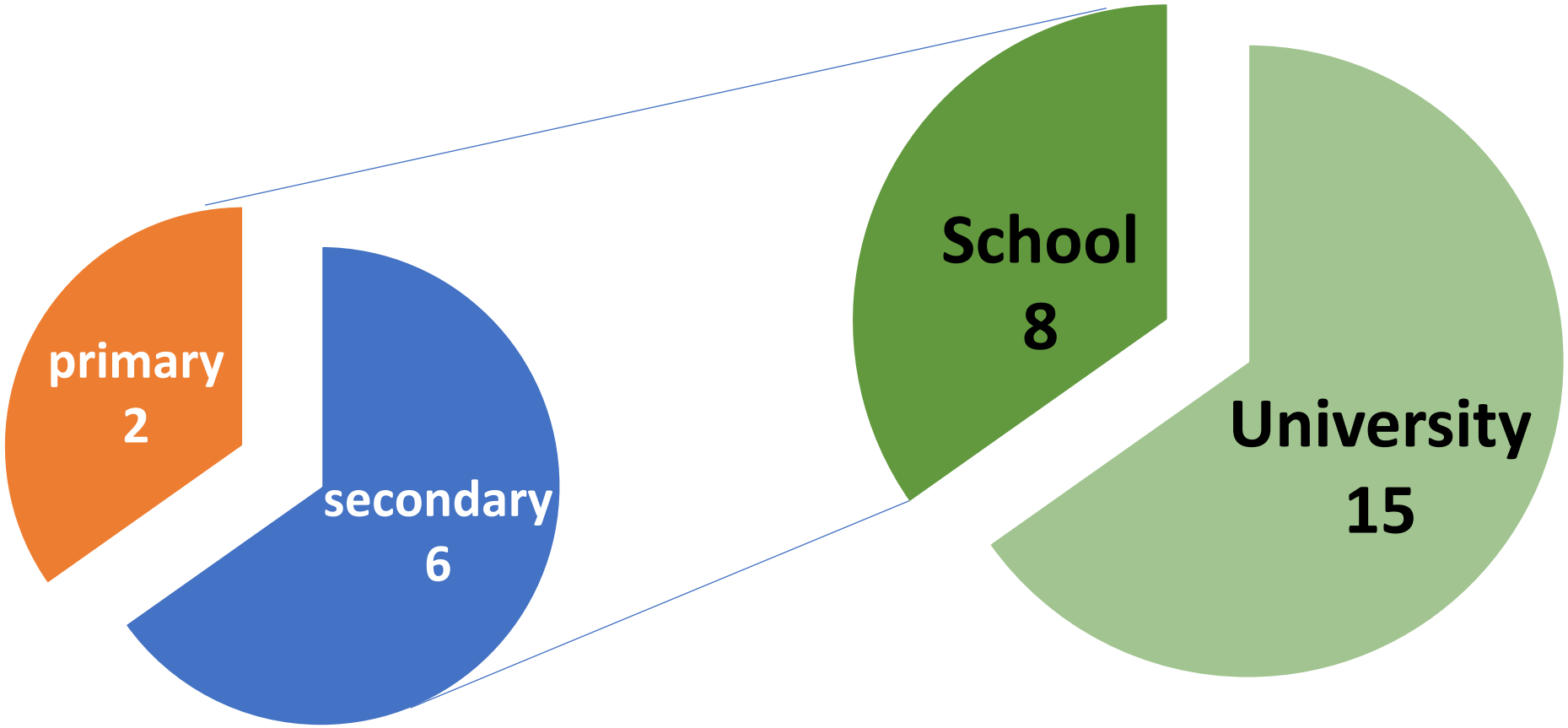
Most efficient method of spaced retrieval is as an **expanding sequence**

Retrieved information becomes more easy to retrieve the **more we retrieve it**

Retrieval practice **tests** are more efficient that just rereading information

If pupils are tested on knowledge they **profit** in memory terms from retrieving it

Education based research



Moreira (2019)

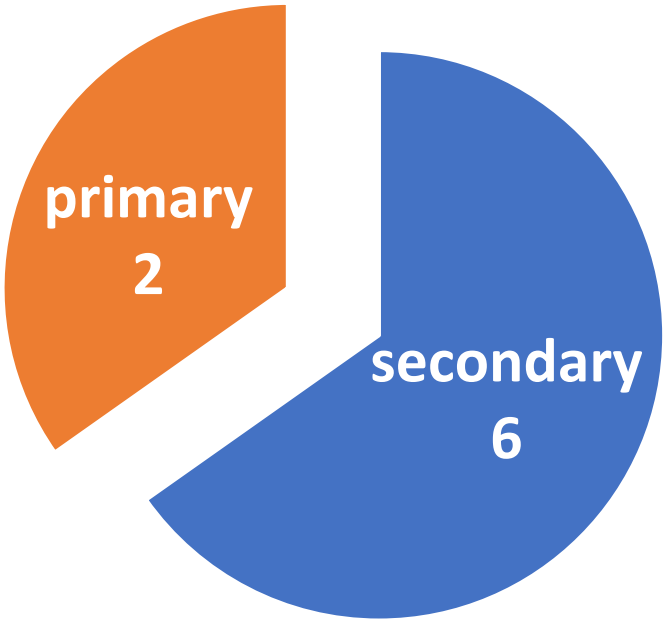
Education based research findings

Retrieval practice can be used reliably in an educational setting

Beneficial in short and long term periods

Short answer tests were not beneficial for retrieval purposes in primary settings without comprehensive feedback *(are pupils benefiting from retrieval or good feedback?)*

No one examined benefits for pupils of different ability



Moreira (2019)

Retrieval practice programming examples

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Ways to keep programming knowledge alive when we are not teaching it

- Occasional quick quizzes
- Everyday algorithms

Class rules as an algorithm

```
If interrupting leaning
    If first time
        give verbal warning
    if second time
        give detention
```

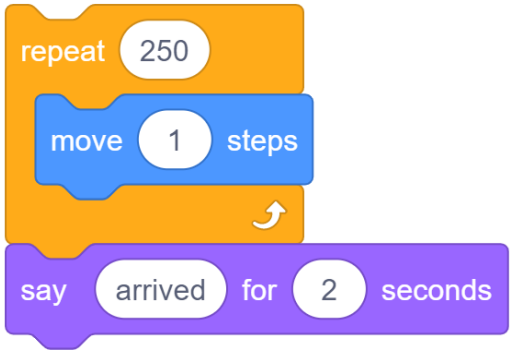
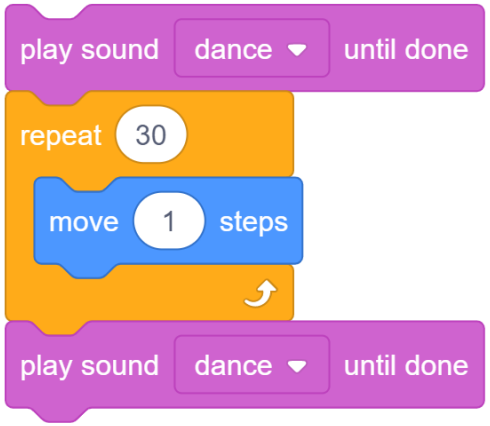
Class Procedures

```
Stop work
Tidy class
If no club in classroom
    stack chairs
Line up
Go home
```

Circle the words that mean a loop is starting

Underline the actions that are inside the count-controlled loop

Sing happy birthday
Loop three times
  Shout hoorah
Sit down
Eat birthday cake
	Pick up drum stick
	Loop 10 times
	  Hit drum
	Put down drum stick
		Walk forward one step
		Turn right 90 degrees
		Walk forward one step
		Turn left 90 degrees
		Walk forward one step
		Turn right 90 degrees

Stand
Loop 100 times
  Point up
  Jump
  Point down
  Jump
Sit
		

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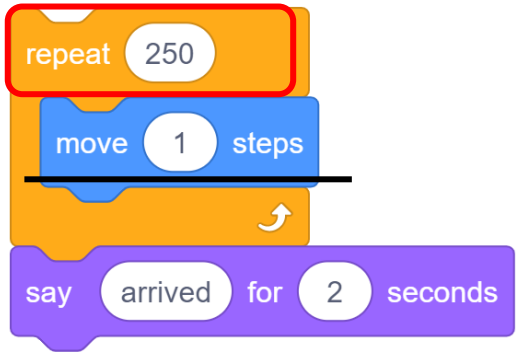
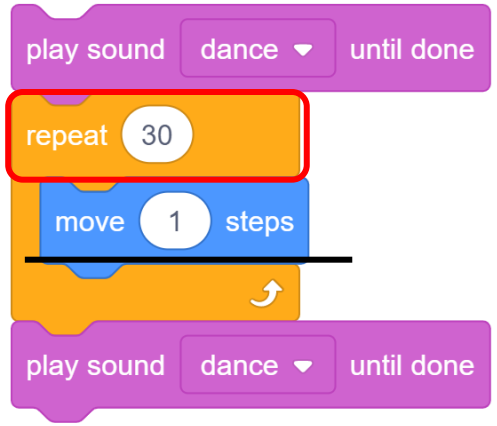
Circle the words that mean a loop is starting
Underline the actions that are inside the count-controlled loop

Sing happy birthday Loop three times Shout hoorah Sit down Eat birthday cake	Pick up drum stick Loop 10 times Hit drum Put down drum stick	Walk forward one step Turn right 90 degrees Walk forward one step Turn left 90 degrees Walk forward one step Turn right 90 degrees
Stans Loop 100 times Point up Jump Point down Jump Sit		

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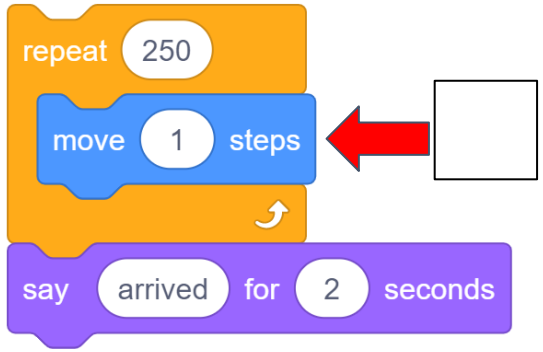
How many times will the action run?

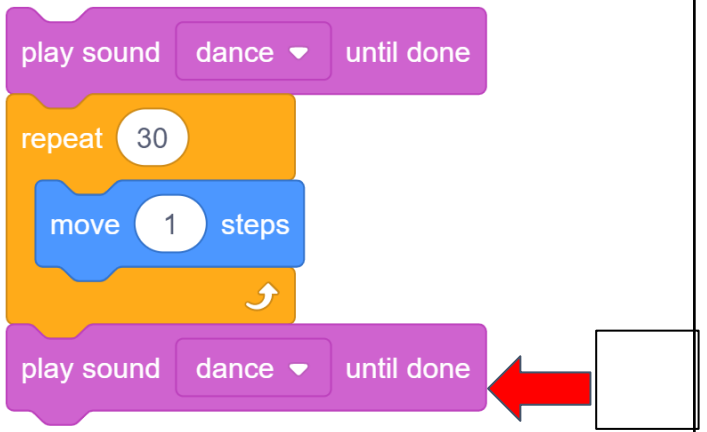
Sing happy birthday
Loop three times
    Shout hoorah
Sit down
Eat birthday cake

Pick up drum stick
Loop 10 times
    Hit drum
Put down drum stick

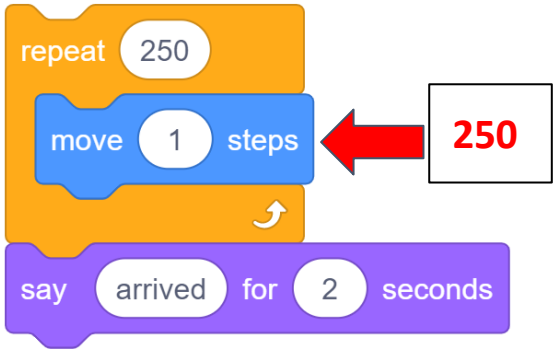
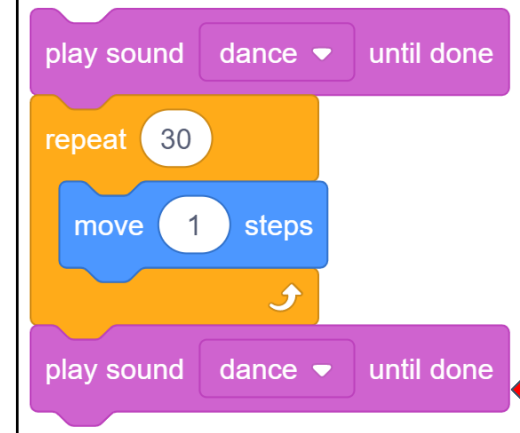
Walk forward one step
Turn right 90 degrees
Walk forward one step
Turn left 90 degrees
Walk forward one step
Turn right 90 degrees

Stand
Loop 100 times
    Point up
    Jump
    Point down
    Jump
Sit

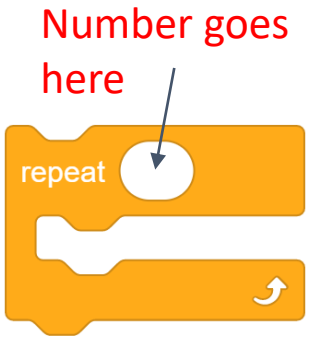




How many times will the action run?

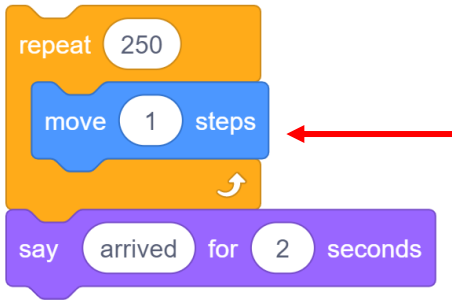
Sing happy birthday Loop three times Shout hoorah Sit down Eat birthday cake **3**	Pick up drum stick Loop 10 times Hit drum Put down drum stick **10**	Walk forward one step Turn right 90 degrees Walk forward one step Turn left 90 degrees Walk forward one step Turn right 90 degrees **1**
Stans Loop 100 times Point up Jump Point down Jump Sit **100**	 **250**	 **1**

Tick the programming plans that **could** use a count-controlled loop



Programming Plan	Tick if it could use a count-controlled loop
A program to draw a regular five-sided shape	
A program to make a ghost sprite flash ten times	
A program to have a conversation between two characters	
A program to make a toy car move 250 steps to the end of the screen slowly and then stop	
A program to say how good a football team is	

Tick the programming plans that **could** use a count-controlled loop



Programming Plan	Tick if it could use a count-controlled loop
A program to draw a **regular five-sided** shape	✓
A program to make a ghost sprite flash **ten times**	✓
A program to have a conversation between two characters	
A program to make a toy car move 250 steps to the end of the screen slowly and then stop	✓
A program to say how good a football team is	

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True or False?

	True	False
A loop is a sequence of instructions that are repeated		
Indefinite means that we won't know how many times a loop will run		
Definite means we do know how many times a loop will run		
A **count-controlled loop** ends after the count is finished and is a definite loop		

CC BY NC ND

True or False?

	True	False
A loop is a sequence of instructions that are repeated		
Indefinite means that we won't know how many times a loop will run		
Definite means we do know how many times a loop will run		
A **count-controlled loop** ends after the count is finished and is a definite loop		

CC BY NC ND

Supporting Learners

Session Four

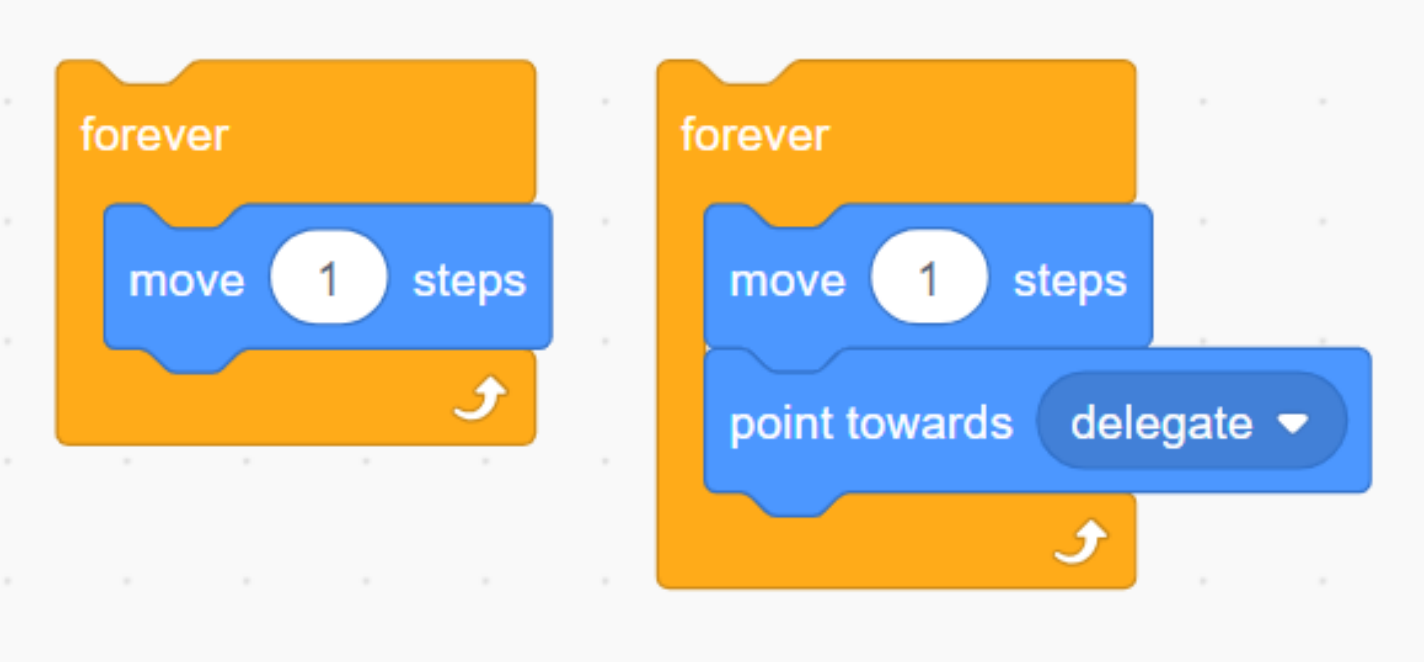
Phil Bagge @baggiepr

Supporting learners

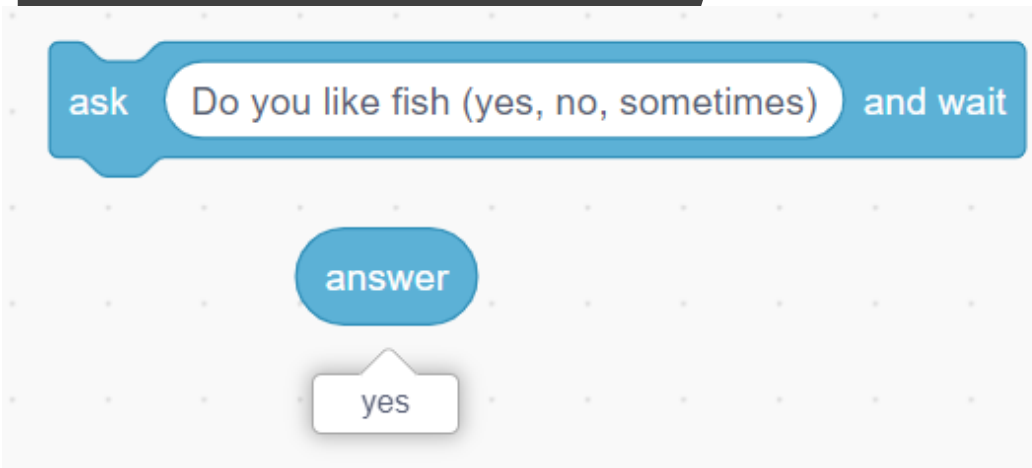
Red	Little knowledge
Amber	Some knowledge
Green	Good knowledge

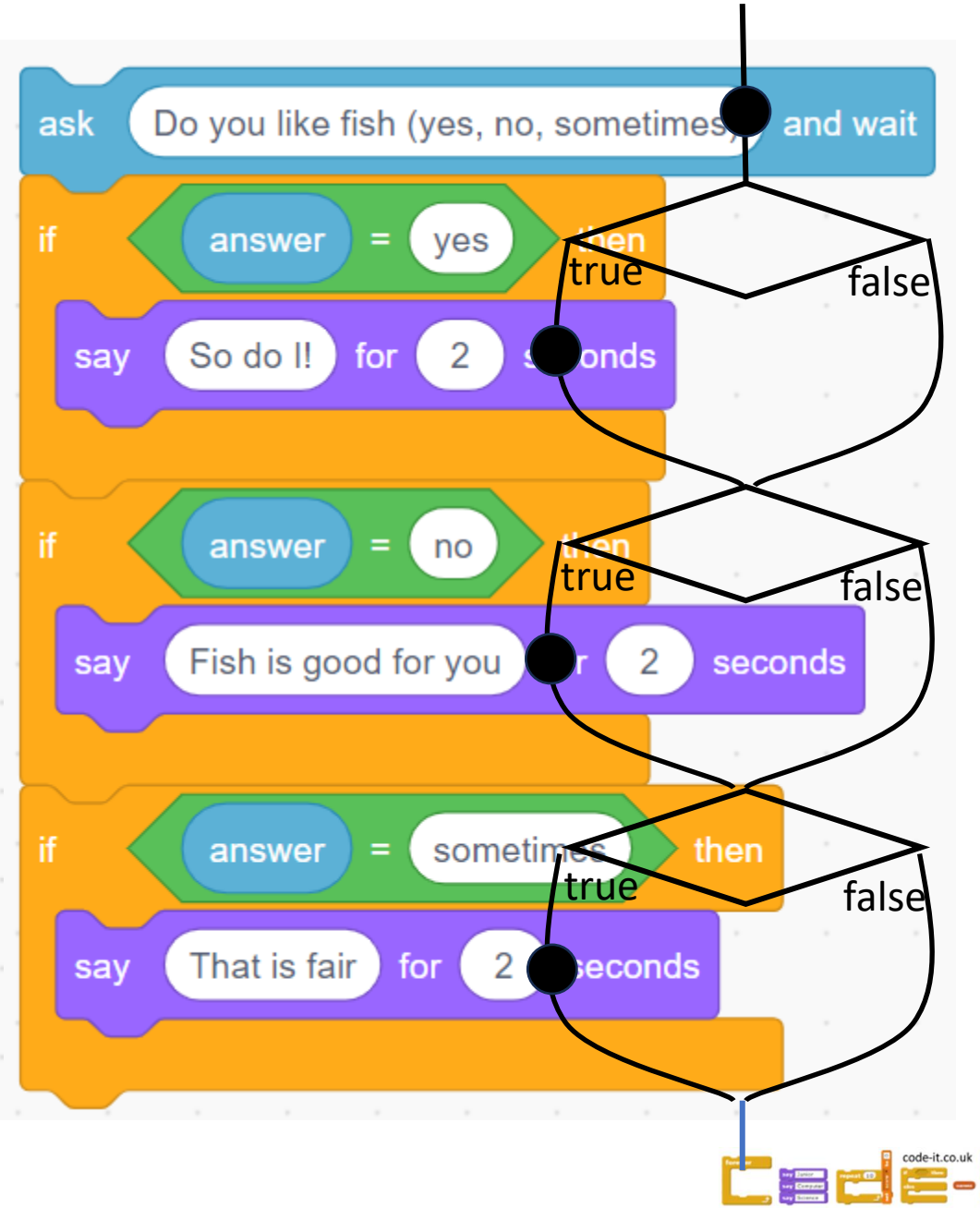
Aim	At start	At end
I can identify learners who might have additional needs in computing		
I know how to deploy a range of strategies to support learners with additional needs		

Concrete to explain abstract



Trace and explain



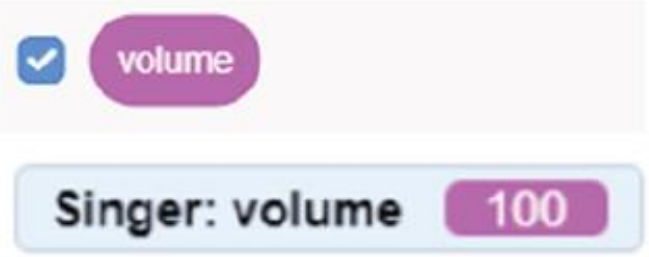


More clues

Of more use to younger programmers is the size value.

Hidden Sound Variables

Volume



Hidden Motion Variables

In the motion blocks we have x position, y position and direction.

These will display on the screen as shown below.

Read code aloud

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Support copy code cards

Change Backdrop

You will need to import some backdrops first or draw your own

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Scratch Dressing Up Extension Cards

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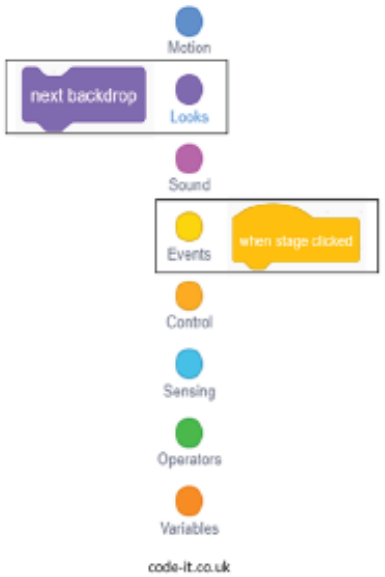

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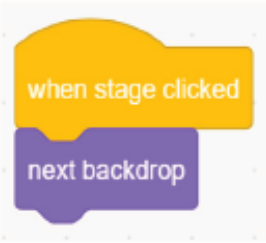

Parsons support cards

Scratch
Crab Maze
Support
Card

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Steering

Turn right or left when a key is pressed

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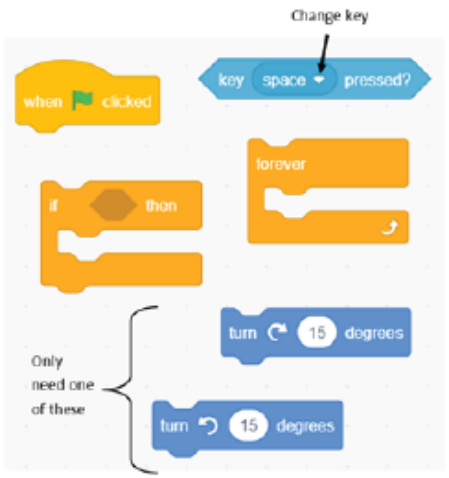

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What additional needs have your pupils had?

dyslexia

sensory

Global

EAL

physical

development

delay

Autism

dyspraxia

?

trauma

Delayed Language

Development

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English as an additional language

Helpful EAL Knowledge

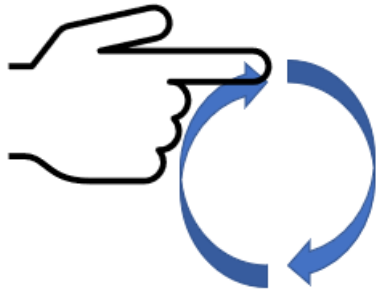
- Bilingual learners have a smaller vocabulary in each language than monolinguals, but their total vocabulary is comparable.
- Teachers are often hesitant to enable students to communicate in a language they do not understand. However, studies have shown that when young bilingual learners are encouraged to communicate with one another, their motivation increases.
- Code switching (the use of two or more languages in one conversation or even one sentence) is an effective way for bilingual learners to communicate, but is often not accepted

Paired programming

If you have another child who speaks the same first language as your new EAL pupil and is much further along in their language learning, pair them together.

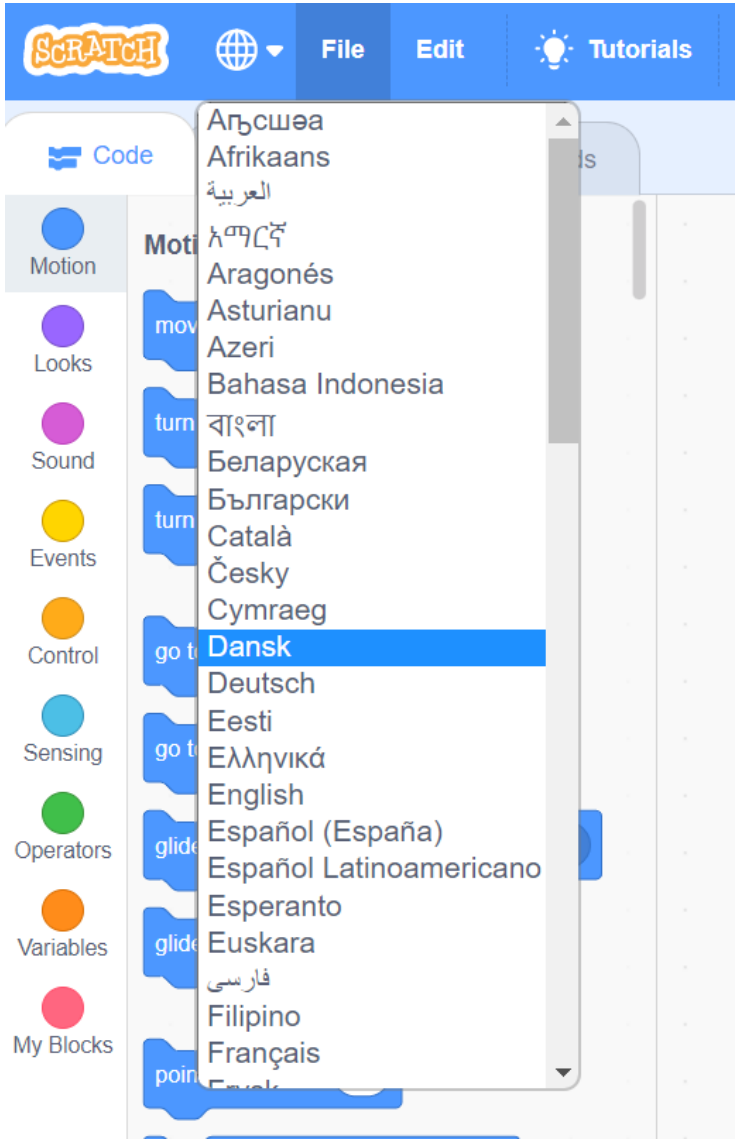
General EAL Presenting information

- Face to face with EAL pupils
- Use exaggerated gestures alongside words
- Single step instructions
- Visuals help



Translate Scratch

If you are demonstrating Scratch programming, change the language after each demonstration snippet so that your EAL pupil can use this to increase understanding.



Flipped learning

Create an area on your learning platform with common EAL computing resources

Share that with your EAL pupil so they can access it at home

Autism spectrum disorder (ASD)

Autism spectrum disorder (ASD) is a developmental disability that affects an individual's

- Social communication
- Interaction abilities

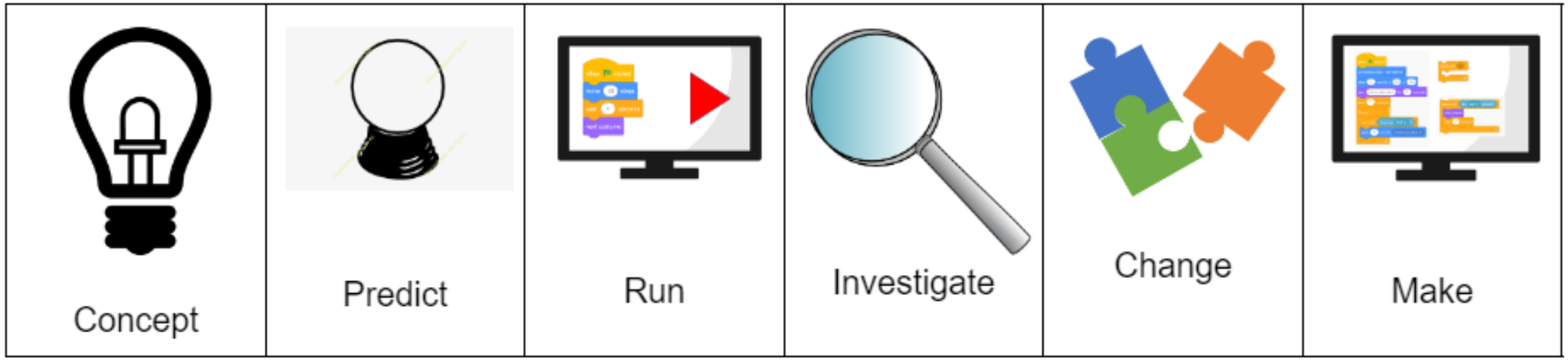
Tends towards restricted or repetitive behaviours or interests.

Differences in the brain are the root cause of ASD. Approximately 1% of the children in our schools are on the spectrum1.

Avoid over busy workspaces / IT suites
Keep a low distraction corner

Structure

Computing lessons that follow a clear, predictable structure will benefit autistic children



PRIMM Module organisation shared with autistic child

Standing Desks

Many teachers report autistic children coping better in a class if they are allowed to stand for some of the time. Desks that can be lowered and raised can be used for computing by an autistic child and other pupils.

Suite design

Limit paired programming interaction

Whilst paired programming would be beneficial for autistic pupils to develop social interaction it is often too long an interaction to be beneficial. I recommend encouraging collaboration for a single element such as prediction in PRIMM

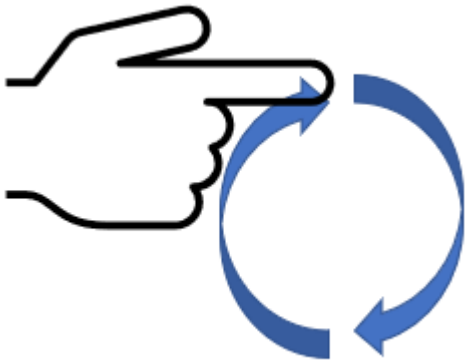
Developmental Language Disorder (DLD)

DLD refers to **persistent challenges in comprehending and/or expressing spoken language** across all languages used by a child. Its cause remains unknown. Emotional issues or insufficient language exposure are not the root causes of DLD.

Clear concise instructions

Facing the child or children and adding appropriate face or hand actions to support our instructions.

If we are reading through the steps of an algorithm, we can act it out as we demonstrate



Actions for…..

- Sequence
- Loops
- Conditional selection
- Variables
- Procedures

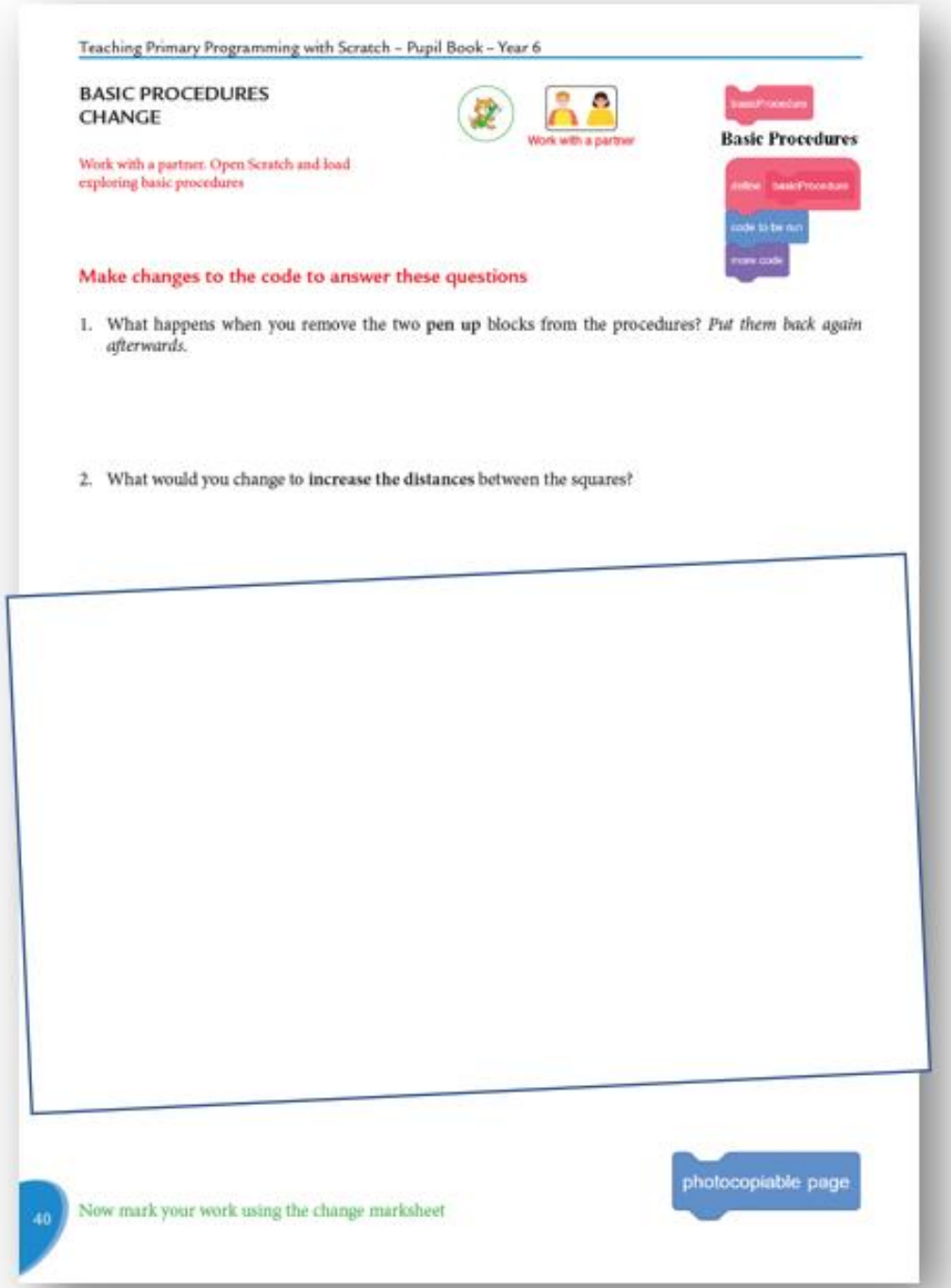
- Bold
- Italic
- Align right/left/centre
- Font
- Text size

- Saving
- Loading
- Naming
- Copy
- Paste

Repeat when 1 to 1

Once the class has begun an independent task the child with DLD will benefit from a personal repetition of the key instructions in the shortest most explicit language.

Cover up



Teaching Primary Programming with Scratch – Pupil Book – Year 6

BASIC PROCEDURES CHANGE

Work with a partner

Work with a partner. Open Scratch and load exploring basic procedures

Basic Procedures

Make changes to the code to answer these questions

1. What happens when you remove the two **pen up** blocks from the procedures? *Put them back again afterwards.*

2. What would you change to **increase the distances** between the squares?

photocopiable page

40

Now mark your work using the change marksheet

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Paired work helps pupils with DLD

The advice for pupils with DLD is to encourage opportunities for them to talk with their classmates. To encourage children with and without DLD to talk to each other. Studies show that the child with DLD will show language growth and there will be no negative effects for the child without DLD.

Paired programming, which has a good research base in educational programming research, where two children work together as navigator and driver to understand, design and create programming. This is a great opportunity to carry out meaningful talk in the classroom with children with DLD.

Dyslexia

Dyslexia affects word reading and spelling
phonological awareness
verbal memory
verbal processing speed
Dyslexia occurs across the range of intellectual abilities

Different ways to do tasks

Adapted from a problem solving rubric created by Mark Dorling & Thomas Stephens hosted at http://code-it.co.uk/attitudes/

Culture where pupils can ask for support

Important that pupils feel they can ask for help in a computing lesson once they have exhausted other methods of support.

Our friendliness and positive attitude will support all students, including our dyslexic ones.

You know you can always ask for a hint once you have thought about it yourself and you know I will not be cross if you ask

Multisensory approaches

Reading, listening, watching, touching an object, physically moving about the room, or employing gestures are all examples of multisensory activity

Concrete to explain abstract is a good strategy to use for dyslexic students

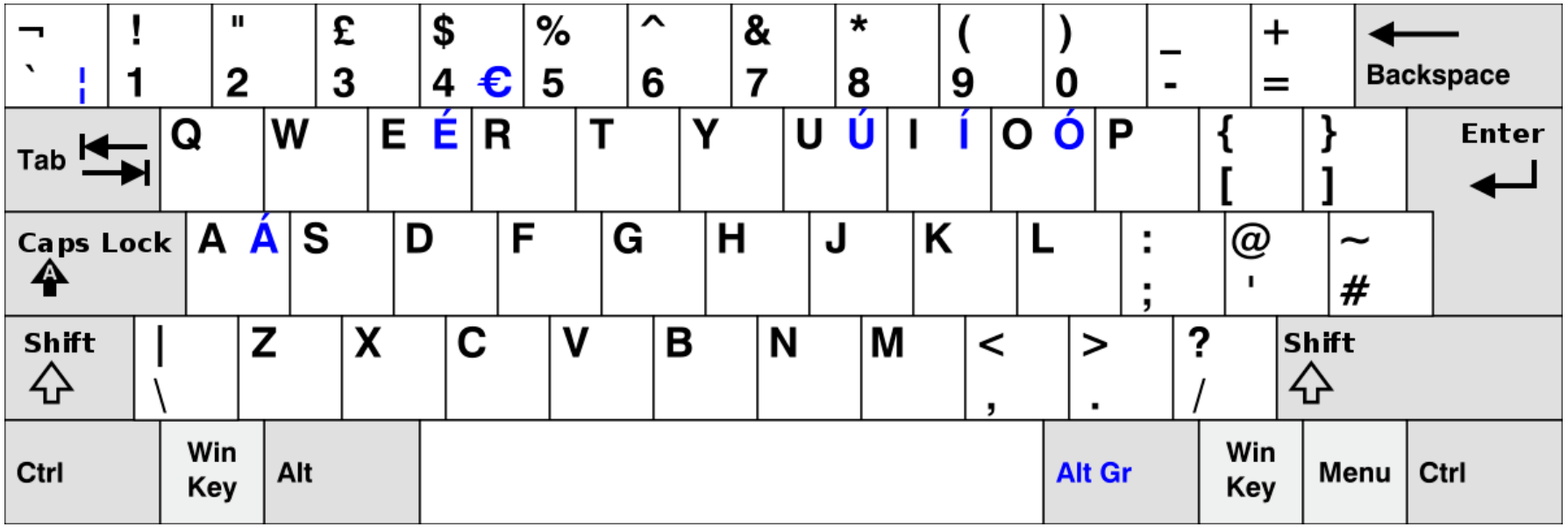
Mark work with pupils

The immediacy of the comment, audible rather than written, combined with being delivered through a supportive encouraging teacher makes it more useful for a dyslexic pupil.

Dyspraxia (DCD)

Developmental coordination disorder (DCD), also known as dyspraxia, is a condition affecting physical coordination. It causes a child to perform less well than expected in daily activities for their age

Touch Typing



Mouse Control

Slow the mouse down

Breaks

Build in breaks in the lesson

- Stand up
- Walk around

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Trauma

Trauma is damage done to unborn babies and very young children through living with people who are violent, take alcohol, use drugs, have a history of trauma themselves, or have mental health problems.

Children who have experienced trauma learn a variety of undesirable coping mechanisms through adapting to threats, and they also lack the development of key life skills including impulse control, problem-solving, and knowledge acquisition.

Avoidant attachment pattern

- Help me to feel good about myself regardless of achievement
- Organise me into small groups and encourage 1:1 relationships
- Show me that you hold me in mind
- Precise questions

I can see how much effort you have put into your programming. Well done

I thought about you when I was planning this module

You can work with the same person as you did last term

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Preoccupied attachment pattern

- Highly predictable structured routine
- Break tasks down into small chunks

Write a game idea first then we can discuss next stage together

Cover up the other questions and just read that one

We are using PRIMM just like we did last term. You can work with the same person as you did last term

You can get a hint from me just by holding up your hint card

Hypervigilance

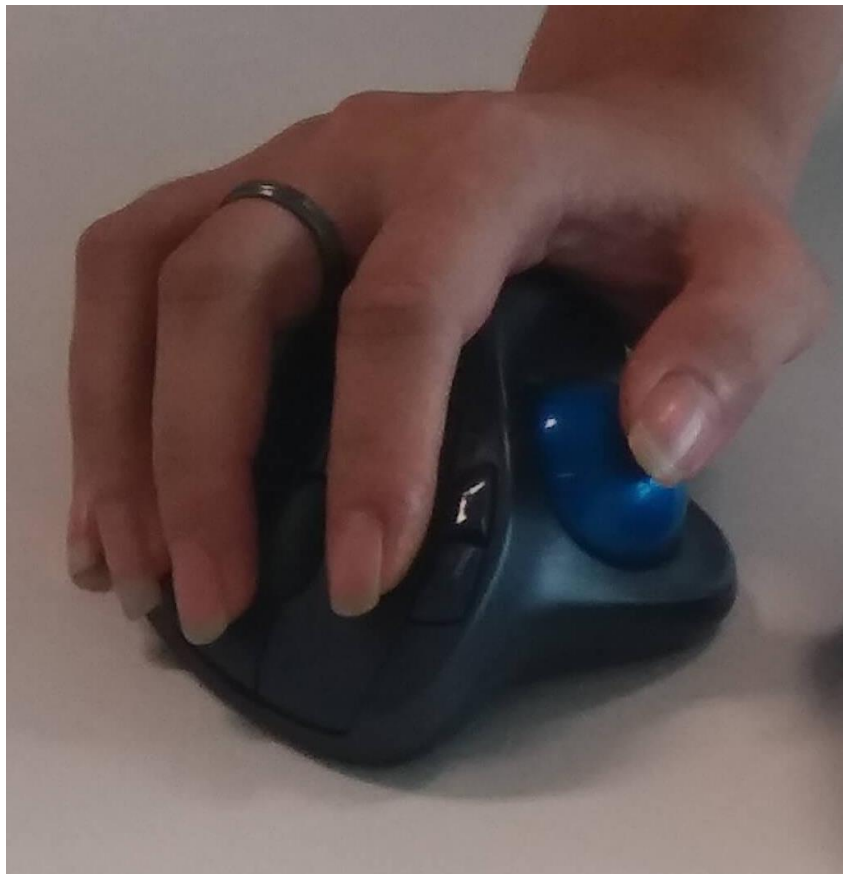
- The pupils flight or fight sensor is so sensitive that the slightest classroom change distracts them
- Pupils with hypervigilance will often zone out of learning or discussion and their brains will fill in the blanks- meaning knowledge is insecure
- Check learning frequently

I know you notice everything happening in the class so sometimes miss my instructions. Let me show you….

Sensory or physical needs

Keyboard and mouse

Non standard mice



Keyboard shortcuts

Cheatography

Top Windows 10 Keyboard Shortcuts Cheat Sheet
by mjspieglan via cheatography.com/772/cs/9017/

System

⊞-D	Toggle show **D**esktop
⊞-E	Open File **E**xplorer
⊞-P	**P**rojector (manage 2nd screen)
⊞-X	System menu
⊞-←	Dock window left
⊞-→	Dock window right
⊞-Shift-←	Move window to left monitor
⊞-Shift-→	Move window to right monitor
Alt-Tab	Select / Toggle windows[1]
Ctrl-Shift-Esc	Open Task Manager
Ctrl-Shift-N	New folder
Ctrl-Click	Toggle selection[2]
Shift-Click	Select range[2]
Esc	Escape[3]

[1]Hold Alt down and tap Tab repeatedly to cycle through windows. Tap Tab and release Alt immediately to toggle between two last windows.
[2]Works for File Explorer and selection dialogs of many programs.

Screenshots

PrtScn	Entire screen
Alt-PrtScn	Active window

Copies images to Clipboard

Virtual (Multiple) Desktops

⊞-Tab	Task View / Manage Desktops
⊞-Ctrl-←	Previoust desktop
⊞-Ctrl-→	Next desktop
⊞-Ctrl-D	Create a new desktop

Web Browsers

Ctrl-⊕ (no shift)	Zoom in
Ctrl-⊖ (no shift)	Zoom out
Ctrl-0 (digit zero)	Zoom to normal (100%)
Ctrl-Click	Open link in new tab
Home	Top of page
End	Bottom of page
Alt-←	Back
Alt-→	Forward

Editing

Ctrl-S	**S**ave
Ctrl-Z	Undo
Ctrl-X	Cut (think "X" = "scissors")
Ctrl-C	**C**opy
Ctrl-V	Paste
Ctrl-A	Select **A**ll

Word

Ctrl-Shift-V	Insert without formatting
Alt-Shift-D	Insert **D**ate
Alt-Shift-T	Insert **T**ime

Excel

Ctrl-`	Toggle show formulas

Cheat sheet anyone?

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Supporting learners Progress

Red	Little knowledge
Amber	Some knowledge
Green	Good knowledge

Aim	At start	At end
I can identify learners who might have additional needs in computing		
I know how to deploy a range of strategies to support learners with additional needs		

Scratch practical conditions in loops

Session Five

Phil Bagge @baggiepr

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Conditions in loops

Red	Little knowledge
Amber	Some knowledge
Green	Good knowledge

Aim	At start	At end
I understand how conditions operate when inside a loop		
I can communicate effectively how conditions operate when inside a loop through explaining the flow of control		
I understand the importance of planning and decomposition when students create more complex programming projects		

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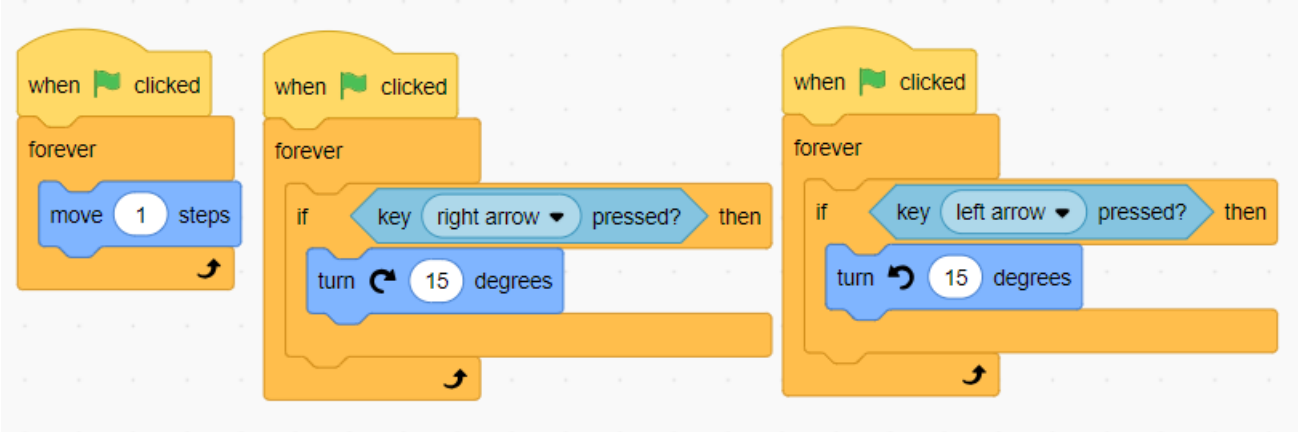
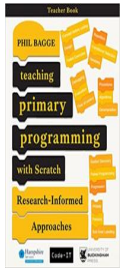
Task Level	Steer a moving mouse through a maze
Design Level (algorithm, objects & initialisation) *Language a human will understand, code agnostic*	Move always, left arrow = turn left, right arrow = turn right **Loop always move** | **Loop always if right arrow turn right** | **Loop always if left arrow turn left**
Code Level	
Execution Level	I changed the degrees to turn *What did we learn, change, adapt when we ran the code?*

Levels of abstraction

Useful reading
Design
p 107



Supported by the research of Armoni 2013, Waite et al 2017

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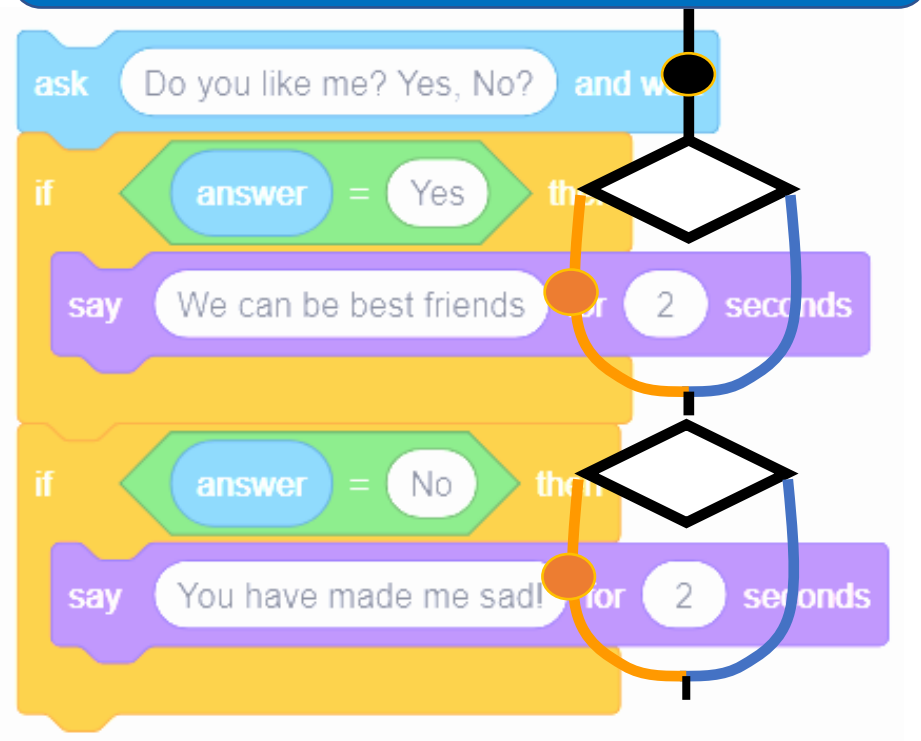
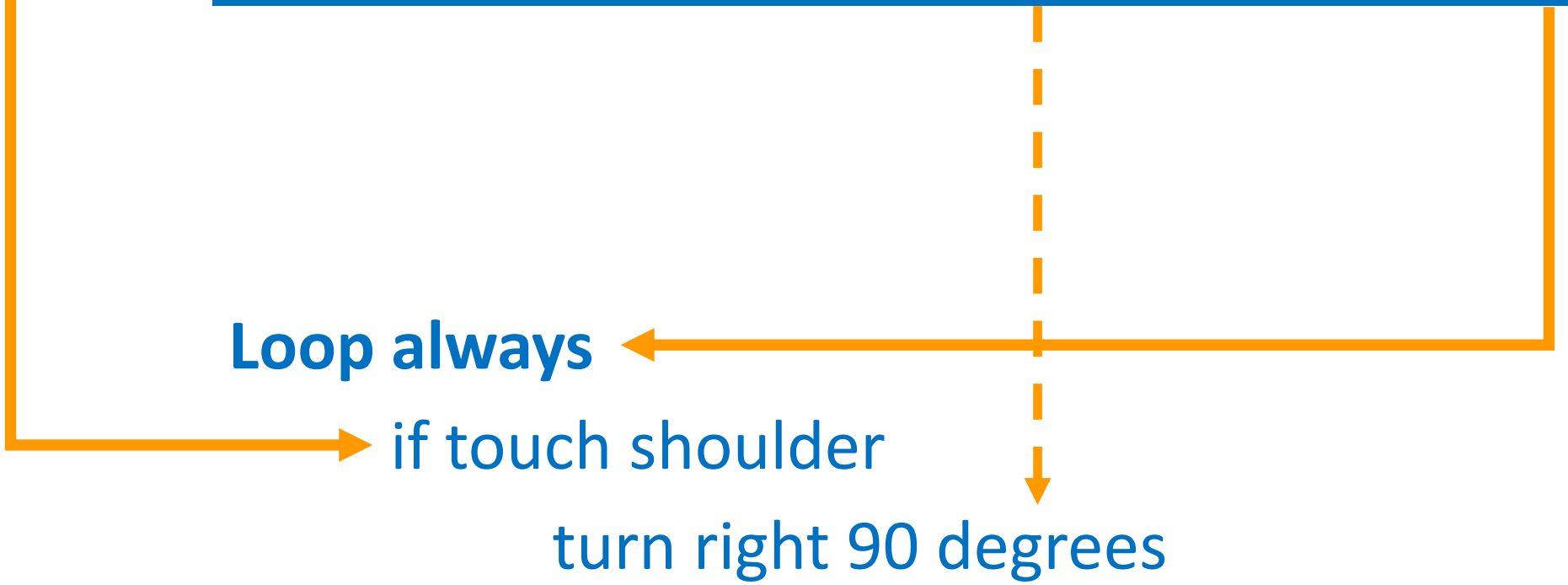
Revising Condition Starts Action

In Scratch Code



Conditions starts action inside loop



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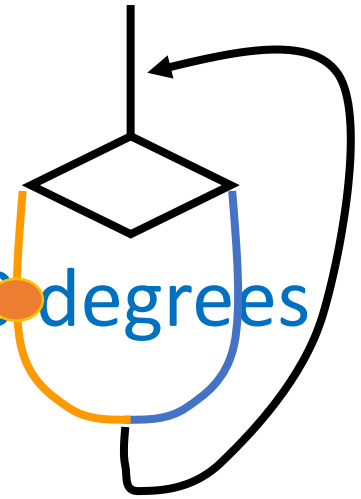
Conditions starts action inside loop

Loop always

if touch shoulder

turn right 90 degrees



Condition is checked many times because of the loop

Conditions starts action inside loop

Loop always

if touch shoulder

turn right 90 degrees

Work with a partner to act this out

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Conditions starts action inside loop

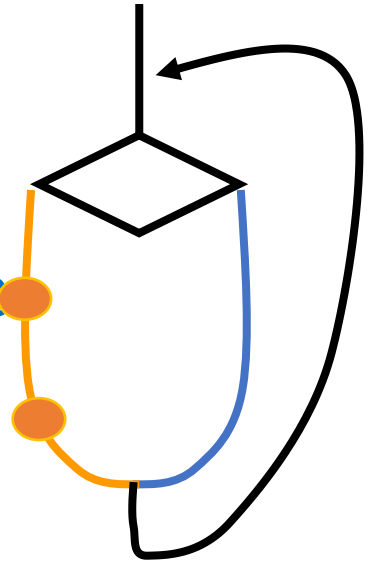
Always loop

if partner clap

jump once

bow once

A condition can start many actions



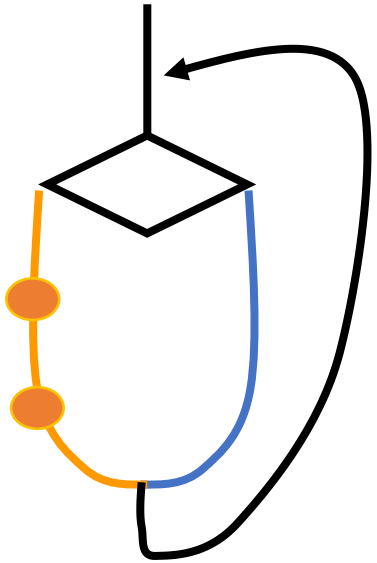
Conditions starts action inside loop

Always loop

if partner clap

jump once

bow once



Work with a partner to act this out

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Conditions starts action inside loop

Always loop

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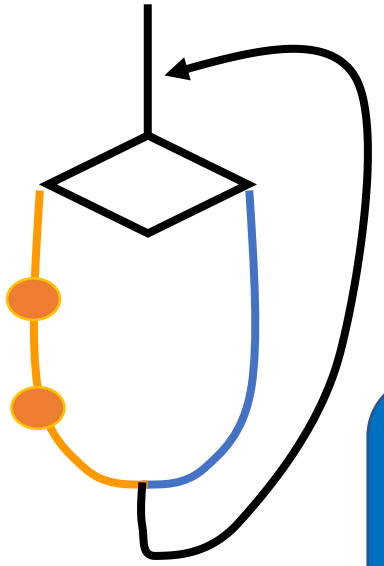
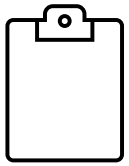
jump once

bow once



Try it out with a partner

Now write your own



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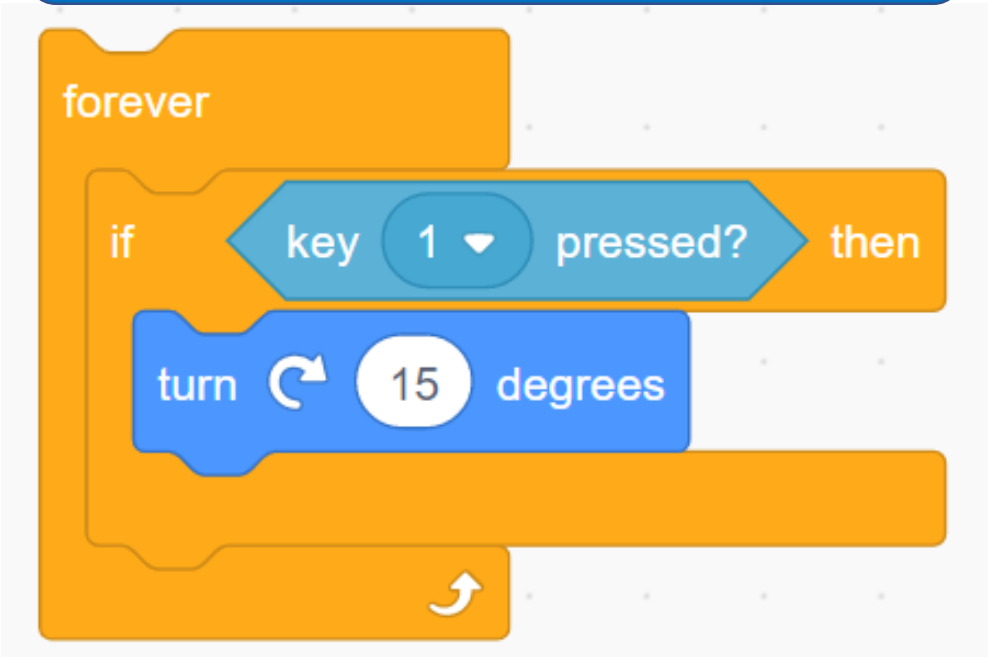
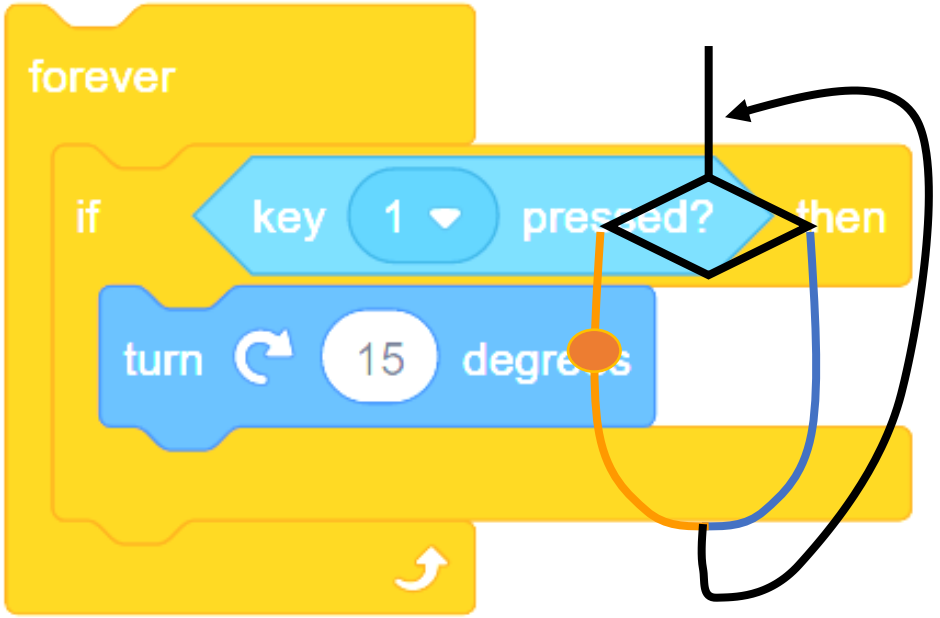
Conditions starts action inside loops

In Scratch Code



Conditions starts action inside loops

In Scratch Code



PRIMM Challenge Diving Beetle Game

1. Predict Sheet first without your PC
2. Load Diving Beetle game on one computer between two teachers
3. Work together on Run, Investigate & Modify before marking these challenges
4. Examine the example plan to help you plan a game (on your own or with your partner)
5. Check your plan with Phil before you make
6. Finally on a computer each, Make

Game examples from students aged 9-10

Conditions in loops Progress

Red	Little knowledge
Amber	Some knowledge
Green	Good knowledge

Aim	At start	At end
I understand how conditions operate when inside a loop		
I can communicate effectively how conditions operate when inside a loop through explaining the flow of control		
I understand the importance of planning and decomposition when students create more complex programming projects		

Assessing programming

Session Six

Phil Bagge @baggiepr

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What makes programming good?

Jamboard activity

Phil Bagge @baggiepr

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Programming project assessment example

Teacher and Pupil Assessment

Circle one column on each row to show what you think you have achieved

	Not used **condition-starts-action** blocks	Used a single **condition-start-action** block in a question	Used more than one **condition-starts-action** blocks in a question	2 marks and Used either <, >, OR, AND or NOT in a condition
Condition-starts-action	0 Marks	1 mark	2 marks	3 marks

	Not used previous programming concepts for real purpose	Used previous programming concepts for real purpose
Used previous programming concept such as count controlled or indefinite loops correctly	0 Marks	1 mark

	No theme in planning or code	Has a theme in planning or code
Has a project theme in create second	0 Marks	1 mark

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Taking everyone with us

Session Seven

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Issues that hinder programming teaching and learning in your school

Jamboard activity

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Final steps

Session Eight

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BREAK