DIGITAL SCHOOLHOUSE
together with
NINTENDO SWITCH

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Teaching Guide.

Just Dance® with the Algorithm

Introduction

Just Dance with the Algorithm was developed by Digital Schoolhouse in partnership with Ubisoft, and is based upon the original workshop 'Get with the Algo-rhythm'. This workshop combines dance and video games to teach core programming and computing concepts in a way that appeals to a diverse range of students. The workshop begins by creating flow charts of instructions to perform dance moves from popular music tracks. Teachers could easily select either the current craze or more iconic dances such as Michael Jackson's Thriller. The initial objective is to develop the understanding of a sequence and appreciate the importance of accurate instructions. Loops are then introduced for repeated instructions within the dance and students move on to introduce selection statements through questions.

Once students have understood the concepts they then look into different ways of representing algorithms. By comparing their text based and flowchart algorithms with a more graphical presentation as used in the Just Dance game students further develop their understanding. They physically manipulate graphical representations of dance moves in order to choreograph their own dance sequence which are then digitised into an animation.

UBISOFT

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Computing Programmes of Study Links

2.1 design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts

2.2 use sequence, selection, and repetition in programs; work with variables and various forms of input and output

2.3 use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs

3.7 understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem

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Progression Pathway bands covered

ALG = Algorithms: Pink, Yellow, Orange, Blue

DDR = Data & Data Representation: Pink, Yellow, Orange

Reference

PA1	Understands what an algorithm is and is able to express simple linear (non-branching) algorithms symbolically.
PA2	Understands that computers need precise instructions.
PA3	Demonstrates care and precision to avoid errors
YA1	Understands that algorithms are implemented on digital devices as programs
YA2	Designs simple algorithms using loops, and selection i.e. if statements.
YA3	Uses logical reasoning to predict outcomes.
YA4	Detects and corrects errors i.e. debugging, in algorithms.
OA1	Designs solutions (algorithms) that use repetition and two-way selection i.e. if, then and else.
OA2	Uses diagrams to express solutions.
OA3	Uses logical reasoning to predict outputs, showing an awareness of inputs.

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Reference

PP1	Knows that users can develop their own programs and can demonstrate this by creating a simple program in an environment that does not rely on text
PP2	Executes, checks and changes programs
PP3	Understands that programs execute by following precise instructions
YP1	Uses arithmetic operators, if statements, and loops, within programs.
YP2	Uses logical reasoning to predict the behaviour of programs
YP3	Detects and corrects simple semantic errors i.e. debugging, in programs.
OP1	Creates programs that implement algorithms to achieve given goals.
OP2	Declares and assigns variables.
OP3	Uses post-tested loop e.g. ‘until’, and a sequence of selection statements in programs, including an if, then and else statement.
PP1	Knows that users can develop their own programs and can demonstrate this by creating a simple program in an environment that does not rely on text

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Computational Thinking Strands

AL – Algorithmic Thinking

Ref.	Activity
A1	Writing instructions that if followed in a given order (sequences) achieve a desired effect
A4	Writing instructions that choose between different constituent instructions (selection) to achieve a desired effect;
A5	Writing instructions that repeat groups of constituent instructions (loops/iteration) to achieve a desired effect;
A6	Grouping and naming a collection of instructions that do a well-defined task to make a new instruction (subroutines, procedures, functions, methods);
A13	Creating algorithmic descriptions of real world processes so as to better understand them (computational modelling)

AB – Abstraction

Ref.	Activity
Ab1	Reducing complexity by removing unnecessary detail;
Ab2	Choosing a way to represent artefacts (whether objects, problems, processes or systems) to allow it to be manipulated in useful ways;
Ab3	Hiding the full complexity of an artefact, whether objects, problems, processes, solutions, systems (hiding functional complexity);

EV – Evaluation

Ref.	Activity
E1	Assessing that an algorithm is fit for purpose;
E2	Assessing whether an algorithm does the right thing (functional correctness);
E3	Designing and running test plans and interpreting the results (testing);
E4	Assessment whether the performance of an algorithm is good enough;
E5	Comparing the performance of algorithms that do the same thing;
E10	Stepping through algorithms/code step by step to work out what they do (dry run / tracing);
E15	Assessing whether a solution meets the specification (criteria);

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Learning Outcomes

1. To understand what an algorithm is
2. Be able to follow an existing algorithm in order to test the outcomes
3. Be able to write an algorithm to achieve a desired result
4. Be able to make simple suggestions to help improve the effectiveness of an algorithm
5. To be able to represent an algorithm as a flowchart
6. To understand what is meant by a 'procedure'
7. To be able to include the use of procedures when writing algorithms
8. To understand the concept of repetition and be able to recognise opportunities for repetition within algorithms
9. To understand the concept of selection and be able to implement selection statements within an algorithm
10. To be able to evaluate the effectiveness of an algorithm
11. To be able to consider different forms of representation for algorithms
12. To be able to evaluate the effectiveness of representing an algorithm
13. To be able to implement a pre-written algorithm within a programming language such as Scratch
14. To be able to able to create a digitised dance sequence using sequence, selection and repetition.
15. To be able to improve the effectiveness of a program by implementing procedures.

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Session Overview

SESSION 1

Session Content / Activity	Resources Used	Prog. Pathway	Comp. Thinking	Computing POS Link
Welcome, Introductions General information about the day, including any Health and Safety information. Begin with some ice breaker activities	DSH_WelcomeIntroduction.ppt			
Show a video showcasing a popular and easy to follow set dance, for example “The Haka – New Zealand Vs Tonga” Discuss: why is everyone able to follow the dance so easily? Can you do the Haka? What are the steps involved? *The Haka could be replaced with another video showing a dance move which is the current latest ‘craze’ amongst pupils, i.e. The Floss*	The Haka.mp4	ALG PA1	A1	2.1
Introduce the topic for the day. Do “A Thunk” activity	JustDance.pptx			
Divide the class into pairs and give each group some playdough and a set of images (the ones in the pack can be replaced with other more thematic ones if wished). One member of the pair selects an image (and chooses to be the programmer) and the other is given the playdough (the human computer). The programmer than describes the image they can see, with their partner following those instructions to construct the model in playdough. You may want to time this and set a competitive element to this. Which pair completes the challenge in the fastest time? Who creates the most accurate model? After completing	JustDance.pptx Making Faces	ALG PA1 – PA3, YA1- YA4, OA1 – OA4	A1, A4, A5, A6, A13, Ab1, Ab2, Ab3	2.1, 2.2, 2.3

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it once, use the prompts on slide 4 to have a discussion about the challenges involved. Use the discussion to tease out concepts and ideas about algorithmic thinking and debugging. Post discussion if there is time allow the students to repeat the activity and compare what they did differently and if it was any easier.				
Work through slides 5 - 11. Slide 5 links to a short video clip of the Waka Waka (Shakira) dance. These slides will reinforce the idea of sequence in algorithms, representing them as diagrams and procedures. Judge your level of discussion based on student's abilities. For some students they may find these activities easy and will simply allow them to consolidate their learning. However, for other students this will reinforce their learning and understanding of the key concepts. Vary the time spent on this according to the needs of your students. It is important that they understand the key ideas being introduced in this session.	JustDance.pptx	ALG PA1 – PA3, YA1- YA4, OA1 – OA4	A1, A4, A5, A6, A13, Ab1, Ab2, Ab3	2.1, 2.2, 2.3
Note: *You can use one of the videos included in this pack or pick another one of your own. Selecting a music video that is currently popular amongst the pupils can be a good way to raise motivation and the 'fun factor'. However, be careful when choosing your video to ensure the sequences aren't too complicated. The students will need some space to carry out these activities. You can move them to an appropriate venue or restrict their movements.*				

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SESSION 2

Session Content / Activity	Resources Used	Prog. Pathway	Comp. Thinking	Computing POS Link
In this session you will be working through slides 12 - 19. This section looks at different ways of presenting algorithms and being able to recognise them in the different forms available around us. If available it may be useful to bring out printed examples of DIY instruction guides, LEGO instructions and others for students to be able to consider and compare. Ask pupils for their initial thoughts around these instructions? Do they recognise them as algorithms? Why have the designers chosen to write them like this rather than in a text-based form? Slide 17 looks at watching a just dance video. The Just Dance® is available on a range of platforms including an app Google Play and Apple Store as well as PC browser based and PlayStation and Xbox Consoles. Choose one that is most suitable for your school. With the app or PC version of the game it will be easier to enable each group of students to play the game for themselves. But consider space. This part of the activity may be better delivered in an outdoor space or a hall. When students are playing the game get them to pay particular attention to the way the dance instructions are being given and note the pictos appearing in the bottom right hand corner of the screen. If possible choose the same song that was used in the first part of this workshop i.e. Dame Tu Cosita. By doing so it will be easier for pupils to compare the algorithm they have written against the graphical version they see on screen.	JustDance.pptx MiniWhiteboard.pdf Dance Feedback Worksheet (doc & pdf) https://justdancenow.com/	ALG PA1 – PA3, YA1 – YA4, OA1 – OA3	A1, A4, A5, A6, A13, Ab1, Ab2, Ab3, E1 – E5, E10, E15	2.1, 2.2, 2.3 3.7

The student task from slide 17 – 19 asks pupils to once again come up with their own algorithm for a portion of the dance. However, this time they are to use a more graphical layout rather than writing text-based instructions. The pictos used by the Just Dance® game are provided as part of this workshop and students can manipulate these in a number of ways. For example, you may wish to print out copies of the pictos on card and allow pupils to physically manipulate them into order, drawing arrows to connect one picto to the next to recreate a flowchart. Or alternatively pupils could move them around in a digital file. Once again, encouraging pupils to connect the different images with arrows to create a flowchart would enable them to draw the similarity with the first section of work that they carried out. Pupils should be made aware that they will be testing each other's algorithms, so they should think about presentation. Not setting rules and guidelines to this will enable valuable discussion about presenting for clarity. Once the task has been carried out the key element of this activity is the discussion enabling students to compare their work and evaluate effectiveness.	JustDance.pptx MiniWhiteboard.pdf Dance Feedback Worksheet Pictos https://justdancenow.com/	ALG PA1 – PA3, YA1 – YA4, OA1 – OA3	A1, A4, A5, A6, A13, Ab1, Ab2, Ab3, E1 – E5, E10, E15	2.1, 2.2, 2.3 **3.7**
This section of slides (19 – 29) introduces two important concepts: repetition and selection. Judge the time spent by the needs of the students. It is worth spending time allowing them to write and refine their algorithms (they may wish to simply continue with their algorithm from earlier in the workshop or create a new segment to ultimately put together at the end). Use a simple video recording device (i.e. Flip Camera) to record the dance performance of each group. At the end of the session it is important	JustDance.pptx MiniWhiteboard.pdf Dance Feedback Worksheet (doc & pdf)	ALG PA1 – PA3, YA1 – YA4, OA1 – OA3	A1, A4, A5, A6, A13, Ab1, Ab2, Ab3, E1 – E5, E10, E15	2.1, 2.2, 2.3 **3.7**

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that students present their algorithm and their dance to the rest of the class. Use the feedback sheet to enable the class members to record their feedback. There is room for a 6th criterion – use suggestions from the class to identify a good 6th criterion for everyone to use (or perhaps allow each pupil to add their own – it will create useful discussion at the end about the value of different feedback criteria to judge an algorithm).

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SESSION 3

Session Content / Activity	Resources Used	Prog. Pathway	Comp. Thinking	Computing POS Link
End the session by discussing how pupils will now be moving onto a programming environment such as Scratch to create a program of their dance routines. Gather information about pupil's prior knowledge of Scratch. Introduce them to the environment and basic skills. If there is enough time, you can ask pupils to 'explore' Scratch; ask them to 'discover' or 'find out how to…' use various features within Scratch. The pupils can then demonstrate what they have discovered to the class using the IWB.		P&D PP1, PP3, YP2, YP3, OP1,	A1, A4, A5, A6	2.1, 2.2
The main focus of this session is creating the programme to implement the dance routine. It will involve working through Slides 30 onwards in the slideshow, at a pace that suits the class. Using the order suggested, use a pedagogy that suits the needs of the class to work through the refinement of their program. It is a good idea for pupils to try and implement the algorithm they wrote in Session 2. You may wish to give them time to improve their algorithm based on the class feedback given. The help videos demonstrate different elements of Scratch and these should be made available to pupils for them to view at their own convenience.	JustDance.pptx Help Videos: Video 1 D…mp4 Video 2 D…mp4 Video 3 D…mp4 Video 4 D…mp4 Video 5 D…mp4 Video 6 D…mp4 Video 7 D…mp4	P&D PP1 – PP3, YP1 – YP3, OP1 – OP3	A1, A4, A5, A6, A13, Ab1, Ab2, Ab3, E1 – E5, E10, E15	2.1, 2.2, 2.3, 3.7

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You may wish to allow for time at the end of the session to allow pupils to view the completed outcomes.

Suggestion

If time and facilities allow, the following variation is a good one to implement. Take photos of students as they perform their dance algorithm. If they are implementing their dance algorithm from session 2, then these could be done during their performance. Or alternatively, take photos of students as they pose. These would then be imported into Scratch and used as costumes for their program.

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Files/Resources

Filename	Resource Type	Purpose/Description
WelcomeIntroduction.ppt	PowerPoint	PowerPoint to be used at the start of the day
JustDance.pptx	PowerPoint	Main teaching PowerPoint
MiniWhiteboard.pdf (.docx)	Photocopiable	To be printed and laminated for use as a mini whiteboard
Dance Feedback Worksheet.docx (.pdf)	Worksheet	A worksheet to be used by the pupils
Video 1 Dance – Import Costumes.mp4	Video Tutorial	Video tutorial providing support on Scratch programming
Video 2 Dance – Rename.mp4	Video Tutorial	Video tutorial providing support on Scratch programming
Video 3 Dance – Sequence.mp4	Video Tutorial	Video tutorial providing support on Scratch programming
Video 4 Dance – Procedure.mp4	Video Tutorial	Video tutorial providing support on Scratch programming
Video 5 Dance – Repeating Procedure.mp4	Video Tutorial	Video tutorial providing support on Scratch programming
Video 6 Dance – Selection.mp4	Video Tutorial	Video tutorial providing support on Scratch programming
Video 7 Dance – Duplication & Backgrounds.mp4	Video Tutorial	Video tutorial providing support on Scratch programming
Song List	Information Sheet	Information sheet listing recommended songs in Just Dance® and associated YouTube links

PLEASE NOTE: The activities outlined in this workshop pack are a suggested outline of how the workshop can be delivered. It is envisaged that teachers will adapt the resources and the organisation of them according to the needs of their class.