Topic Lesson Plans

Topic: Introduction to Programming

Each Topic starts with an introduction, designed to help introduce the content and encourage students to start to explore more about the topic.

There then follows a Topic Lesson Plan. Topic Lesson Plans are designed to be used by you to deliver the teaching and learning for the topic. Collectively, they should form a small scheme of work with a selection of student activities to bring the topic to life.

Each Topic Lesson Plan includes 3 or 4 activities that are designed to support the learning of the topic to your students, enabling them to develop the Knowledge, Understanding and Skills and provide an opportunity for formative assessment.

The Topic Lesson Plans should be used in conjunction with the following documents:

- Introduction to Programming PowerPoint
- Introduction to Programming Industry Links
- Links to Assessment

Introduction to the Topic: Introduction to Programming
A lot of people, before entering the programming field, are curious to know how things work behind the scene. How does Google give us a search result regardless of what we are searching? How are we able to connect to someone on Facebook around this world? How do Google Maps work to give us direction anywhere in this world? All these questions inspire young programmers of today. We are all dependent on technology in our daily life, for entertainment, for communication, and everyday life, but very few people know how to read and write code. There are 7 billion people in the world today and yet only 0.005% of people know how to read and write code. Five leading companies have the most significant influence on our daily lives, Amazon, Facebook, Google, Apple and Microsoft. Bill Gates, a software programmer and the founder of Microsoft, is considered one of the most powerful and influential people in the world. Today's programmers can enjoy an attractive salary and numerous career opportunities. They develop problem-solving and logical thinking skills, as well as important interpersonal skills.

Introduction to the Topic Lesson Plans
These Topic Lesson Plans cover the main elements of understanding the specific data types and declare constants and variables in a programming language. It also covers the main elements of why certain data types are used and in what situations. We then move on to program structure and arrays and why arrays are a key element of the programming paradigm. The final elements of the lesson plans cover the functions and features when designing and building a program. The students then get to use Python to develop their own programming skills via a series of tasks and online exercises.

Topic Lesson Plan No: 1	
Title	Program Data
Aim and objective	Understand the use of different data types within programs. Aims: • Identify different data types • Apply commands to manipulate string data Create a program to convert data types
How long will this Topic Lesson Plan take to deliver?	120 minutes
What knowledge, understanding and skills will students develop?	2.1.1 Understand the use of, and need for data types 2.1.2 Be able to declare and use constants and variables that use appropriate data types
Self-study activities	Programming Exercises to reinforce learning, exam questions
Activity 1	
Title	Matching Exercise
How long will this activity take to deliver?	20 minutes

Instructions	Use 'Matching Exercise.pptx.' Use arrows to connect the data to the correct data type.
Worksheets / templates	Matching Exercise.pptx
English, maths and digital skills	E5 Synthesise information.
Industry Links	N/A
Activity 2	
Title	Data Types
How long will this activity take to deliver?	30 minutes
Instructions	Each student should give an example of a program that would use each of the data types below. Assign a suitable variable for each data type. • String • Integer • Float • Char • Boolean Explain why it is essential to use the correct data types when programming. Define what is meant by 'casting' concerning data types. Provide meaningful examples of 'casting'.
Worksheets / templates	N/A
English, maths and digital skills	M4 Using rules and formulae. M5 Processing data. D4 Process and analyse numerical data
Industry Links	N/A
Activity 3	

Title	Python Exercise
How long will this activity take to deliver?	70 minutes
Instructions	Work out what code is needed to output the following from the string "Welcome to Python" Students should create a tutorial to show how to manipulate strings in Python. The tutorial should include screenshots of commented code with associated output together with a written explanation of the code's purpose. They could include: • String slicing • String indexing • String length • String upper and lower case
Worksheets / templates	N/A
English, maths and digital skills	E5 Synthesise information. M4 Using rules and formulae. M5 Processing data. D2 Design, create and edit documents and digital media. D3 Communicate and collaborate. D4 Process and analyse numerical data.
Industry Links	N/A

Topic Lesson Plan No: 2	
Title	Introduction to Iteration
Aim and objective	Understand how to use count-controlled loops within algorithms and programs. Aims • Explain the purpose of iteration within algorithms. • Demonstrate the use of definite iteration with count-controlled loops Create Python programs which make use of count-controlled loops
How long will this Topic Lesson Plan take to deliver?	60 minutes
What knowledge, understanding and skills will students develop?	2.1.3 Understand the use of, and need for, the following data structures 2.1.4 Understand how to manage variables within a program, including
Self-study activities	Writing Variables: https://www.w3resource.com/python-exercises/python-basic-exercises.php
Activity 1	
Title	Program Structure
How long will this activity take to deliver?	40 minutes
Instructions:	1. Write a program in Python to display the first 10 natural numbers 2. Write a Python program to find the sum of first 10 natural numbers. 3. Write a program in Python to display n terms of natural numbers and their sum.
Worksheets / templates	N/A

English, maths and digital skills	M7 Interpreting and representing with mathematical diagrams. M8 Communicating using mathematics.
Industry Links	Version in C: https://www.w3resource.com/c-programming-exercises/for-loop/index.php
Activity 2	
Title	FOR Loops and Answers
How long will this activity take to deliver?	20 minutes
Instructions	Presentation on iteration and why we use loops. Ask students to show some examples, compare to linear code and how much more efficient it is using repetition in most cases. Get the students to explain which code version is best used in which situation.
Worksheets / templates	N/A
English, maths and digital skills	M4 Using rules and formulae. M5 Processing data. M6 Understanding data and risk. M7 Interpreting and representing with mathematical diagrams. M8 Communicating using mathematics
Industry Links	N/A

Topic Lesson Plan No: 3	
Title	Arrays and Files
Aim and objective	Be familiar with the use of one and two-dimensional arrays in algorithms and programming. Aims: • Demonstrate what is meant by an array • Create and manipulate 1D arrays containing string data • Create and manipulate 1D arrays containing numerical data Understand how and why we write outputs from a program to a file. Aims: • Identify commands used to write information to a file. • Experiment with different commands to change how data are written to a file • Create programs that make appropriate use of file writing commands.
How long will this Topic Lesson Plan take to deliver?	150 minutes
What knowledge, understanding and skills will students develop?	2.4.1 Understand how sequence, selection (branching) and iteration are used within programs and algorithms 2.4.2 Be able to write, interpret and debug code that makes use of sequence 2.4.3 Be able to write, interpret and debug code that makes use of selection (branching) 2.4.4 Be able to write, interpret and debug code that makes use of iteration 2.5.3 Be able to write code that makes use of user-written and pre-written code (built-in functions, standard libraries) (Self-Study) 2.5.1 Understand the benefits and drawbacks of using prewritten code 2.5.2 Be able to select and justify the use of pre-written code provided by the Python programming language (built-in functions, standard libraries)

	2.6.1 Understand the need for different types of input validation and be able to write, interpret and debug code that makes use of these validation techniques including 2.6.2 Understand the need to develop reliable and robust code.
Self-study activities	Pre-written code: https://skillcrush.com/blog/python-programming-examples/ Input Validation: https://automatetheboringstuff.com/2e/chapter8/
Activity 1	
Title	Array Student Task
How long will this activity take to deliver?	60 minutes
Instructions	Complete the Student task PPT. and associated activities.
Worksheets / templates	Array Task.pptx
English, maths and digital skills	E5 Synthesise information. M4 Using rules and formulae. M5 Processing data.
Industry Links	N/A
Activity 2	
Title	Plenary Starters
How long will this activity take to deliver?	30 minutes
Instructions	Students should explain how writing to files works on Python. Write their code for how this would work. Explain how arrays work, why we use them, benefits and drawbacks Python, but can adapt for their chosen

	paradigm.
Worksheets / templates	NA
English, maths and digital skills	E5 Synthesise information. M4 Using rules and formulae. M5 Processing data.
Industry Links	N/A

Topic Lesson Plan No: 4	
Title	Writing Functions
Aim and objective	Understand the use of functions to simplify programs. Aims: • Explain the critical difference between a procedure and a function. • Demonstrate the use of a function in algorithms and pseudocode. • Practise using functions to pass values to different parts of a program.
How long will this Topic Lesson Plan take to deliver?	160 minutes
What knowledge, understanding and skills will students develop?	2.4.5 Be able to declare and call functions and procedures whilst programming 2.6.2 Understand the need to develop reliable and robust code 2.7.1 Understand the accepted style conventions (such as Python's PEP 8) and how these are implemented to create readable and maintainable code. 2.8.1 Understand the fundamental importance of testing for all components (Self Study) 2.8.2 Understand the use of testing and quality assurance methodologies to seek out problems and issues (Self Study) 2.8.3 Understand how automated and functional testing tools can be applied to test digital systems and code (Self Study)

	2.8.4 Understand how to apply root cause analysis to solve problems (Self Study) 2.8.5 Understand how to construct an effective test plan including (Self Study)
Self-study activities	Guru99 (Testing): https://www.guru99.com/what-everybody-ought-to-know-about-test-planing.html Testing plans: http://softwaretestingfundamentals.com/test-plan/
Activity 1	
Title	Essential Functions
How long will this activity take to deliver?	20 mins
Instructions	Programming techniques using functions. Ask the students to explain what 5 essential functions are and why we use them.
Worksheets / templates	NA
English, maths and digital skills	E5 Synthesise information. M4 Using rules and formulae. M5 Processing data. D2 Design, create and edit documents and digital media. D3 Communicate and collaborate. D4 Process and analyse numerical data.
Industry Links	N/A
Activity 2	
Title	Writing to files Student Task
How long will this activity take to deliver?	60 minutes
Instructions	Complete the Student task PPT and associated activities.

Worksheets / templates	Writing to files Intro.pptx. Writing to files Activities.pptx
English, maths and digital skills	E5 Synthesise information. M4 Using rules and formulae. M5 Processing data.
Industry Links	N/A
Activity 3	
Title	Writing Algorithms (Python)
How long will this activity take to deliver?	40 mins
Instructions	Each exercise contains specific Python topic questions students need to practice and solve. When they have completed each exercise, they will have a better understanding of Python. Using these exercises, students can practice various Python problems, questions, programs, and challenges. The solution is provided for each practice question.
Worksheets / templates	N/A
English, maths and digital skills	E5 Synthesise information. M4 Using rules and formulae. M5 Processing data. D2 Design, create and edit documents and digital media. D3 Communicate and collaborate. D4 Process and analyse numerical data.
Industry Links	https://pynative.com/python-exercises-with-solutions/
Activity 4	
Title	Interactive coding challenges
How long will this activity take to	40 mins

deliver?	
Instructions	Everyone knows the fastest way to learn a spoken language is by having conversations with native speakers. Likewise, the fastest way to learn to code is by actually coding. Edabit offers an almost limitless supply of bite-sized challenges, so your students can rapidly advance their abilities.
Worksheets / templates	N/A
English, maths and digital skills	E1 Convey technical information to different audiences. E2 Present information and ideas. M4 Using rules and formulae. M5 Processing data. M6 Understanding data and risk. M7 Interpreting and representing with mathematical diagrams. M8 Communicating using mathematics. D2 Design, create and edit documents and digital media. D3 Communicate and collaborate. D4 Process and analyse numerical data.
Industry Links	https://edabit.com/challenges/python3