Learning Path For
YOUNG LEARNERS

BASIC PROGRAMMING CONCEPTS (Code.org)

During these classes the students will go through a recap of the basic concepts of programming starting from sequencing and gradually moving to loops, conditionals, functions and variables in a block based environment. They will solve puzzles of varying complexities and create projects in Blockly programming language during these classes.

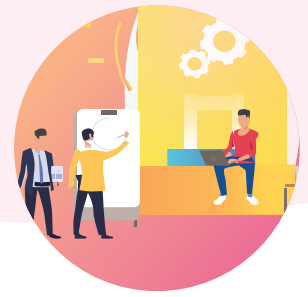| SESSION	CONCEPT	SKILLS
1	Command, Sequence, Algorithm	**Sequencing, Step-wise thinking** Putting commands in a sequence to solve puzzles.
2	Debugging	**Problem solving, Resilience** Identifying errors in the given code
3	Counting Loops	**Pattern recognition, Decomposition** Identifying patterns in code while solving puzzles
4	Nested Loops	**Pattern abstraction, Decomposition** Identifying repetitive blocks of code while solving puzzles to draw complex geometric shapes
5	Conditionals	**Problem solving, Decision making** Using conditional statements in code while solving complex puzzles
6	**Formative Assessment**	Assessment of learning
7	Functions	**Logic, Abstraction** Use existing function blocks to solve complex puzzles
8	Variables	**Data manipulation** Use variables in code to get differentiated outputs
9	Advance Loops	**Pattern recognition, Decomposition** Identifying patterns in code while solving complex puzzles
10	**Project Work**	

INTRODUCTION TO PYTHON PROGRAMMING

During these classes the students learn the basic concepts of python programming language. They start programming using blocks with python commands written on them and gradually shift to text based programming. All programs are written using the python turtle library.

SESSION	CONCEPT	SKILLS
11	Algorithms	**Step-wise thinking** Exploring the python commands and python turtle programming interface.
12	Motion, Angles	**Sequencing** Write code in python to create lines, angles and hollow basic 2d shapes.
13	Shapes	**Decomposition** Write code in python to create color filled advance 2d shapes
14	Cartesian coordinate system	**Numeracy** Write code in python to create drawings at specific coordinates
15	Project Work	**Pattern recognition, Decomposition** Practice activities
16	**Formative Assessment**	Assessment of learning
17	Loops-I	**Pattern recognition, Logic** Explore the need of loops in code. Use basic loops to create art.
18	Practice activities	**Perseverance, Problem solving** Practice activities on loops
19	Nested Loops	**Pattern recognition, Decomposition, Abstraction** Write code using nested loops to create complex art patterns
20	Practice activities	**Perseverance, Problem solving** Practice activities on nested loops

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21	Debugging in Loops	**Problem solving, Perseverance, Algorithms** Find and fix errors in code
22	**Formative Assessment**	Assessment of learning
23	User Input, variables, Data types	**Numeracy, Logic** Write code to create programs that behave according to the user inputs.
24	Conditionals	**Decision making, Logic** Write code using conditionals to give specific outputs
25	Strings	**Logic** Write code using string manipulation operations.
26	Practice Activities	**Perseverance, Generalization** Practice activities on strings, user input and conditionals.
27	Events-I	**Logic, Abstraction** Write code to control the turtle using key events
28	Events-II	**Logic, Abstraction** Write code to control the turtle using mouse events
29	**Project Work**	**Algorithms, Logic** Write code to create a simple turtle animation/ game
30	**Course Review and feedback**	

BASIC APP DEVELOPMENT

The students also explore the basics of UI/UX design and try their hand at designing and developing simple apps like language translator, text to speech convertor, color mixer etc. using Thunkable interface.

SESSION	CONCEPT	SKILLS
31	Application development basics	**Exploration** Familiarity with thunkable interface components.
32	Translator component	**Creativity, Logic** Use basic UI components and write code to create a language translation app
33	Image component	**Creativity** Use the image component to design the UI of the Encyclopaedia app
34	Screen navigation	**Logic** Do the UX coding for the Encyclopaedia app
35	Variables	**Numeracy** Use math blocks to create a basic calculator
36	Lists and List Viewer component	**Creativity, Logic** Use canvas UI to create a task manager
37	Combining components	**Creativity** Use basic UI components to design the Quiz App interface.
38	Conditionals, Variables	**Logic, Numeracy** Write the UX code of the Quiz app
39	**Project Work**	**Perseverance** Fine-tuning the UI and UX coding for publishing the app on play store/app store
40	**Course review and feedback**	

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GAME DESIGN USING JAVASCRIPT

During these classes, the students will explore the drawing commands of JavaScript in the block based environment and create beautiful landscapes and drawings. They will then learn how to create sprites, manipulate their properties and use events to create animations and interactive games.

SESSION	CONCEPT	SKILLS
41	Revisiting the Cartesian coordinate system	**Exploration** Explore the JavaScript platform, basic drawing commands
42	Shapes and Angles	**Creativity, Decomposition** Create art by superimposing shapes
43	Variables, Random numbers	**Numeracy, Computation** Use random numbers to get different outputs
44	Functions	**Abstraction** Define and use functions specific tasks in their code.
45	Draw Loop	**Generalization, Pattern recognition** Write code to create animated shapes
46	Objects, Properties	**Abstraction, Creativity** Manipulating sprite properties to create gif images
47	Counter Pattern	**Numeracy, Decomposition** Use the counter pattern to animate sprites
48	**Formative Assessment**	Assessment of Learning
49	Conditionals	**Logic, Decision making** Use conditionals to control the sprite's state
50	Events-I	**Logic** Use edge detection to restrict the sprite within the canvas
51	User Input-I	**Logic, Generalization** Use mouse events to create a simple clicker game

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52	User input-II	**Logic, Generalization** Use key events to control the sprite using keyboard keys
53	Game Design	**Algorithms, Decomposition** Plan the interface, layout and create UI of the game
54	Game Development	**Generalization, Persistence** Complete the UX code for the game
55	Variables	**Numeracy** Add variables to store the game score
56	Debugging	**Problem solving, Persistence** Test and debug the game
57	**Project-I**	**Step-wise thinking, Decomposition** Plan the UI, levels, algorithm of their own game
58	**Project-II**	**Logic, persistence** Write code for the different levels of their game
59	**Project-III**	**Problem solving, Persistence, Presentation** Test, debug and present the game
60	**Course review and feedback**	

ARTIFICIAL INTELLIGENCE AND SCRATCH		
During these classes, students are given a quick overview of Scratch programming interface using a movie making project and a game project. They are then introduced to the basics of Artificial intelligence concepts and terms. The students then learn to train machine models to recognize text, voice and image commands and use the same models to create projects in Scratch platform.		

SESSION	CONCEPT	SKILLS
61	Introduction to Artificial Intelligent systems	**Exploration** Explore various existing AI systems

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62	What is Artificial intelligence	**Analysing** Build understanding on human vs artificial intelligence
63	The big ideas of AI- part 1	**Exploration** Explore the AI basics
64	The big ideas of AI- part 2	**Exploration** Explore the AI basics
65	**Formative Assessment**	Assessment of learning
66	Rule based models	**Abstraction** Create a rule based model of sentiment analysis in scratch
67	Rule based vs machine learning models	**Analysing** Discuss limitations of rule based models
68	Text recognition	**Abstraction** Train a model to recognise textual commands
69	Importance of data in machine learning	**Analysing** Test the machine learning model and improve the dataset to get accurate results
70	Text recognition	**Analysing** Train and test a supervised learning model for sentiment analysis
71	Text recognition	**Creativity** Use the above machine learning model to create a sentiments detector in Scratch.
72	Text recognition	**Problem solving, Perseverance** Train and test a supervised learning model for a digital assistant
73	Text recognition	**Creativity, Logic** Use the above machine learning model to create a digital assistant in Scratch.
74		**Project Work**
75		

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76	Color classification	**Exploration** Create a color classifier in teachable machines
77	Color classification	**Analysing** Analyse data to train a good color classifier machine model
78	Color classification	**Creativity, Generalizing** Use the above machine learning model to create a color identifying project in scratch
79	Image detection	**Analysing** Create an object classifier in teachable machines
80	Image detection	**Creativity, Logic** Create a project in scratch that identifies webcam pictures.
81		**Project Work**
82	Face detection	**Creativity, Logic** Create a video filter in Scratch to turn the face into a cartoon
83	Face detection	**Abstraction** Create a video filter in Scratch to add a mask to your face
84	Face detection	**Exploration, Generalizing** Create a face detection model in teachable machine
85	Voice detection	**Creativity, Logic** Create an alien in scratch that recognises alien language
86	Voice detection	**Generalizing, Creativity** Create a voice activated digital assistant in Scratch
87	Voice detection	**Generalizing, Analysing** Create a voice activated game in scratch
88		**Project Work**
89		

90	Course review and feedback

| ADVANCED ANDROID APP DEVELOPMENT		
The students also dive deeper into app development and create apps such as game apps, quiz apps etc.		
SESSION	**CONCEPT**	**SKILLS**
91	The Canvas Component	**Creativity, Step by step thinking** Plan and design the interface of a drawing app
92	Lists, List Viewer Component	**Numeracy** Add a random Word picker to the drawing app
93	The Player Component	**Creativity** Design the UI of the music player app
94	The slider component	**Logic** Create the UX code for the music player with sliding volume control
95	Slider component	**Creativity, Step by step thinking** Plan and design the interface of the color changer app
96	Game Design- I	**Algorithms, Creativity** Plan the steps, interface of their own game app.
97	Game Design- II	**Logic, Pattern recognition, Decomposition** Design the interface of their game app
98	Game Design- III	**Problem solving, Persistence** Test, debug their game app
99	**Project Work**	
100	**Course review and feedback**	

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WEB DEVELOPMENT AND CYBER SECURITY

During these classes students will explore different websites to understand the elements, design of websites. They will then create their own website using HTML commands and style it using CSS. Their website will be hosted on the PurpleTutor domain. During the cybersecurity module, the students will explore the safe techniques to be followed while working on the internet.

SESSION	CONCEPT	SKILLS
101	Exploring websites	**Exploration, Observation** Observe various websites to study website elements and designs
102	Introduction to HTML	**Structuring** Website content & structure, HTML structure and element , Planning & Building a structure, Heading tags
103	Common Tags in HTML	**Scripting** Paragraph tags, Creating horizontal rules & line breaks
104	Div Tag and Creating ID & Classes	**Classification** HTML division tags and creating HTML ID & CLASS
105	CSS: Working with text - Part 1	**Classification and Targeting** Introduction to CSS, CSS syntax, Understanding CSS properties
106	CSS: Working with text - Part 2	**Creativity, Design** Using CSS properties for styling text content
107	Links & CSS: Links - Part 1	**Exploration, Scripting** Web navigation, Examples of web navigation, Adding HTML links
108	Links & CSS: Links - Part 2	**Creativity, Design** CSS: Styling Links
109	Adding & Styling Images - Part 1	**Creativity, Generalization** Adding Images in HTML, Image usability guide
110	Adding & Styling Images - Part 2	**Classification and Targeting** Creating image with link, Styling link using CSS properties
111	**Assessment**	Assessment of learning

112	Working with Lists - Part 1	**Classification and Ordering** Introduction to list, HTML list , Creating ordered & unordered list
113	Working with Lists - Part 2	**Formatting** Styling list using CSS properties
114	Working with Tables - Part 1	**Nested Lay outing** Introduction to tables, HTML tables, Creating HTML table
115	Working with Tables - Part 2	**Design** Styling tables using CSS properties
116	Working with Forms - Part 1	**Event Based Programming** Introduction to web forms, HTML forms, Creating HTML forms Basic
117	Working with Forms - Part 2	**Event Based Programming** Web form Examples, Creating HTML form advance
118	Working with Forms - Part 3	**Design, Creative Thinking** Styling Form using CSS properties
119	**Assessment**	Assessment of learning
120	Creating a Web Gallery in HTML- Part 1	**Design, Visualization** Introduction to gallery & Web Gallery, Creating Image Gallery
121	Creating a Web Gallery in HTML- Part 2	**Design, Formatting** Adding Captions to the images and styling web gallery using CSS properties
122	Adding Multi Media in HTML- Part 1	**Exploration** Introduction to Multimedia and multimedia formats for audio & video, Adding video to web page
123	Adding Multi Media in HTML- Part 2	**Styling** Adding audio to web page and adding YouTube videos to webpage and styling the content using CSS properties
124	Adding Transformation to web elements	**Visualization, Creativity** Introduction to transformation, using 2D and 3D CSS property to rotate, scale, skew, or translate an element.
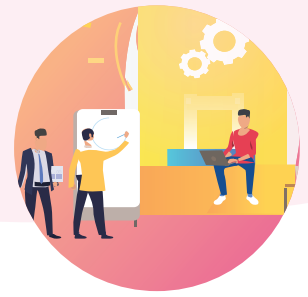
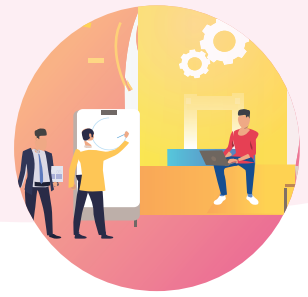|		
125	Adding Transition to web elements	**Visualization, Creativity** Introduction to Transition, Using CSS transition properties to control the duration of effect
126	Adding Animations to web pages - Part 1	**Spatial Visualization** Introduction to animation, CSS animations, Learning about key frames and animation properties
127	Adding Animations to web pages - Part 2	**Spatial Visualization** Adding animation properties to elements of web page
128	Adding Animations to web pages - Part 3	Creating animation buttons, text color animation and text reveal effect.
129	Pagination & Footer in web pages	**Formatting** Introduction to Pagination, creating and styling pagination, adding footer to web page.
130	**Assessment**	Assessment of learning
131	My online Neighbourhood	**Exploration** Introduction to online Neighbourhood, Steps to be responsible digital citizen when online, Internet Traffic light that awares of kind of good and bad websites
132	Online Community and Social media life	**Generalization, Collaboration** What is Online community and how are we connected via Social Media. Keeping social life healthy and safe.
133	Private and Personal Information	**Critical thinking, Analysing** What does private & personal information mean? How to protect self-privacy and understand what should be shared online.
134	Password Power up	**Critical Thinking, Logic** Building powerful password & how to handle safely advanced tech
135	Binary Code	**Computation, Numeracy** Introduction to Binary code and the study of binary representation systems.
136	Exploring Encryption & Decryption 1	**Computation, Numeracy** Pigpen Ciphers - Encoding & Decoding
137	Exploring Encryption & Decryption 2	**Computation, Numeracy** Caesar Cipher - Encoding & Decoding
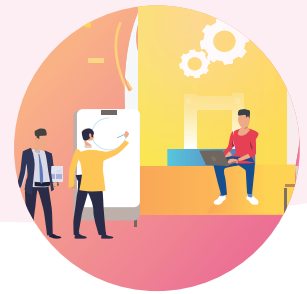
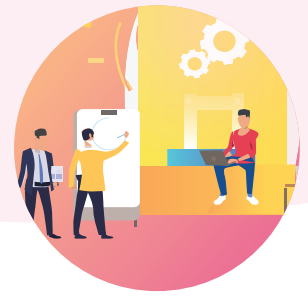| 138	Phishing for Scams	**Exploration, Analyse** What is clickbait, and how can you avoid it? , How can you protect yourself from phishing?
139	Internet and Cybersecurity Dilemmas	**Exploration, Analyse** Discover How Networks Work, Find Out What Protocols Are And How to Create One, Find Out What Malware Is
140		**Course review and feedback**

3D ANIMATION AND GAME DESIGN		
During these classes, the students will learn the basics of 3D designing in the Roblox studio. They will learn to create 3D objects and scenes. They will also learn the basic commands of LUA programming script to create different animations and a maze game.		
SESSION	**CONCEPT**	**SKILLS**
141	Digital Citizenship	**Exploration** Cyber security, Software Set-up
142	Introduction to Roblox Studio	**Exploration, Visualization** Getting familiar to the 3D Game designing platform
143 144	Working with 3D Parts	**Creativity, Spatial Visualization** Putting 3D parts together to build an obstacle course
145	Creating game levels	**Creativity, Logic** Creating multiple check points that serve as the milestones for the player
146 147	LUA Coding fundamentals	**Computational Thinking** Learning how to code using Lua programming language : Loops, Functions, Variables
148 149	Developing the Game theme	**Creativity, Imagination** Adding an ambience to the game

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150	Deadly Lava	**Creativity, Logic** Making the game adventurous by introducing Lava lands and touch events
151	Getting Started with building a Maze	**Step wise Thinking** Planning of a 3D Maze game
152 153	Create a score system	**Numeracy, Critical thinking** Adding collectable items, enemies and score board to the game
154 155	Build the Maze	**Persistence, Problem Solving** Completing the construction of the Maze as per the plan
156 157	Finish Line	**Persistence, Generalization** Building the destination for the Maze
158	Blocked Door	**Logic, Computation** Making the game more adventurous by adding an obstacle door to reach the destination. Making use of coding a closed door which opens only if the player satisfies certain conditions.
159 160	Introduction to World Building	**Exploration** Getting familiar with the components of 3D scene building
161	Plan and Get started	**Imagination, Step-wise Thinking** Plan an adventure game and the scenes that are involved
162	Visual Effects	**Creativity, Exploration** Working with shadows and lights , Learning to blur / deepen / sharpen the visual effects
163 164	Building a fireplace	**Visualization, Generalization** Use of 3D game designing techniques to build a fireplace
165 166	Beautification	**Creativity, Decomposition** Learning about Decals and Textures : Adding details to the game ambience like Trees , Chairs, Tables, Lamps, Wallpapers

167	Completion	**Persistence** Working with sound effects
168		
169	Basics of Roblox Animation	**Exploration** What is animation? Introduction to the basics of 3D Animations in Roblox
170		
171	Creating animations	**Creativity, Step-wise Thinking** Plan and build your first animation in Roblox. Ex: A human performing an action of swimming/dancing/walking etc.
172		
173	Export and play	**Generalization, Problem-solving** Learn how to export your animation to the game. Modify your game theme, Export and play
174		
175	Scripting Game Mechanics	**Computational thinking, Logic** Application of Lua Coding to achieve game outcomes
176		
177	Connecting the dots	**Generalization, Logic, Critical Thinking** Weaving together the game parts to finish the game
178		
179	Game assessment and feedback	**Problem-solving, Persistence** Game feedback and modification
180	Publish the game	Publish and Play

INTRODUCTION TO DATA SCIENCE

During these classes, students will explore and understand different types of data and their real life applications, They will be introduced to the working of google sheets and will learn how to run basics math operations to analyse data and represent it using different types of charts and infographics. During the data analysis module they will learn the python panda library commands to create tables, insert data in them and print it. They will also learn how to read data from the CSV file and filter it, use data frames to analyse data.

SESSION	CONCEPT	SKILLS

181	Data and Data Science	**Exploration** Exploring what is data, information and data science
182	Areas of Data Science	**Exploration, Observation** Exploring areas where data science is used in everyday life
183	Introduction to Data Visualization	**Visualization, Analysis** Context for data visualization
184	Data Visualization rules	**Analysis** Rule of 2 for data visualization
185	Introduction to Google sheets	**Exploration** Entering, formatting and saving data into google sheets
186	Data analytics - I	**Numeracy, Decomposition** Doing basic math operations to run analytics on data
187	Data Analytics - II	**Numeracy, Decomposition** Sorting and searching data in a table
188	**Assessment**	Assessment of learning
189	Data Representation - I	**Representation, Generalization** Representing data using charts - Part 1
190	Data Representation - II	**Representation, Generalization** Representing data using charts - Part 2
191	Data Visualization techniques	**Visualization, Representation** Map visualization of data in google sheet
192	Data clean up	**Numeracy, Logic** Clean up of data
193	Data Visualization-Types	**Visualization, Abstraction** Types of data for data visualization
194	Data Representation- III	**Generalization** Use of infographics/info grams for data representation
195	**Assessment**	Assessment of learning
196	Python concepts recap	**Computation** Recap of use of variables, loops in python

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197	Introduction to Panda library	**Computation, Numeracy** How to create data with pandas: create table, insert data and print table data
198	Introduction to Random function	**Computation** Use of Random function
199	The CSV file format	**Numeracy** Introduction to the CSV file format
200	Data frames and CSV files-I	**Generalization, Decomposition** Reading data from CSV file to data frame and do filtering
201	Data frames and CSV files-II	**Generalization, Decomposition** Reading data from CSV file to data frame and do filtering (cont.)
202	**Assessment**	Assessment of learning
203	Python Data Types	**Numeracy** Data types in Python
204	Introduction to statistical concepts	**Computation** Introduction to statistical concepts- Mean, Median, Mode
205	Introduction to data frame commands- I	**Computation** Explore top 5 Data frames - Head, Length, columns, shape, describe
206	Introduction to data frame commands- II	**Computation** Explore top 5 Data frames - Head, Length, columns, shape, describe
207	Data analysis using data frames- I	**Analysis, Generalization** How to analyse data using data frame
208	Data analysis using data frames- II	**Analysis, Generalization** How to analyse data using data frame (cont.)
209	Data frames and charts	**Analysis** Data frames and charts
210	**Assessment**	Assessment of learning