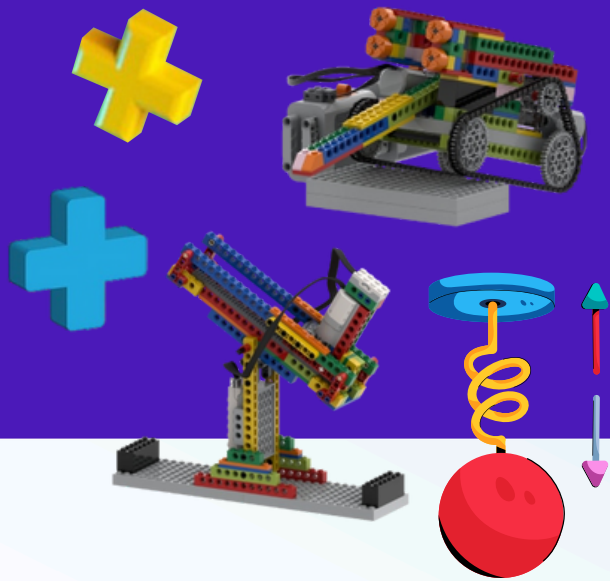




Ace

Recommended for Age 10-12

OBJECTIVES

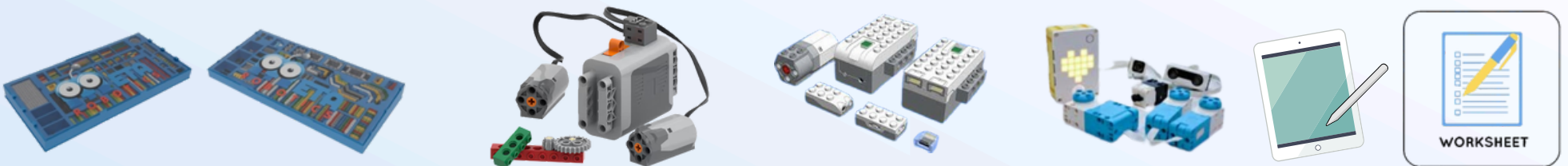


The Ace Programme is designed to offer an advanced and comprehensive educational experience through four integrated modules: **Robotics STEM, Robotics Coding, Machine Learning, and Games and Animation Computing**. This programme aims to deepen students' understanding and skills in **Science, Maths, Coding, Design**, and evolving technology, preparing them for future academic success and career opportunities. The highlights come from our **machine learning module** which explores how **AI works through real-world applications**, helping students understand the role and impact of AI in today's technology landscape.

SKILL ACQUIRED

- | | |
|----------------------------|----------------------------|
| ✓ Fine Motor Skills | ✓ Problem-Solving |
| ✓ Visual Spatial Awareness | ✓ Creativity |
| ✓ Mathematical Skills | ✓ Conceptual Understanding |
| ✓ Pattern Recognition | ✓ Data Literacy |
| ✓ Social Skills | |

EDUCATION TOOLS



SOFTWARE

- LEGO® Education Spike Prime App
- Machine Learning for Kids
- MIT Scratch 3.0

STUDENT'S OUTCOME

- ✓ Adaptability to New Technologies
- ✓ Boost Creativity
- ✓ Increase confidence
- ✓ Foundation for future learning
- ✓ Improved Science & Mathematics
- ✓ Enhance problem solving
- ✓ Build patience and focus
- ✓ Entrepreneurial skills

LESSON OUTLINE



Theoretical Introduction

- ★ **Robotics STEM:** Introduction to Science, Math and Engineering concepts through LEGO® prototypes.
- ★ **Robotics Coding:** Algorithm and pseudo coding discussion applied to LEGO® models.
- ★ **Games and Animation:** Learning design concepts for games and animations in computing projects.
- ★ **Machine Learning:** Training on the fundamentals of machine learning and real-world applications



Construction & Visual Spatial Perception

- ★ **Visual Spatial Skills:** Learning to identify and assemble 3D LEGO® pieces from 2D instructions.
- ★ **Motor Skills:** Developing fine motor strength, precise object manipulation, and coordination.
- ★ **Apply for Robotics Modules only**



Experiments

- ★ **Logical Reasoning:** Engaging in logic-based activities aligned with lesson objectives.
- ★ **Project Evaluation:** Analyzing and evaluating projects to meet specific requirements.



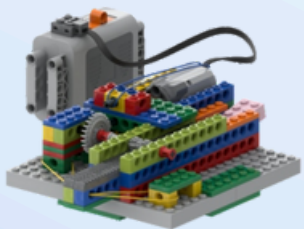
Problem Solving Tasks

- ★ **Progressive Challenges:** Tackling three tasks of increasing difficulty.
- ★ **Assessment:** Evaluating problem-solving abilities and creative thinking.



Knowledge Play

- ★ **Fun Facts:** Enhancing general knowledge with science, technology, engineering, and math facts.
- ★ **Quizzes:** Testing conceptual understanding with engaging quizzes on daily topics.



Lego Launcher



Three Bush Road Sweeper



Space Vehicle



Balancing Car



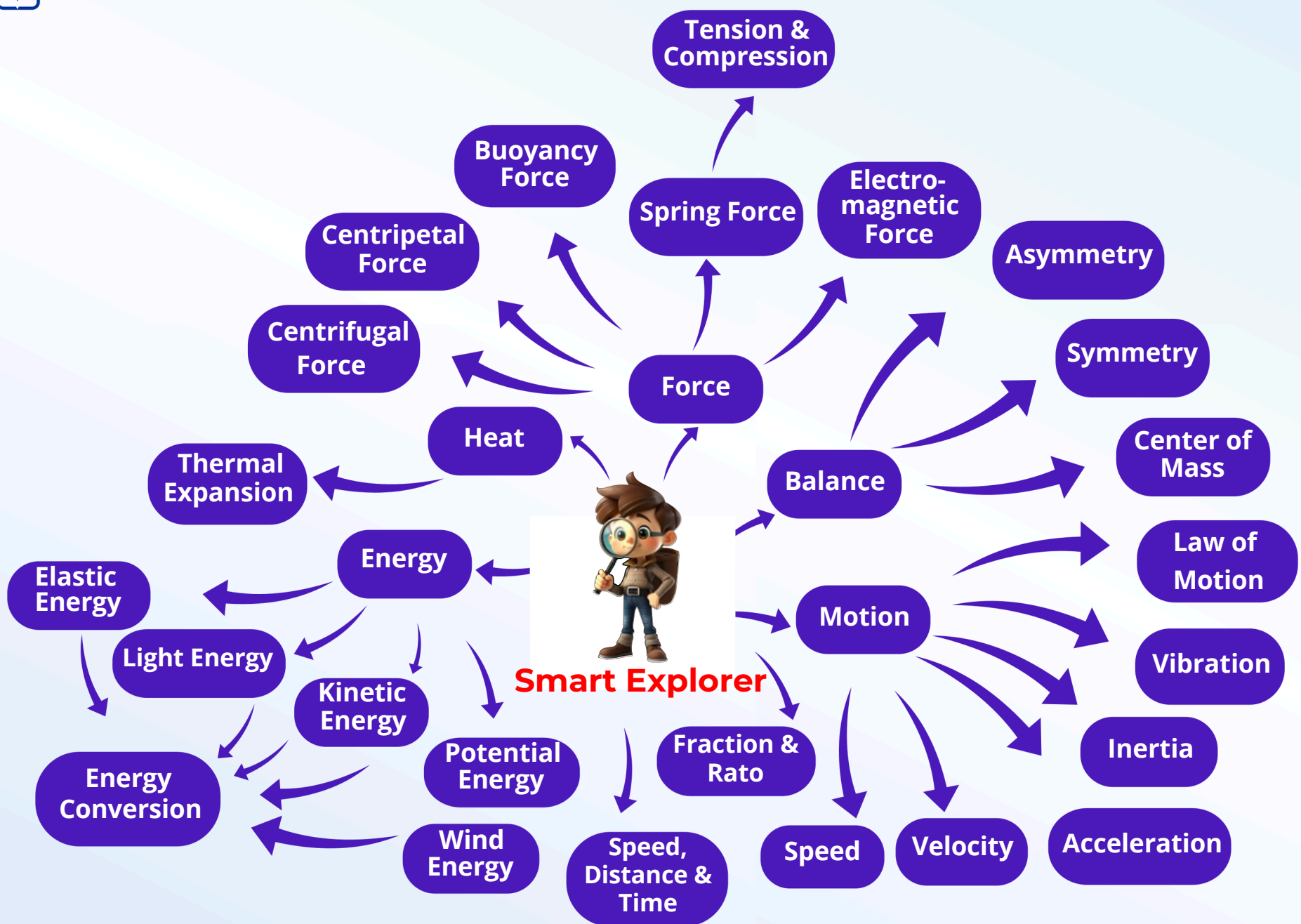
Tilting Maze



Car Wash Station

Science Topics

- | | | |
|---|---|---|
| ☒ Electromagnetic Force | ☒ Thermal Expansion | ☒ Vibration |
| ☒ Tension and Compression | ☒ Energy Conversion | ☒ Inertia |
| ☒ Buoyancy Force | ☒ Asymmetry | ☒ Velocity |
| ☒ Symmetry | | |



Math Topics

- | | |
|--|--|
| ☒ Fraction | ☒ Distance |
| ☒ Ratio | ☒ Time |
| ☒ Speed | |

Engineering Topics

- | | |
|--|---|
| ☒ Principle of Moments | ☒ Thermal Equilibrium |
| ☒ Leverage | ☒ Law of Motion |
| ☒ The Bernouli Principle | ☒ Hydraulic |

Enhance the love for Science and Math in a fun, explorative way while cultivating motor, spatial, problem-solving, and creative skills through building LEGO® models that illustrate real-world principles. This comprehensive program aims to make learning science and math enjoyable while building essential cognitive and social skills, giving students a head start in STEM education.



Smart Explorer



Pressure & Friction

Pressure is the amount of force applied per unit area. It is calculated using the formula: $\text{Pressure} = \text{Force} / \text{Area}$. Friction is the resistance that one surface or object encounters when moving over another. It can be static (preventing motion) or kinetic (resisting motion).

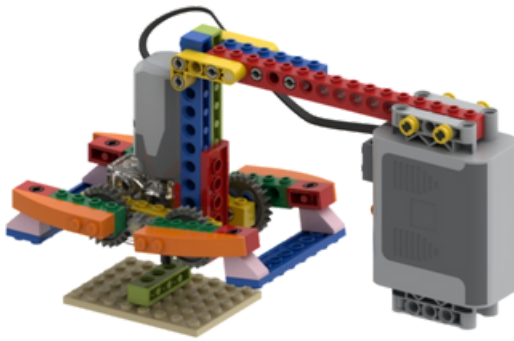
LEGO® Grabber

1. Use the LEGO® Grabber to pick up different objects.
2. Observe how different surfaces (smooth vs. rough) affect the grip due to friction.
3. Discuss how the pressure and friction between the claw and the object determine the effectiveness of the grab.

1. Friction is what allows us to walk without slipping.
2. Pressure is a key factor in designing tires for different vehicles.
3. Friction generates heat, which is why your hands get warm when you rub them together.



1. Pressure is the amount of _____ applied per unit area. (Ans: force)
2. Friction is the _____ that one surface encounters when moving over another. (Ans: resistance)
3. If the contact area is increased, the pressure will _____. (Ans: decrease)



Energy Conversion

Energy conversion is the process of changing energy from one form to another. Examples include converting mechanical energy to electrical energy, or potential energy to kinetic energy.

Panorama Wheel

1. Attach the motor to the LEGO® Panorama Wheel.
2. Turn on the motor and observe the wheel spinning.
3. Discuss how the electrical energy from the battery is converted into mechanical energy to move the wheel.

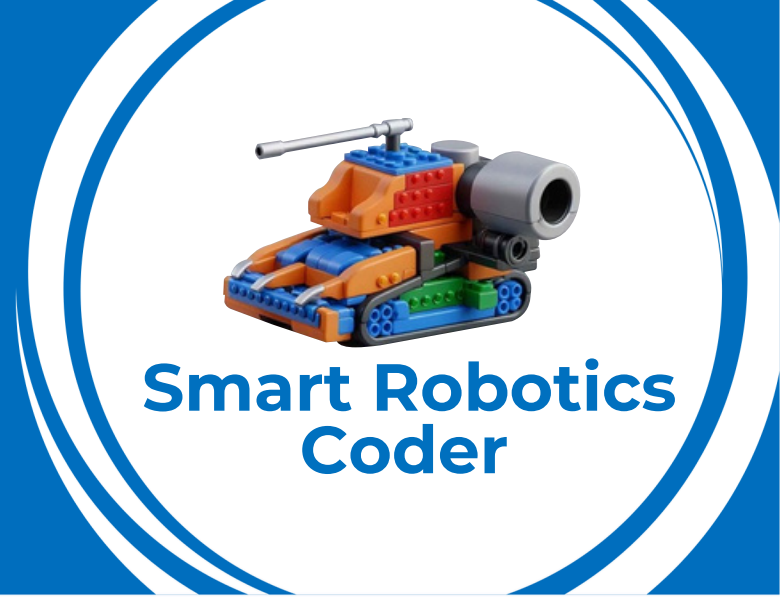
1. The first Ferris wheel was designed by George Washington Gale Ferris Jr. for the 1893 Chicago World's Fair.
2. Ferris wheels convert electrical energy from motors into mechanical energy to rotate the wheel.
3. The largest Ferris wheel in the world is the Ain Dubai, standing at 250 meters tall.

1. Energy conversion is the process of changing energy from one _____ to another. (Ans: form)
2. Which of the following is an example of energy conversion?
a) A ball sitting still b) A battery powering a motor
c) A book on a shelf. (Ans: b)
3. If the Ferris wheel has a radius of 5 meters, its circumference is _____ meters. (Answer: 31.4, using the formula $C = 2 \pi r$)

Disclaimers

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To enhance students' love for coding and technology through fun and engaging activities, building on the foundation established in the Young Robotics Coder programme. This module introduces more complex builds and coding using WEDO hardware and accessories. Students will further develop their motor skills, spatial visual skills, and logical reasoning by constructing and programming advanced LEGO® models. The aim is to cultivate problem-solving abilities and inspire creativity, preparing students for more advanced STEM education.



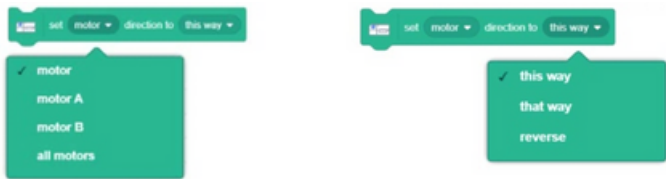
Lifting Platform

Powered industrial trucks, commonly called forklifts or lift trucks, are used in many industries, primarily to move materials. One of the main uses of forklifts are to lift heavy loads that are way beyond the limitations of a human being. They can be used to move, raise, lower, or remove large objects or a number of smaller objects on pallets or in boxes, crates, or other containers.

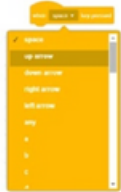
As we moved towards automation, you as a software researcher for the forklift company have to come out with an automated forklift to help ease up the workload and reduce manpower.



1) Students will explore the different parameters for the movement of two motors

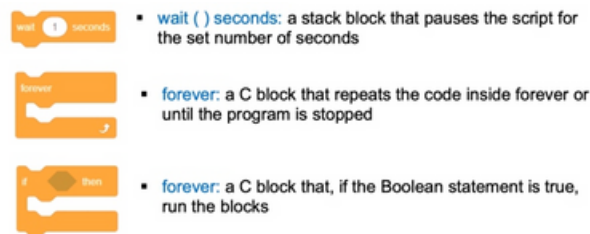


2) Using Different Hat Blocks (key pressed) to start the program



- Example:
Motor:
- i. Right arrow = Forklift move forward
 - ii. Left arrow = Forklift move backward / reverse

3) Using Different Control Blocks (key pressed) to start the program



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Task 1 Program the forklift to move



Task 2 - Program the pallet to be lifted by the forklift



Task 3 Simulation of the forklift using scratch



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To enhance students' proficiency in advanced robotics and coding through complex builds and programming. Building on the Smart Robotics Coder module, students will explore sophisticated coding techniques and advanced hardware, engaging in projects that require critical thinking, creativity, and advanced problem-solving. The focus includes advanced sensor integration, algorithm development, and realworld applications of robotics principles using SPIKE Prime.



Smart Creative Coder



All Terrain Vehicle (ATV)

TV in short stands for All Terrain Vehicle. Typically, ATV are used for recreation and they are motorized vehicles that are meant to be used o -road or on dirt roads, not on paved roads or highways. They usually have four large balloon-style tires, with a seat in the middle that a rider straddles while steering by the handlebars.

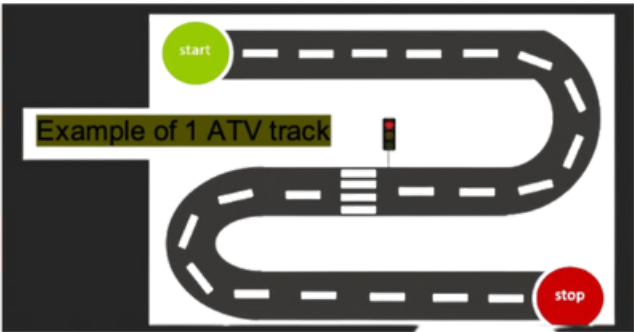


Coding

1. Students have a chance to explore the parameters for setting the motor rotation direction



2. Design an ATV track for racing



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Progressive Tasks

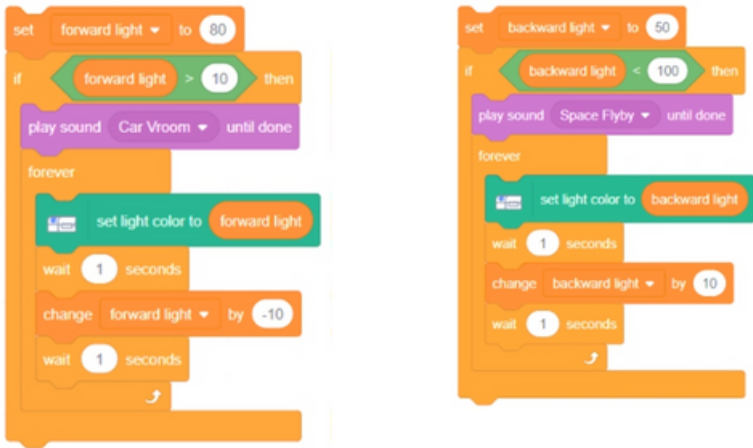
Task 1 Program the front wheel



Task 2 Program the rear/back wheel with color and a stop key



Task 3 Program the ATV to add sound e ect



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To advance students' skills in games, animation, and storytelling design using MIT Scratch 3.0, building on the foundation established in the Young Computer Scientist programme. This advanced programme aims to deepen creativity, logical thinking, and digital literacy through complex projects. By creating sophisticated interactive stories and games, students will enhance their problem-solving abilities and communication skills. This programme complements learning in Robotic STEM and Robotics Coding.



Underwater Treasure

Welcome to "Underwater Treasure Hunt!" Imagine you are a deep-sea diver on a mission to collect hidden treasures scattered across the ocean floor. Your goal is to collect as many treasures as possible while avoiding obstacles like seaweed and dangerous sea creatures. You will use your coding skills to keep track of the treasures you collect and compete for the highest score. Are you ready to dive into this adventure?

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Task 1: Set up the Games Scene

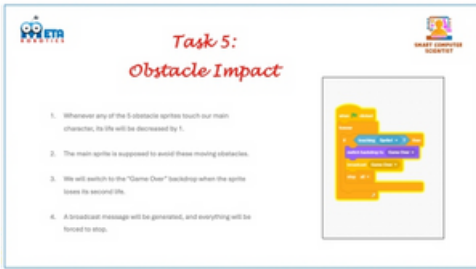


Task 4: Adding Obstacles



Task 2: Diver Movement

Task 5: Obstacles Impact



Task 3: Score Variable



- Fact 1: The ocean is home to more historical artifacts than all the world's museums combined.
- Fact 2: Less than 5% of the planet's oceans have been explored.
- Fact 3: The world's longest mountain range is underwater and called the Mid-Ocean Ridge.
- Fact 4: There are lakes and rivers beneath the ocean, created by salty brine.
- Fact 5: Every creature in the ocean plays a vital role in maintaining the balance of the marine ecosystem.



- 1) What blocks do you use to move the sprite in Scratch?
- A) Motion blocks B) Sound blocks C) Control blocks D) Event blocks
- 2) The block used to keep track of a value that can change is called a _____
- 3) Explain what a variable is and how it is used in our underwater treasure hunt game.

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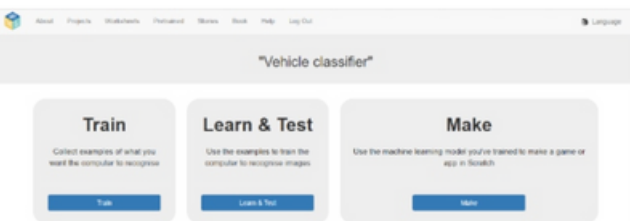
IMAGE CLASSIFICATION USING SCRATCH 3.0 AND MACHINE LEARNING FOR KIDS

Imagine you work with a smart robot that helps manage traffic in your city. Your job is to teach the robot how to recognize different vehicles like cars, buses, and bikes from pictures. This way, the robot can help make sure the traffic runs smoothly and everyone gets to their destination safely. By training the robot, you're making your city a better place for everyone!

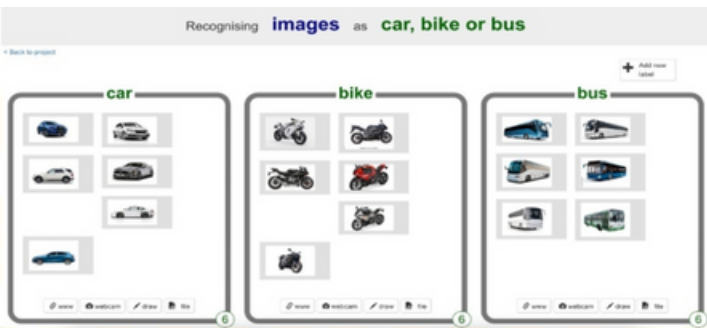
- Task 1: Collect Images of Vehicles
- Task 2: Set Up Machine Learning for Kids



- Task 3: Create a Project
- Task 4: Add Training Data



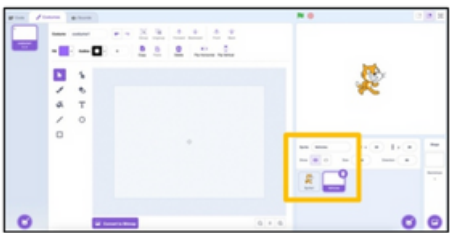
- Task 5: Train the Model
- Task 6: Test Your Model



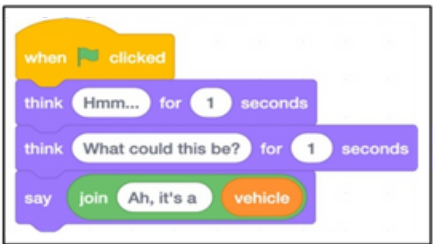
Progressive tasks

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This programme equips students with the skills and knowledge they need to excel in future academic pursuits and potential careers in technology and design.



Task 7: Integrating trained model with Scratch 3.0



Task 8: Program the Cat to interact with the vehicle images.



Task 9: The Cat will then identify whether the vehicle is a car, bike, or bus.

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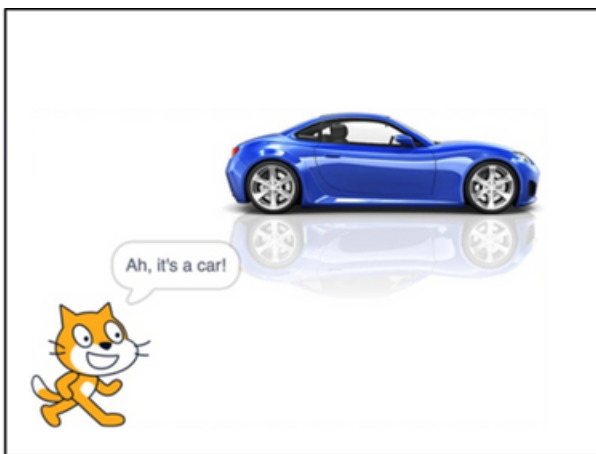
IMAGE CLASSIFICATION USING SCRATCH 3.0 AND MACHINE LEARNING FOR KIDS



**Machine Learning
Explorer**

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Task 10: Test the project by clicking on the Vehicles sprite and uploading different vehicle images.



1. What is image classification?
 - a) Drawing pictures.
 - b) Identifying objects in photos.
 - c) Writing stories.

2. Which tool is used to train a machine learning model in this lesson?
 - a) Scratch 3.0
 - b) Machine Learning for Kids
 - c) Paint

Task 11: See if the Cat correctly identifies the vehicle and provides the appropriate feedback.



3. _____ is the process of identifying and categorizing objects in images.

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