ASPIRATIONAL CURRICULUM 4

KAUSHALI

Class X

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Kaushali
(Aspirational Curriculum)

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PREFACE

The School and Mass Education Department, Government of Odisha, has introduced an aspirational curriculum and four school clubs namely, Jigyansa, Kaushali, Kridangan and Sahitya Srujani for the secondary grades of high schools from the academic year of 2023-24.

'Kaushali' provides IT and Coding education to the students, playing a pivotal role in shaping a digitally inclusive and thriving society. Through its carefully curated curriculum, 'Kaushali' ignites digital knowledge, accessibility, interactive learning, data driven insights, creativity, and innovation, among others.

Mo School Abhiyan Parichalana Sangathan and its collaborators, The Raspberry Pi Foundation, Quest Alliance, and Learning Links Foundation deserve heartfelt gratitude for their invaluable contribution to the development of 'Kaushali.' Their expertise, insights, and commitment to promoting digital education have played a pivotal role in shaping this book into an engaging and effective learning resource.

Teachers, students, and parents are requested to inform the authority of the Board of Secondary Education, Odisha, about any missing information or unwarranted mistakes in the book for timely correction.

(Board of Editors)

FOREWORD

This book has been carefully curated to cater to students of class X. It is divided into five parts: Transitioning to Advanced Scratch, Delving into Advance Scratch, Introduction to Artificial Intelligence, Exploring Basic AI concepts, AI projects and Scratch and Career Pathway. Each of the sessions is designed to cover essential topics that form the core of modern technology.

This module consists of 31 lessons where students will learn advanced features of Scratch programming, basics of AI, and how to create creative AI solutions for real-world problems. Additionally, students will receive guidance on career choices. By actively participating in this module, students will become proficient creators of AI and be well-prepared for future opportunities in the 21st Century.

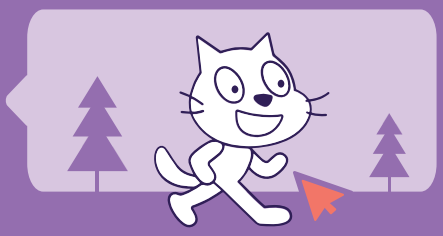
With 'Kaushali,' the aim is to ignite a passion for technology and empower students to become innovators, problem solvers, and leaders of change. Together, let us embark on this transformative journey to create a digitally inclusive and thriving future for our students and our beloved Odisha.

President
Board of Secondary Education,
Odisha

CONTENTS

01

Recap of Scratch Platform: Sprites, Backdrop & Blocks



LEARNING OBJECTIVES

- Learn and explore sprites, backdrops, costumes, and basic movements in Scratch.

LEARNING OUTCOMES

Students will be able to:

- Add a sprite and change its properties.
- Add backdrops and change them.
- Recognise the 'Motion' blocks and understand their usage.
- Use the Motion blocks available in Scratch.
- Change the position of respective sprites using XY coordinates.

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1-4ddWYMjkfBvTL24n0sbHoYF_o5Wbfvm/view?usp=drive_link

Assignment Sheet printouts

https://drive.google.com/file/d/1yGViY7FKDhanCTPqBQenJrzekTMD2v3J/view?usp=drive_link

LEARNER: PREREQUISITE KNOWLEDGE

- An understanding and familiarity with devices.
- A basic understanding of the Scratch interface.
- How to use the downloaded Odissi dance images from the device.

TEACHERS: PRIOR PREPARATION

- [ ] Projector to showcase the Scratch tool and toolkit
- [ ] Download the Odissi dance images from the Resources folder in Lesson 1
- [ ] Access to and familiarity with:
  - Adding sprites:

    https://www.youtube.com/watch?v=Vn6u1VWclLs

  - Adding backdrops:

    https://www.youtube.com/watch?v=D4QNNOSNYLg

  - Sample project for Motion blocks:

    drive.google.com/file/d/1HTG82Gk6cucreX6c_7wK9eqRkdWum_UQ/view?usp=sharing

- [ ] Activity sheet printouts
- [ ] Assignment sheet printouts

RECAP 5 minutes

Recalling What Scratch Is and How It Works (Slide 2)

Prompt students to recall the Scratch platform, its features, and how projects are created, using the guiding questions on the slide.

Note:
It might be useful to have the Scratch interface open to aid recall!

INTRODUCE 7 minutes

Introduction, Addition of Sprites, and Changing Costumes (Slides 4-11)

(Slide 4)
Ask students if they have played any games on the mobile or laptop. Tell them that similar animations or games can be created using Scratch.

Take a game known to the class and discuss its features (characters, background, size, sound effects, costume changes).
Tell them that similar features exist on Scratch and can be used to create projects/ games on their own.

(Slides 5-7)
Ask students about the folk dance of Odisha, and discuss the elements of a dance performance. Similar to the online game, in Scratch, we have stages, sprites, and costumes to create the dance.

Explain that, similar to a dancer (in the case of Odisha's folk dance) or a player, an umpire (in the case of a game), Scratch has sprites as characters.

Play the introductory video for adding sprites:
https://www.youtube.com/watch?v=Vn6u1VWclLs
(From 1.38 to 3.05 and 3.16 to 3.48)

Demonstrate! (Slides 8-10)

- Add a sprite from the library
- Download new sprites from the internet and then upload them
- Change the size of the added sprite
- Change the costume from the Costume tab

Activity: Worksheet (offline)

Ask students to complete Q1 and Q2 of Worksheet 1 using the Scratch tool.

Note:
Use the different Odissi dance images as costumes provided in the Resources folder of Lesson 1.

CREATE 8 minutes

Adding a Backdrop to Your Project (Slide 21)

Display the project slides that show the step-by-step procedure of adding a backdrop, and highlight the category of blocks used.

Note:
Tell students to follow your instructions to complete the addition the concert stage backdrop to the Odissi dance project.

INTRODUCE 3 minutes

Introduction to the Block Palette, Motion and Coordinates System (Slides 22-28)

(Slide 22)
Display the triggering question and inform students that they will be animating sprites by making them move in the desired direction using Motion blocks.

(Slide 23)
Play the example project video to show how to add code from the Block palette and run the program until 0:32:

drive.google.com/file/d/1HTG82Gk6cucreX6c_7wK9eqRkdWum_UQ/view?usp=sharing

Demonstrate! (Slides 24-27)

- Where the Block palette is located, including the different categories of blocks.
- Add Motion blocks from the palette to the code area (such as 'move 10 steps', 'turn 15 degrees').
- The Coordinates system, and using X and Y coordinates.
- Coordinates using the Goto and Glide blocks from Motion. ('glide 1 sec to x: y:').
- Highlighted blocks that can be used to position the sprite on the stage area.

Activity: Worksheet (offline) (Slide 28)

Ask students to complete Q4 and Q5 of Worksheet 1 using the Scratch tool.

CREATE 3 minutes

Adding a 'go to x() y()' Block to Your Project (Slide 29)

Display the project slides that show the step-by-step procedure of adding a 'go to x() y()' block, and highlight the category of blocks used.

Note:
Tell students to follow your instructions to add a goto block to move/place the sprite to/at the center of the stage in their Odissi dance project, and save it.

02

Sound, Looks, Events & Loops in Scratch

LEARNING OBJECTIVES

Students will:

- Recap the use of loops and sound blocks
- Recap events and loops in Scratch

LEARNING OUTCOMES

Students will be able to:

- Recognise different categories of blocks (Looks and Sound), and their usage
- Understand the purpose of events
- Test the functioning of various event blocks
- Learn about repetition and loops

LEARNER: PREREQUISITE KNOWLEDGE

- A basic understanding of the Scratch interface, and hands-on experience with its elements

TEACHERS: PRIOR PREPARATION

- [ ] Projector to showcase the Scratch tool and toolkit
- [ ] Access to and familiarity with:
  - Adding sounds:

    https://drive.google.com/file/d/1NX97-EsVbwR-7yWJNgCWd1Ie26DN29H2/view?usp=sharing

  - Using Event blocks:

    https://drive.google.com/file/d/1Et8cCpT4bBglkAKB3WdY2-CsuYGKdz2V/view?usp=sharing

- [ ] Activity sheet printouts
- [ ] Assignment sheet printouts

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1gTWQsvnKFlirwvSLmtRphq5a_ITJp6Cq/view?usp=drive_link

Assignment Sheet printouts

https://drive.google.com/file/d/1wIFBltKC8et3dW3_-C33IxIpnK0NPGXu/view?usp=drive_link

RECAP 5 minutes

Recall the Basics of Scratch (Slides 2-4)

Recap of the previous Lesson using the answers in worksheet 2 and probing questions.

Note:
It might be useful to have the Scratch interface open to aid recall!

LEARN 7 minutes

Introduction to Sounds and Looks Blocks (Slides 5-9)

Describe and discuss how students can make sprites produce sounds and change their appearance using the Looks and Sounds blocks.

Demonstrate!

- Add sounds
  - From the library
  - By recording
  - By uploading the downloaded sound

https://drive.google.com/file/d/1NX97-EsVbwR-7yWJNgCWd1Ie26DN29H2/view?usp=sharing

- How to make the human sprites interact with each other

Explain the purpose of the Looks Block and how to use it.

CREATE 5 minutes

Adding Sounds and Changing Looks in Your Project (Slides 10-13)

Display the project slides that show the step-by-step procedure of adding sounds and changing looks, and highlight the category of blocks used.

Note:
Tell students to follow your instructions to make the dancer say 'Namaste' using the 'Say' block, and start the dance performance.
They will add music using the 'Play Sound' block, and also use the 'Switch Costume' blocks for the dance sprite to show different dance moves in the Odissi dance project.

EXPLORE 8 minutes

Introduction to Event Blocks (Slides 14-20)

Activity: In-Class (Slide 14)
Call for four students: one will act as the volunteer, and the remaining three will perform the opposite of the action the volunteer makes, as described on the slide.

Explain: The first student's action triggers a response. Similarly in Scratch, an Event block starts/ signals any activity.

(Slide 15)
Use the triggering questions to explain that there is another way to start the program by using Event blocks.

Demonstrate! (Slides 16-18)
Use Scratch to show:
- An Event palette
- Event blocks

(Slide 19)
Play the sample video on how to use Event blocks: https://drive.google.com/file/d/1Et8cCpT4bBglkAKB3WdY2-CsuYGKdz2V/view?usp=sharing

Activity: Applying Events, Sounds and Looks (Slide 20)
Ask students to complete Q3 from Worksheet 1 using the Scratch tool.

CREATE 10 minutes

Adding an Event Block in Your Project (Slide 21)

Display the project slides that show the step-by-step procedure of adding sounds and changing looks, and highlight the category of blocks used.

Note:
Ask students to follow your instructions to add the 'When green flag clicked' block in their Odissi dance project.

LEARN 5 minutes

Introduction to Loops Blocks (Slides 22-25)

Activity: In-Class (Slide 22)
Ask for a volunteer, and instruct them to follow the directions on the slide. Make sure to repeat some instructions to connect this repetition of this set of instructions to loops.

(Slide 23)
Using the triggering questions, introduce the terms 'repeat' and 'loop'

Demonstrate! (Slide 24)
- Loops
- Repeat and Forever blocks

(Slide 25)
Ask students to complete Q4 from Worksheet 1 using the Scratch tool.

CREATE 12 minutes

Adding Loop Blocks in Your Project (Slides 26-27)

Display the project slides that show the step-by-step procedure of adding Forever blocks, and highlight the category of blocks used.

Note:
Ask students to follow your instructions to add the Forever block in their Odissi dance project.

CONCLUDE 5 minutes

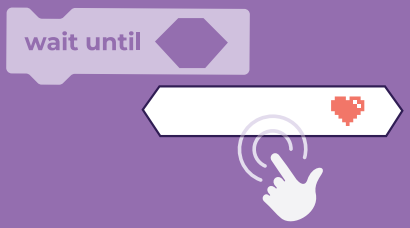
Reflection and Assignment (Slide 28)

Use the questions on the slide to check for understanding, then summarise the lesson.

Distribute the Assignment worksheet and explain how to complete it.

03

Control Structures in Scratch



LEARNING OBJECTIVES

Students will:

- Learn about control structures in Scratch.

LEARNING OUTCOMES

Students will be able to:

- Understand condition checking by using Conditional blocks.
- Implement comparison operators in condition checking.

LEARNER: PREREQUISITE KNOWLEDGE

- A basic understanding of the Scratch interface, and hands-on experience with its elements.

TEACHERS: PRIOR PREPARATION

- ☐ Projector to showcase the Scratch tool and toolkit
- ☐ Activity sheet printouts
- ☐ Assignment sheet printouts

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1YvVHHqCheza4MZjBqkKjp9sCq477ei5A/view?usp=drive_link

Assignment Sheet printouts

https://drive.google.com/file/d/1sZRy7R4RlqgZLmPl2uGFzykn-gd16kZS/view?usp=drive_link

RECAP 5 minutes

Recall Looks, Sound, Loops and Events in Scratch (Slides 2-4)

Recap the previous lesson with the guided and triggering questions.

DISCOVER 10 minutes

Introduction to Conditional Blocks (Slides 5-9)

(Slide 5)
Ask students to listen to each statement and respond as instructed.

(Slide 6)
Explain: In the game, students responded with a specific action if they agreed/disagreed with the statement. Similarly, we can give conditions to control the flow of a project in Scratch.

Demonstrate! (Slides 7-9)
Use Scratch to show:

- The Control palette
- Conditional blocks
- Control blocks

Also explain the working of the Wait block, and conditional blocks in the Odissi dance project.

CREATE 5 minutes

Introduction to Operator Blocks (Slide 10)

Explain the different mathematical operators blocks available in the Operator palette, its types, and its usage in condition checking.

Discuss the different comparison operator blocks.

CREATE 20 minutes

Adding Conditional Blocks and Basic Operator Blocks in Your Project (Slides 11-20)

Display the project slides that show the step-by-step procedure of adding conditional blocks and basic operator blocks from the palette to the code area to control all sprites, and highlight the category of blocks used.

Note:
Tell students to follow your instructions to add the Wait block. Also, add an If block with an 'equal to' Operator block to check the costume number in the Odissi dance project.
Condition: If the costume number is equal to 4, then the sprite will say 'Thank You' and stop performing.

CONCLUDE 5 minutes

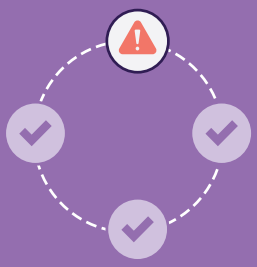
Reflection and Assignment (Slide 21)

Use the questions on the slide to check for understanding, then summarise the lesson.

Distribute the Assignment worksheet and explain how to complete it.

04

Introduction to Problem Identification & Presentation



LEARNING OBJECTIVES

Students will:

- Identify contextual problems and ways to break them down into small parts.
- Conduct thorough research on the selected problem.

LEARNING OUTCOMES

Students will be able to:

- Revise the Problem-Solving Process they learned in the previous class
- Identify the Problem-Solving cycle that helps solve any problem.
- Identify the problem they have faced in their locality
- Research the selected problem statement

LEARNER: PREREQUISITE KNOWLEDGE

- An understanding of the Problem Statement and Problem-Solving Process as previously taught.

TEACHERS: PRIOR PREPARATION

- ☐ Stone, music + speakers
- ☐ Laptop + projector to view:

https://www.youtube.com/watch?v=z7RaFPT3DTE

- ☐ Activity sheet printouts
- ☐ Assignment sheet printouts

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1XvFJ1okfQcVTBVM4SSi1PU34B0Pf65D8/view?usp=drive_link

Assignment Sheet printouts

https://drive.google.com/file/d/15JWdsjiEkvncogVv7xIkpMp2TxJBtt6T/view?usp=drive_link

RECAP 10 minutes

Recalling the Problem-Solving Process (Slide 3)

Recap last year's Problem-Solving lesson and how students applied it to solve a problem of their choice.

Passing the Stone
Get students to pass a stone and play music. Stop the music randomly; the student holding the stone must respond to the questions shared on the slide.

Questions

1. What problem did you choose to solve last year?
2. How did you research to gather information?
3. What did you share in your presentation?
4. What was your experience of last year's process?
5. Share one learning from last year.

INTRODUCE 10 minutes

Recap Activity Summary and the Problem-Solving Process (Slides 4-5)

(Slide 4)
Summarise the outcomes of the Recap activity to recall the problem-solving process followed last year.

Show this video:
https://www.youtube.com/watch?v=z7RaFPT3DTE
or share the story.

(Slide 5)
Discuss how they applied the problem-solving process to arrive at the desired solution step by step. Relate the video to the steps.

- Break down the problem into smaller parts and perform a root cause analysis using 5W1H (who, what, when, where, why, and how).
- Research existing solutions and explore possible options.
- Select a solution that considers all ground realities.
- Develop an implementation plan and divide the work within the team.
- Once the solution is implemented, check if it solves the problem effectively and is practical to use. Refine the process, if needed, and think about ways to make it more efficient.

This year, they will work on different community problems and solve them using technology and computational techniques.

EXPLORE 20 minutes

Problem Selection and Step 1: Defining the Problem (Slides 6-8)

Activity: In-Class
Get students into groups of 5. Ask them to list what problems they want to solve. Sample problems in the community, school, and local context are provided for reference.

From the list, ask the groups to vote for one problem they want to solve.

Ask students to discuss and list all the problems that they want to solve or improve to make their lives better in their schools, homes or community. Encourage them to write detailed descriptions and specify issues related to themselves or their parents.

Distribute the worksheet and ask students to document the information in the sheet.

CONCLUDE 5 minutes

Reflections and Assignment (Slides 9-11)

(Slide 9)
Summarise what was taught in class: the steps required to solve a problem, any specific strategies used to develop the problem statement, and any challenges faced during the process.
Discuss whether this process can be used to solve other issues.

(Slide 10)
Distribute the Assignment worksheet and explain that they have to search for answers to the questions to gather information. Ask students to gather as much information as possible, especially the “Why,” and document it on the assignment sheet.

(Slide 11)
Share an example for them to see the depth of information-gathering. .

05

Problem Statement & Root Cause Analysis

LEARNING OBJECTIVES

Students will:

- Use a problem-solving tool to break down a problem and create a problem statement.
- Analyse the problem further using Root Cause Analysis tools.

LEARNING OUTCOMES

Students will be able to:

- Break down the problem into smaller parts.
- Develop the problem statement.
- Analyse the problem further using the Root Cause Analysis "Why-Why" tool.
- Research a problem statement to gather information

LEARNER: PREREQUISITE KNOWLEDGE

- An understanding of the Problem Statement and Problem-Solving Process as previously taught.

TEACHERS: PRIOR PREPARATION

- ☐ Activity sheet printouts
- ☐ Assignment sheet printouts

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/19eytppjzOL61k0iwP-XElFwRpKVO5tK_/view?usp=drive_link

Assignment Sheet printouts

https://drive.google.com/file/d/1satr8nVaelGpSyNtTa8layZ8EUW64zSb/view?usp=drive_link

RECAP 5 minutes

Recalling Problem Identification (Slide 3)

Recap the previous lesson on problem identification using the questions on the slide.

EXPLORE 10 minutes

Review Lesson 4 Assignment and Develop the Problem Statement (Slides 4-7)

(Slide 4)
Review and discuss the assignment sheet from the last class.

It is important to ask students what information they gathered and where they got specific details, as listed on this slide. This information helps them to narrow down and focus on specific problems.

(Slide 5)
Explain this with the example of the findings of the 5w1H process.

(Slide 6)
Read the Problem Statement aloud from the slide, and make sure it is properly understood.

Demonstrate! (Slide 7)
Demonstrate how to write a problem statement using the gathered information. This will serve as an example for the students to follow in order to write their own problem statements for their selected issues.

Give them 5 minutes to write their problem statements.

(Slide 8)
Explain that this completes the “Define” part of the cycle. Step 2 of the problem-solving cycle is to ”Think”, which includes Root Cause Analysis and solution research.

EXPLORE 10 + 20 minutes

Step 2: Root Cause Analysis and Researching the Problem (Slides 9-11)

Demonstrate! (Slides 9-10)
Explain the "Why-Why" process with the same Heatwave example, to identify the root cause of the problem and understand the underlying causes. Sometimes, one "why" can have multiple answers, and the "Why-Why" process will be applied to each answer to understand the problem in detail. This will help in coming up with an appropriate solution.

You can ask even more "why" questions. Usually, the first few whys will have basic answers, but clarity will emerge as you ask more "why" questions.

Activity (Slide 11)
Ask students to form groups and use the worksheet to carry out a Root Cause Analysis of their problem statements.

Note:
Once the problem statement is ready, students should do a Root Cause Analysis to investigate the problem further and break it down into smaller parts.

CONCLUDE 5 minutes

Reflections and Assignment (Slides 12-13)

Summarise what was taught in class. Distribute the Assignment worksheet and explain how to proceed.

06

Solution Selection, Planning Computational Artifacts, & Presentation

LEARNING OBJECTIVES

Students will:

- Select a solution after assessing its feasibility
- Draw a prototype of their problem
- Plan the prototype as a computational artifact

LEARNING OUTCOMES

Students will be able to:

- Select the best-suited Solution for the problem
- Relate the concept of planning and prototyping with real life
- Plan a prototype of the computational artifact
- Create an algorithm from the solution

LEARNER: PREREQUISITE KNOWLEDGE

- Critical thinking and problem-solving skills to define, analyse, and address problems
- Design Thinking principles to help generate creative ideas and design concepts for the computational artifact

TEACHERS: PRIOR PREPARATION

- ☐ Digital or physical images: house, blueprint
- ☐ Activity sheet printouts
- ☐ Assignment sheet printouts
- ☐ Go through the slides and decide the flow accordingly

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1CCj82GaGatxeQ0QcsgAzMruqdOBmCq1G/view?usp=drive_link

Assignment Sheet printouts

https://drive.google.com/file/d/1_9uJmImxHgmvjIrSxAEVwddT22blErNo/view?usp=drive_link

RECAP 5 minutes

Recalling the Problem-Solving Cyle and Root Cause Analysis (Slide 3)

Review the previous class activities, go over the problem-solving cycle, and the RCA process that the students learned in the last class.

Ask each group of students to share their experiences with the RCA exercise and and the research of the solution. Discuss what they learned throughout the process.

EXPLORE 10 minutes

Step 3 of the Problem-Solving Cycle: Select the Solution, or 'Choose' (Slides 4-5)

(Slide 4)
Explain: Now that students have a list of possible solutions for their selected problem, it's time to select one best-suited solution that can be implemented.

In the problem-solving cycle, we are moving into the "Choose" stage, where the solution will be selected based on the conditions of the problem.

(Slide 5)
Ask students to refer to their Assignment sheets from the previous lesson and select a solution based on the points on this slide.

Give the students some time to discuss and choose the best solution that suits their context.

This concludes the "Choose" stage of the problem-solving cycle. Next, we will move into the "Try" and "Reflect" stages, where we will plan, implement, and test the chosen solution to refine it and solve the problem effectively.

INTRODUCE 10 minutes

Introduction to Computational Artifacts and Planning (Slides 6-9)

(Slide _)
Display the picture of a house and ask students to think about what would have been done before the house was built.

(Slide 6)
Note their responses, then explain the planning stage, where one determines the goals, features, and functions of the house. Draw their attention to the list on the slide.

Display the blueprint of the house. Explain that a blueprint or prototype is usually created before physically constructing the house.

Similarly, the students should create a prototype for their chosen solution.

(Slide 7)

Define **"Prototyping"**: Creating a preliminary or initial model of the product to test and refine the artifact. And when people apply technology to any solution, it's called a "computational artifact".

(Slide 8)
Share these examples of computational artifacts.

For more clarity, ask the following questions:

1. What are the most common mobile apps you use?
2. What kinds of problems do these mobile apps help you to solve?

Explain that these mobile apps/any solution that uses technology/computational devices are also called "Computational Artifacts".

(Slide 9)
Explain that even for computational artifacts, planning is needed. Draw students' attention to the points on this slide. Based on these points, we prepare a blueprint/prototype design for any solution.

EXPLORE 15 minutes

Prototype Planning and Development (Slides 10-12)

(Slide 10)
Ask students to return to their groups and begin creating prototype designs for their solutions.

To guide the process, display the key points that students should keep in mind when developing their tangible designs.

(Slide 11)
Designing the Prototype of the Solution
The group needs to use the Worksheet space to design the first sketch of their prototype and write the algorithm/flow of how the solution will work for its implementation.

(Slide 12)
Show an example of a solution and its design for the heatwave problem.

PRESENT 10 minutes

Presentation of the Solution (Slide 13)

Ask each group to present their solution to the class, following the points outlined on the slide, within the allocated time. Invite the class to provide constructive feedback.

CONCLUDE 3 minutes

Summary and Assignment (Slide 14)

Summarise what was taught in the last 3 classes and recap the process followed so far to solve the problem. Use the questions on the slide for reflection.

07

Introduction to Variables

LEARNING OBJECTIVES

Students will:

- Revise the concepts of Loops, Conditions, Events and Control blocks.
- Learn the concept of variables and their types, with real-life applications.

LEARNING OUTCOMES

Students will be able to:

- Recall the concepts of Loops, Events, Conditions and Control blocks.
- Explain the concept of variables.
- Identify the form of values that can be stored in variables.
- Apply the concept of variables in real-time.
- Explore the variable blocks used in the sample project.

LEARNER: PREREQUISITE KNOWLEDGE

- An understanding of Scratch interfaces and hands-on experience with its elements.

TEACHERS: PRIOR PREPARATION

- ☐ Projector to showcase the tool (including sample project)
- ☐ Laptop loaded with the video
  - Sample project:

    https://scratch.mit.edu/projects/942353415

  - Video:

    https://youtu.be/62Y0GN1DmmA

- ☐ Activity sheet printouts
- ☐ Assignment sheet printouts

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1Xc_DrxgBWr_I3h2DN2hvpzRhkHalQXYN/view?usp=drive_link

Assignment Sheet printouts

https://drive.google.com/file/d/1Gdk5TSyyor2Gsk69WnCPt5dhOVrg5h1_/view?usp=drive_link

RECAP 15 minutes

(Slide 2)
Do a recap of concepts previously taught using probing questions about the tool interface and its purpose.

(Slides 3-4)
https://scratch.mit.edu/projects/852332847
Show the cyclone project that students created in grade 9. Ask questions related to the concepts in the project as displayed on the slide.

(Slide 5)
Use this slide to further explore and establish understanding.

Activity: (Slide 6) Worksheet (offline)
Identify the appropriate Scratch blocks.

Distribute the worksheets and ask students to complete them.

Tell students that advanced level blocks will be introduced in the upcoming lessons, starting with variables.

INTRODUCE 5 minutes

What is a Variable? (Slides 7-11)

Activity: (Slide 7)
Pick out a scorer and five others as participants. The scorer must identify the participants who perform the actions incorrectly, and keep score.

Instructions to participants:

- Hands-up
- Hands-down
- Clap
- Clap twice, thrice

Follow up with the triggering question on (Slide 8).

Similar to this activity (Slide 9)
What is a Variable?

(Slide 10)
Show students variables in Scratch.

(Slide 11)
Play the sample project video:
https://youtu.be/62Y0GN1DmmA

EXPLORE 12 minutes

Types of Formats of Values (Slides 12-14)

(Slide 12)
Display the triggering question and inform students that they will be animating sprites by making them move in the desired direction using Motion blocks.

(Slides 13 and 14)
Explain how values with different formats can be stored in variables.

COMPARE 3 minutes

Types of Variables: Examples (Slide 15)

Discuss real-time examples of variables, such as how we keep score in games we play.

SHOWCASE 5 minutes

A Sample Project on Scratch (Slide 16)

Demonstrate! (Slides 24-27)
Show the sample project to the students:
https://scratch.mit.edu/projects/942353415

Discuss the blocks and the theme of the project.
Give them the link to explore it further.

CONCLUDE 5 minutes

Reflection and Assignment (Slide 17)

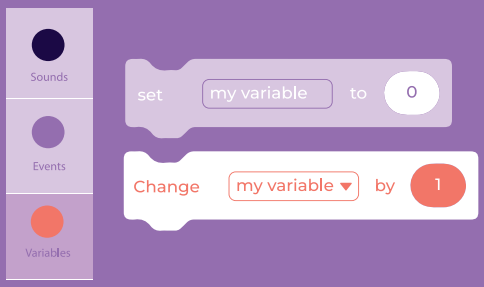
Probe for a logical understanding of the concepts taught in this lesson.

Summarise the discussion and indicate to students that they will explore the sample project and find the variable blocks used.

Distribute the Assignment Worksheet and explain how to complete it.

08

Introduction to Variable Blocks in Scratch



LEARNING OBJECTIVES

Students will:

- Understand the components of variables.
- Learn about the variable blocks available in Scratch.
- Create their own variable using Scratch.
- Observe the project based on the usage of various blocks in Scratch.

LEARNING OUTCOMES

Students will be able to:

- List the variable blocks in Scratch.
- Ideate the structure of the variable.
- Create their own variable using Scratch.

LEARNER: PREREQUISITE KNOWLEDGE

- Students should have an understanding of Scratch interfaces, basics of variable blocks, and hands-on experience on the Scratch blocks.

TEACHERS: PRIOR PREPARATION

- ☐ Projector to showcase the Scratch tool
- ☐ Activity sheet printouts

WORKSHEET

Activity Sheet printouts

https://drive.google.com/file/d/1D0-VrkOGpJc_IzjrH7ilkuEZfOXCvCrm/view?usp=drive_link

RECAP 10 minutes

(Slides 3-4)

Recap previously taught concepts with questions about variables and the format of the values that can be stored in variables.

Ask about the variable blocks that are used in the sample project, such as show variable, hide variable, set and change blocks.

Questions related to the concepts of:
- Text
- Numbers
- Boolean

Activity: (Slide 5) Worksheet (offline)
Identify the different variable types using a self-introduction. Distribute the Activity sheet and questions, then discuss Q1 of the activity sheet.

Triggering Questions (Slide 6)
Motivate the students by telling them that they will be creating their own variable block in this session

INTRODUCE 8 minutes

Components of Variables (Slides 7-8)

(Slide 7)
Discuss the components of a variable.

Activity: In-class (Slide 8)
Show Slide 8 with a few variable declarations and ask students to identify the components of these variables.

INTRODUCE 5 minutes

Introduction to Variable Blocks in Scratch (Slides 9-11)

Show the location of variable blocks, which is present in the code section, and explain the different blocks available in the Variable palette.

Triggering question: How can we create a new variable in Scratch?

EXPLORE 15 minutes

Creating a New Variable (Slides 12-14)

Demonstrate! (Slides 12-13)
Explain the purpose of the 'Make a variable' block on the Scratch platform.
Show the step-by-step procedure to create a new variable using the "Make a variable" block.
Ask students to name the variable 'timer'. Once the variable is created, it will be visible in the block list of variables.

Activity: (Slide 14) (offline)
Distribute the worksheet including the questions based on rearranging blocks to create a new variable.
Discuss Q2 of activity sheet 4.

SHOWCASE 4 minutes

Sample Project Showcase (Slide 15)

Showcase the project to the students that includes various Scratch blocks and ask students to create a similar project.

Project link:
Ask them to find the variable made by using ‘make a variable block’ in the project.

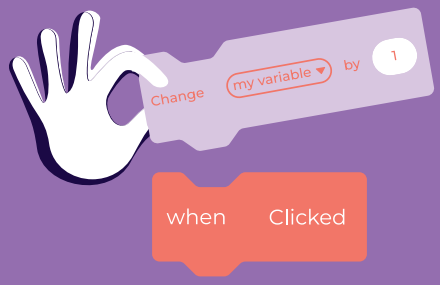
CONCLUDE 3 minutes

Reflection (Slide 16)

Summarise the discussion of the day and tell students they will explore more.

09

Application of Variable Blocks in Scratch



LEARNING OBJECTIVES

Students will:

- Learn about the usage of variable blocks (set, change, show, hide).
- Understand the practical application of variables with operator blocks.
- Create a Scratch project using variable blocks along with previously used blocks.

LEARNING OUTCOMES

Students will be able to:

- Identify and infer the various variable blocks in Scratch.
- Explain the functioning of the variable along with operator blocks.
- Apply the variable blocks to create a simple timer project.

LEARNER: PREREQUISITE KNOWLEDGE

- An understanding of Scratch interfaces, the basics of variable blocks and hands-on experience of the Scratch blocks.

TEACHERS: PRIOR PREPARATION

- ☐ Projector to showcase the tool
- ☐ Activity sheet printouts
- ☐ Assignment sheet printouts

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1j6kZkz2ULUndoiJcrDLoUurSF3E0phqD/view?usp=drive_link

Assignment Sheet printouts

https://drive.google.com/file/d/1KefgxsodOTTI254S9rXvXfaAXAlFWVzb/view?usp=drive_link

RECAP 5 minutes

(Slide 3)
Recap previously taught concepts with questions about variables and their components, related to the concepts of: Variable name, Variable value and Creating a variable.

(Slide 4)
Explain that in the sample project, the Days variable was created using the 'make a variable' block.

Triggering question (Slide 5)
Use this slide to motivate them: they will be using various variable blocks to add timer variables to their project in this session.

INTRODUCE 5 minutes

Usage of Variable Blocks in Scratch (Slide 6)

Explain the different blocks available in the Variable palette.

RECAP 5 minutes

Operator Blocks (Slide 7)

Recall the different blocks available in the Operator palette.

RECAP 10 minutes

Abstraction of Previously Used Blocks (Slides 8-11)

(Slide 8)
Show the slide with the block program for students to identify the blocks and the respective palette.

(Slide 9)
Share these questions and discuss their responses.

(Slide 10)
Show the slide with the answers to the questions in slide 9.

Activity: (Slide 11) Worksheet (offline)
Distribute the worksheet. Once completed, discuss it with the students.

EXPLORE 12 minutes

Creation of a Timer Project (Slides 12-20)

Demonstrate!
Show the step-by-step procedure and highlight the category of blocks used in the project.

SHOWCASE 4 minutes

Sample Project (Slide 21)

Showcase the part of the project that includes various Scratch blocks and ask them to create a similar project.

SHOWCASE 4 minutes

Provide the project link and ask them to find the Operator blocks used in the project

CONCLUDE 4 minutes

Reflection and Assignment (Slide 22)

Use these question to check for a logical understanding of the concepts taught.
Summarise the discussion, distribute the Assignment sheet and explain how to complete it.

10

Sensing using Scratch

LEARNING OBJECTIVES

Students will:

- Understand what is sensing and the correlation between human and digital sensing.
- Understand the sensing blocks in Scratch and their usage (Touching sprite, colour touching, dragging and ask).
- Create a Scratch project using sensing blocks along with previously used blocks.

LEARNING OUTCOMES

Students will be able to:

- Explain the concept of sensing and its purpose.
- Ideate between human and digital sensing.
- List the sensing blocks in Scratch.

LEARNER: PREREQUISITE KNOWLEDGE

- An understanding of Scratch interfaces and hands-on experience with Scratch blocks.

TEACHERS: PRIOR PREPARATION

- ☐ Projector to showcase the tool
- ☐ Activity sheet printouts
- ☐ Assignment sheet printouts

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/19p9O1mV0M9-DiQTJmLzPsc35gqOl_bHp/view?usp=drive_link

Assignment Sheet printouts

https://drive.google.com/file/d/1UK29DQNE5CTmZj4ChZtyozCQYLzt5Ejq/view?usp=drive_link

RECAP 5 minutes

(Slide 3)

Ask questions related to the concepts of:

- Set variable
- Change variable
- Show variable
- Hide variable

(Slide 4)

Ask a question based on the sample project.
Answer: The equal to Operator block was used in the project.

(Slide 5)

Motivate students by telling them that they will be using sensing blocks to make two sprites touch each other or ask questions in their project

INTRODUCE 7 minutes

The Human Senses and Sensing (Slides 6-7)

(Slide 6)

Talk about the different types of senses in the human body.

Activity 1: (Slide 11) Worksheet (offline)

Distribute the worksheet and discuss once completed.

FAMILIARISE 8 minutes

Introduction and Usage of Sensing Blocks in Scratch

(Slides 8-10)

Introduce the different blocks available in the Sensing palette.

- **Touching Sprite**: This block is used to check if the sprite is touching the “mouse-pointer”, the “Edge” of the Stage or any other “Sprite”.
- **Color touching:** This block checks whether its sprite is touching a specified colour.
- **Drag:** This block sets the sprite to draggable or not draggable.
- **Ask and wait**: This block will make the sprite ask the question and show an input box at the bottom of the screen for the answer.

Activity 2: (Slide 11) Worksheet (offline)

Distribute the worksheet and discuss once completed.

DEMONSTRATE 18 minutes

Creation of the Odisha Tourism Project
(Slides 12-20)

Share the step-by-step procedure and highlight the category of blocks used in the project.

SHOWCASE 4 minutes

Sample Project Showcase (Slide 21)

Showcase the project that includes various Scratch blocks.Provide the project link and ask them to find the Sensing blocks used in the project.

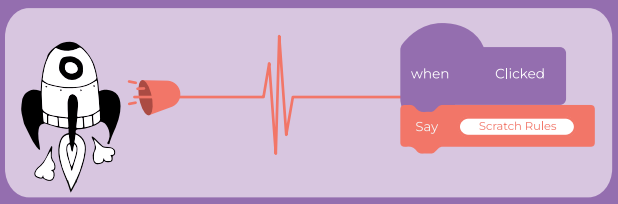
CONCLUDE 3 minutes

Reflection and Assignment (Slide 22)

Ask questions to extract a logical understanding of the concepts taught.
Summarise the discussion, distribute the Assignment Worksheet and explain how to complete it.

11

Communication using Scratch



LEARNING OBJECTIVES

Students will:

- Understand about communication and broadcasting messages.
- Comprehend the broadcast blocks in Scratch and their usage.
- Create a Scratch project using broadcast blocks along with previously used blocks.

LEARNING OUTCOMES

Students will be able to:

- Define Communication and explore different types of mass communication.
- Enhance their knowledge about broadcasting using Scratch.
- Recall the functioning of text-to-speech blocks.
- Create a mini project using the concepts learnt in the lesson.

LEARNER: PREREQUISITE KNOWLEDGE

- An understanding of Scratch interfaces and hands-on experience with Scratch blocks

TEACHERS: PRIOR PREPARATION

- ☐ Projector to showcase the tool
- ☐ Assignment sheet printouts

WORKSHEET

Assignment Sheet printouts

https://drive.google.com/file/d/1JwKK6fKE_KtWZTEzArqyj5Q08c1b064x/view?usp=drive_link

RECAP 4 minutes

(Slide 3)

Ask questions related to the concepts of:

- Touching sprite
- Touching Color
- Dragging
- Ask and wait

(Slide 4)

Ask a question based on the sample project.
Answer: The touching sensing block is used in the project.

(Slide 5)

Motivate students by telling them that they will be using broadcast and text-to-speech blocks to make two sprites talk to each other in their project.

ORIENT 5 minutes

Communication, Mass Communication and Types

(Slide 6-7)

Define Communication and Mass Communication.

(Slide 8)

Share knowledge about the various types of mass communication.

- Broadcast media: TV, Radio.
- Print media: Printed form, hard copy
- Outdoor/Transit media: Like billboards, on buses/ autos etc.
- Digital media: Text, audio, video, and graphics.

Tell students about the broadcast blocks available in the Scratch platform.

What is Communication? (Slide 6)

Communication is the process of passing information and ensuring mutual understanding between individuals.

What is Mass Communication? (Slide 7)

Mass communication refers to a mode of communication that helps us impart or exchange information with a large number of people.

ESTABLISH 5 minutes

Introduction and Usage of Broadcast Blocks in Scratch (Slides 9-12)

Explain the broadcast blocks available in the Event palette.

DEMONSTRATE 12 minutes

Creation of a Broadcast Project (Slides 13-17)

Show the project slides for a step-by-step procedure, highlighting the categories of blocks used in the project.

INTRODUCE 5 minutes

Introduction to the Text-to-Speech Extension

(Slides 18-19)
Use the triggering question to introduce the concept of Extension blocks in Scratch.
Explain the “Text-to-Speech” extension blocks.

(Slides 20-22)
Explain the three text-to-speech blocks

(Slide 19)

The Text-to-Speech Extension is an extension that allows projects to generate output as speech from input as text.

DEMONSTRATE 8 minutes

Adding a Text-to-Speech Block to a Broadcast Project (Slides 23-27)

Share project slides that show the step-by-step procedure to add extension blocks, highlighting the category of text-to-speech blocks used in the project.

SHOWCASE 4 minutes

Sample Project Showcase (Slide 28)

Showcase the project that includes various Scratch blocks. Provide the project link and ask them to find the broadcast and text-to-speech blocks used in the project.

CONCLUDE 2 minutes

Reflection and Assignment (Slide 29)

Ask questions to extract a logical understanding of the concepts taught.
Summarise the discussion, distribute the Assignment Worksheet and explain how to complete it.

12

Cyber Crime, Cyber Security and Its Importance

LEARNING OBJECTIVES

Students will:

- Learn about cyber crime.
- Gain knowledge about cyber security.
- Comprehend malware and its types.
- Acquire knowledge about security measures against malware.

LEARNING OUTCOMES

Students will be able to:

- Demonstrate knowledge of cyber crime and cyber security.
- Explain malware and its types.
- Recall security measures against malware.

LEARNER: PREREQUISITE KNOWLEDGE

- An understanding of the basics of the internet and how to use it correctly and ethically.

TEACHERS: PRIOR PREPARATION

- ☐ Projector to showcase the tool
- ☐ Activity sheet printouts
- ☐ Assignment sheet printouts

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1wuybO1LJHJ5_5WFNouKctpYFjLuH9aVc/view?usp=drive_link

Assignment Sheet printouts

https://drive.google.com/file/d/1J7i7ARjpaN-n5Pw9uKnxZJftTayJ5uwN/view?usp=drive_link

RECAP 5 minutes

(Slide 2)
Ask which operator block has been used in the sample project?
Set voice to, speak(), say and broadcast() blocks from Text-to-Speech and Broadcast category have been used in the project.

(Slide 4)
Ask questions about the internet and digital citizenship, and related to the concepts of:

- Search Engines
- Ethics of using the internet

INTRODUCE 5 minutes

A Cyber Crime Scenario (Slides 5-6)

(Slide 5)
Share this scenario and discuss using the triggering questions.

(Slide 6)
Motivate students by informing them that they will learn measures to protect themselves and their devices from online dangers.

DEFINE 5 minutes

What is Cyber Crime? (Slides 7-8)

(Slide 7)
Explain the concept of cyber crime.

(Slide 8)
Explain the cyber crime cases recorded in India in 2020.

Cyber crime is a criminal activity that either targets or uses a computer, a computer network or a networked device. Most cyber crime is committed by cyber criminals or hackers who want to make money. However, occasionally, cyber crime aims to damage computers or networks for reasons other than profit.

EXPLAIN 5 minutes

How Computers Get Infected (Slide 9)

Explain the different ways computer systems can be infected.

Triggering question:

Now that you know about cyber crime, what exactly is the element that gets into your computers and helps hackers steal your information?

INTRODUCE 10 minutes

Introduction to Malware and its Types (Slides 10-13)

(Slide 10)
Introduce and define 'Malware'.

(Slides 11-13)
Play the video and then talk about the types of malware.
https://www.youtube.com/watch?v=0mLeeE8VM9U

Malware, short for 'malicious software', is software that gets installed on your laptop, desktop computer or smartphone and performs a multitude of undesirable tasks such as stealing passwords, deleting files or reformatting the hard disk.

INTRODUCE 5 minutes

What is Cyber Security? (Slides 14-15)

(Slide 14)
Explain the concept of cyber security.

(Slide 15)
Go through the ways to be secure.

Cyber Security is the protection of computer systems, devices and networks from any unauthorised access or misuse by others.

Secure Password: A strong password is one that is designed to be hard for a person or program to guess. A password can be made strong by using a combination of alphabets, numbers and special characters, such as: m#P52s@ap$V

Internet privacy: Refers to the level of protection your personal data gets on the internet.

Captcha: Stands for Completely Automated Public Turing test to tell computers and humans apart. These are tools that can be used to differentiate between real users and automated users, such as bots.

INTRODUCE 5 minutes

Security Measures against Malware (Slides 16-17)

(Slide 16)
Explain different measures that can be taken to protect devices.

Activity : (Slide 17) Worksheet (offline)
Distribute the Activity sheet and discuss once completed.

Triggering question:

How can we protect our devices from getting infected by malware?

CONCLUDE 5 minutes

Reflection and Assignment (Slide 18)

Ask questions to extract a logical understanding of the concepts taught.

Ask students to explore the common threats to mobile phone security and measures to protect smartphones.

Summarise the discussion, distribute the Assignment Worksheet and explain how to complete it.

13

Smartphone Protection and Cyber Security in Social Media

LEARNING OBJECTIVES

Students will:

- Learn about common threats related to smartphones.
- Learn about social media and its various applications.
- Grasp the risks involved while using social media.

LEARNING OUTCOMES

Students will be able to:

- List measures to keep smartphones protected.
- Communicate the concept of social media.
- Describe various social media applications.
- Recall the risks involved in using social media

LEARNER: PREREQUISITE KNOWLEDGE

- An understanding of the basics of cyber security and device security.

TEACHERS: PRIOR PREPARATION

- ☐ Projector to showcase the tool
- ☐ Activity sheet printouts
- ☐ Assignment sheet printouts

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1n00b__tlh2SJKR-xFrMzmLSCd6lBov2u/view?usp=drive_link

Assignment Sheet printouts

https://drive.google.com/file/d/1R5cJHvLJARqv2H7ws-RrsM3StmPhhyW2/view?usp=drive_link

RECAP 5 minutes

(Slides 3-4)

Recap previously taught concepts of cyber security and malware.

INTRODUCE 5 minutes

Common Threats to Smartphone Security (Slide 5)

Use the slide to explain and discuss commonly seen threats to smartphone security.

EXPLAIN 5 minutes

How to Protect Your Smartphone (Slides 6-7)

(Slide 6)
Talk about the ways to protect a smartphone from threats.

(Slide 7)
Use these questions to determine students' familiarity with social media.

Slide 6

- Change passwords regularly. There are different security measures like captcha, OTP (one time password), which ensure the security of the user's data and details. Don't share any OTPs with anyone.
- Do not use open Wifi.
- Do not connect to unauthorised bluetooth.
- Protect your PIN details.
- Use a protect security app.

Biometrics is the automated recognition of individuals based on their biological and behavioural characteristics. E.g.: fingerprint lock used in mobile phones.

INTRODUCE 10 minutes

Introduction to Social Media (Slides 8-9)

Activity: (Slide 8) Worksheet (Offline)
Introduce and discuss the concept of social media using the Activity sheet (Slide 8). Include an analysis of students' own social media usage.

(Slide 9)
Explore what social media is using this slide.
Talk about how social media is helpful in enhancing learning.
Social media, with its ability to communicate, reflect, and collaborate, provides support for informal learning through e-learning and technology-based learning.

Slide 9

Social media is any digital technology that allows people to share ideas, information, and thoughts via online communities and networks.
Social media provides multiple ways to connect virtually with others (family, friends/peers, teachers, members of interest groups, and even strangers).

INTRODUCE 5 minutes

Social Media Applications (Slides 10-12)

(Slide 10)
Explain and define what a social media application is using this slide.

(Slides 11-12)
Talk about the commonly used, different social media applications.

Slide 10

Social media applications are web-based applications that support information publishing and sharing (text, video, audio, photo), the building of personal profiles, connecting to a community and searching within the community.

INTRODUCE 5 minutes

Social Media Applications: Risks (Slides 13-14)

Share and discuss each type of risk:

- Cyber bullying
- Cyber grooming
- Gaming addiction
- Identity theft
- Phishing

CONCLUDE 5 minutes

Reflection and Assignment (Slide 15)

Ask questions to extract a logical understanding of the concepts taught.
Summarise the discussion, distribute the Assignment Worksheet and explain how to complete it.

14

Reporting about Cyber Crime

LEARNING OBJECTIVES

Students will:

- Learn about preventive measures and reporting about social media risks.
- Learn about the National Crime Records Bureau (NCRB).
- Discover how to report a complaint against cyber crime on the National Cyber Crime Reporting Portal.
- Understand the impacts of cyber crime.

LEARNING OUTCOMES

Students will be able to:

- Recall the method of making a complaint for a social media application.
- Recall information about the National Crime Records Bureau.
- Explain the step-by-step process of reporting a complaint against cyber crime on the National Cyber Crime Reporting Portal.
- List the impacts of cyber crime.

LEARNER: PREREQUISITE KNOWLEDGE

- An understanding of different social media applications and the risks involved while using these applications.

TEACHERS: PRIOR PREPARATION

- ☐ Projector to showcase the tool
- ☐ Assignment sheet printouts

WORKSHEET

Assignment Sheet printouts

https://drive.google.com/file/d/1atKlEUq7VTjdowMkV46MLPNtsWNBIRLp/view?usp=drive_link

RECAP 5 minutes

Recap (Slides 3-4)

(Slide 3)
Recap previously taught concepts on smartphone protection and social media applications.

(Slide 4)
Tell students they will learn about different ways to report issues on different social media sites.

INFORM 5 minutes

Reporting Risks on Social Media (Slide 5)

Discuss the ways to report any unwanted content on social media platforms.

INFORM 5 minutes

National Crime Records Bureau (NCRB) (Slides 6-8)

(Slide 6-7)
What is the National Crime Records Bureau? What does it do?
Discuss the National Crime Records Bureau and its report on cyber crime in India.

(Slide 8)
Explain the data: cyber crime cases recorded in India in 2020.

EXPLORE 10 minutes

How to File a Complaint on the National Cybercrime Reporting Portal (Slides 9-10)

(Slide 9)
Introduce the National Cybercrime Reporting Portal and share the link: https://cybercrime.gov.in

(Slide 10)
Explain how to file a complaint, step-by-step.

INFORM 5 minutes

Impact of Cyber Crime (Slide 11)

Discuss the impact of cyber crime.

EXPLORE 5 minutes

A Cyber Crime Case Study (Slide 12)

Present this cyber crime scenario of e-mail account hacking. The answers to the questions on the slide are:

- The person who has stolen the account is misusing it.
- Illegal financial gain or jealousy or hatred/ revenge.

CONCLUDE 5 minutes

Reflection and Assignment (Slide 13)

Ask questions to extract a logical understanding of the concepts taught.
Summarise the discussion, and ask students to explore the website of the Central institute of Educational Technology (CIET)
https://ciet.ncert.gov.in/.

Its major aim is to promote the utilisation of educational technologies, such as radio, TV, films, satellite communications, and cyber media, either separately or in combinations.

Distribute the Assignment Worksheet and explain how to complete it.

15

What is AI

LEARNING OBJECTIVES

Students will:

- Grasp the concept of Artificial Intelligence (AI) and how it is used in the world around them.
- Play tic-tac-toe against an algorithm to think about intelligence; then be introduced to AI and the difference between rule-based and data-driven approaches.
- Learn about the history and progress made in the field of Artificial Intelligence.

LEARNING OUTCOMES

Students will be able to:

- Define terms like 'intelligence' and 'Artificial Intelligence'.
- Recall the brief history of Artificial Intelligence and its progress.
- Recall Artificial Intelligence experiments.

TEACHERS: PRIOR PREPARATION

- ☐ 'The intelligent piece of paper' activity resource (one printed copy for demonstration)
- ☐ Familiarity with the resources in this lesson:

https://youtu.be/YgfPypO86gU

https://en.wikipedia.org/wiki/Deep_Blue_versus_Garry_Kasparov

https://www.tableau.com/data-insights/ai/history

- ☐ Activity sheet printouts
- ☐ Assignment sheet printouts

WORKSHEETS

Activity Resource printouts

https://drive.google.com/file/d/16gv1TCv19hqMhn52ver60m2IKrEld8kj/view?usp=drive_link

Assignment Sheet printouts

https://drive.google.com/file/d/1bvvelHdDdwWCNzQNWzOmBt7nK3iWomZb/view?usp=drive_link

The AI resources in this unit have been adapted from a collaboration between Raspberry Pi Foundation and Google DeepMind.

ENGAGE 10 minutes

Human vs. Computers: What is Intelligence? (Slides 1-5)

Activity 1: In-class (Slide 1)
Start the lesson with a simple game to understand how computers and machines, such as calculators, can perform routine tasks easily.
Call for a student volunteer to come forward and participate in this exercise.

Give a list of numbers, and ask the student to repeat them in reverse order. For example, if you say "3, 5, 6, 2, 7, 1, 9, 2, 3, 0, 5," the student will say "5, 0, 3, 2, 9, 1, 7, 2, 6, 5, 3."

This task may seem challenging for humans, but computers and machines can do it effortlessly. They can memorise the list of numbers and produce them in reverse order quickly and accurately.

This exercise demonstrates the fundamental difference between human and machine intelligence. Humans excel in tasks that require creativity, critical thinking, and emotional understanding. On the other hand, we have built machines that are efficient at performing such mathematical and scientific computations.

Since we are creating such machines, the next discussion is about how we make computers perform a certain task.

Activity 2: In-class (Slide 2)
Instruct students to think, write, pair, and share their answers in response to the question on the slide.
Briefly discuss.
Use the animation of the computer walking off a cliff for inspiration.

What is Intelligence? **(Slide 3)**
Set the scene and focus the attention. Ask students to discuss their thoughts with the person next to them. Highlight that the key point is being able to learn something and use that learning to adapt and react to new situations.

(Slide 2)

Note:
The right answer (humans) is not the point of this activity. It is to get them to think about the meaning of intelligence and to debate it.

(Slide 3)

"People describe intelligence as the ability to learn and adapt/ react to new situations."

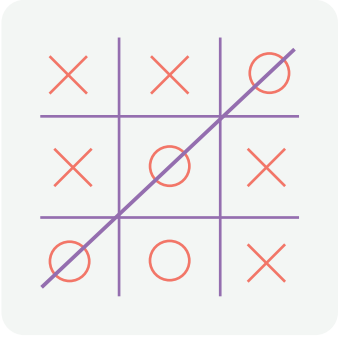
(Slides 4-5)
Share the objectives of this lesson.

INTRODUCE 10 minutes

The 'Intelligent' Piece of Paper (Slides 6-8)

(Slide 6)
Hold up the intelligent piece of paper. The side with the instructions on should be facing you, and the class should see the blank side.

(Slide 7)



Students who think they are more intelligent than the piece of paper will play tic-tac-toe against it. Inform the class that the piece of paper has never lost a game of tic-tac-toe, and it will not be beaten by them.

Draw a tic-tac-toe grid on a whiteboard for the class to see. Pick volunteers. One will represent all humans. As it is a piece of paper with no robotic controls to play by itself, it needs a volunteer to help it play. Their job is to follow the instructions on the piece of paper and do exactly as it says.

Ask the volunteer with the piece of paper to read out the first instruction, saying that the piece of paper wants to go first. The piece of paper's assistant should then read out the first move and make the move: playing in a corner. The player representing humanity can then take a turn.

(Slide 3)

This piece of paper **is** intelligent. Not only is it intelligent, but it is also more intelligent than anyone in this room. Raise your hand if you think you are more intelligent than the piece of paper.

Allow the volunteers to continue playing the game. Support the student with the intelligent piece of paper, ensuring that they read out the appropriate instruction so that the rest of the class can hear it.

The game will result in either a draw or a win for the intelligent piece of paper.

(Slide 8)
The students will now know that the piece of paper had instructions written on one side.

Ask:

"Does that make the piece of paper intelligent?"

Take answers from the students. Someone might point out that **it is not the piece of paper that is intelligent, it is the person who wrote the instructions.** If no one gives this answer, pose it as a **question to the students:**

"Is it the person who wrote the instructions that is intelligent?"

Answer: The instructions can be described as an algorithm. The person who wrote the **algorithm** is intelligent as they have learned about IF/THEN rules and are able to apply them to create an algorithm that cannot lose in noughts and crosses. They can also apply those IF/THEN rules to solve other problems.

Ask:

"If a computer follows an algorithm written by a human, does that make a computer intelligent?"

Answer: It does not. It is not learning or reacting to new situations, it is simply following IF/THEN rules.

LEARN 5 minutes

What is Artificial Intelligence (AI)? (Slides 9–10)

Activity: Worksheet (Unplugged/offline) (Slide 9)
Instruct the students to write in their worksheets what they think 'Artificial Intelligence' is. They should aim to write no more than two sentences.

(Slide 10)
Show the video on the slide:
https://youtu.be/YgfPypO86gU

EXPLORE 2 minutes

The Progress of Artificial Intelligence: A Brief History (Slides 11-14)

Ask students to review and share their definitions of 'Artificial Intelligence'. Write relevant inputs on the board, trying to link them to the answers from the previous activity.

(Slide 11)
Tell students that they will explore the history of AI from the research done to create artificially intelligent machines.
One such researcher was Alan Turing, a famous British mathematician and computer scientist. He is renowned for his work on developing computers to decode the German Enigma machines during World War II.
He considered the idea of "thinking machines" at great length. Turing proposed a game to test AI, called the Imitation Game, where two participants would be asked a series of questions. One of the participants is a computer and the questioner needs to guess which one is which.

"Artificial intelligence is not about creating thinking robots that are going to take over the world. AI is a set of tools and techniques that we can all use to help solve complex problems using computers or machines."

(Slide 12)
Display the timeline:

- Researchers in the 1950s started programming "logic machines" that would be able to deduce the answer to any question; this type of AI is called Generalised AI.
- From 1970 to 1995, there was a lack of advancements in Artificial Intelligence known as the "AI Winter". This occurred because companies overpromised the capabilities of their AI machines and were unable to deliver, leading to a withdrawal of funding and a slowdown in research and development.
- In the 1980s, some researchers began to look back over the AI research and found new applications. Rather than developing a whole system that appears to be "intelligent", the techniques the researchers had developed in the 1950s could be used in a more specialised context to add an element of "intelligence". This type of AI is known as Specialised AI.

(Slide 13)
Tell students about another AI experimentation application designed by Google - Quickdraw - that uses AI to identify the art and doodles made by users.

CONCLUDE 5 minutes

Lesson Summary (Slide 14)

Summarise key points from the lesson. Ask students to think about how Quickdraw is able to identify different figures. They will discuss more such applications in the next lessons.

16

AI Models

LEARNING OBJECTIVES

Students will:

- Appreciate the importance of data in building intelligent machines.
- Learn about the difference between rule-based and data-driven approaches in AI.

LEARNING OUTCOMES

Students will be able to:

- Describe the difference between 'data-driven' and 'rule-based' approaches to application development.
- Develop an understanding of how to create a data-driven, AI model.

TEACHERS: PRIOR PREPARATION

- ☐ An understanding of chatbots.
- ☐ Familiarity with the resources in this lesson:

https://youtu.be/YgfPypO86gU

https://cloud.google.com/blog/products/gcp/drawings-in-the-cloud-introducing-the-quick-draw-dataset

https://en.wikipedia.org/wiki/Deep_Blue_versus_Garry_Kasparov

The AI resources in this unit have been adapted from a collaboration between Raspberry Pi Foundation and Google DeepMind.

RECAP 5 minutes

Recap and Lesson Objectives (Slides 1-3)

(Slide 1)
Play the video on the slide (https://youtu.be/YgfPypO86gU) and revisit the discussion from the previous lesson to check their understanding of "Artificial Intelligence".

(Slides 2-3)
Discuss lesson objectives briefly with the students.

INTRODUCE 8 minutes

What are Rule-Based and Data-Driven Approaches? (Slides 4–5)

(Slide 4)
Describe rule-based and data-driven approaches. Explain more about the data-driven approach through the example of the Google QuickDraw application students had used in Lesson 15. Ask them:

- About their experience with the application
- How it is able to recognise drawings made by them?

Explain briefly about how the Google Quickdraw application was trained. Use this link to show the dataset created by Google: https://cloud.google.com/blog/products/gcp/drawings-in-the-cloud-introducing-the-quick-draw-dataset

(Slide 5)
Explain which approach, between rule-based and data-driven, is more suitable for such AI experiments.

A rule-based approach is the traditional approach associated with programming, where an algorithm is followed to solve a computational problem.

A data-driven approach is a way of building Artificial Intelligence systems using statistics from vast quantities of data, instead of by writing out the rules in a program.

INFORM 15 minutes

What is a 'Model'? (Slides 6-10)

(Slide 6)
Describe the term 'model' in more detail. Draw examples from their science projects, where they might have made models to depict processes such as photosynthesis, the greenhouse effect, and solar-powered villages. You can also give the example of a model of a car or a model aeroplane.

Using Chatbots (Slides 7-8)
Explain that data-driven models are used to solve problems, and make the link to AI by describing that AI chatbots use vast quantities of data to create a conversational model. An application can then use this model to hold a conversation.

Examples of AI Chatbots (Slides 9-10)
Take them through the examples on these slides, making sure to check their understanding.

(Slide 6)

A model is a representation of the real world. Examples: a model of a car or a model aeroplane.

EXPLORE 15 minutes

Creating a Data-Driven Model (Slides 11-14)

(Slides 11-13)
Describe the requirements of creating a model that can play a game of chess against another player.

(Slide 14)
Tell the students about the milestone moment in AI development when IBM's Deep Blue system beat the chess grandmaster Garry Kasparov. (https://en.wikipedia.org/wiki/Deep_Blue_versus_Garry_Kasparov)

Ask:

"Why is a data-driven approach beneficial in creating an application to win a game of chess?"

Answer: There are so many possible combinations and sequences of moves that could lead to a victory, making it very difficult to achieve with a rule-based system.

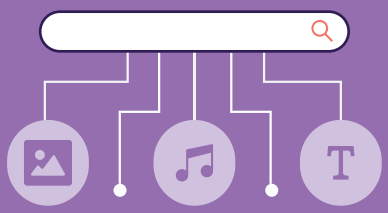
CONCLUDE 5 minutes

Lesson Summary (Slide 15)

Summarise key points from the lesson. Share what students will learn next.

17

Exploring AI Applications



LEARNING OBJECTIVES

Students will:

- Consider the social benefits of each AI application, and any negative consequences of their use.

LEARNING OUTCOMES

Students will be able to:

- Name examples of AI applications.
- Outline some benefits and drawbacks of using AI applications.

TEACHERS: PRIOR PREPARATION

- [ ] Familiarity with and access to:

https://youtu.be/YgfPypO86gU

craiyon.com

ai-activities.raspberrypi.org/computer-vision-ind/

- [ ] Activity sheet printouts

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1KKLnstw0KXLhmYTnSyRsUlwiXa6JBCBd/view?usp=drive_link

The AI resources in this unit have been adapted from a collaboration between Raspberry Pi Foundation and Google DeepMind.

RECAP (Optional)

What is AI? (Slide 3)

Starter video: (Optional)
https://youtu.be/YgfPypO86gU

Play the video to link the definition of Artificial Intelligence established in the previous class.

INTRODUCE 10 minutes

AI Applications: Generative AI (Slides 4–6)

(Slide 4)
Explain briefly what Generative AI is. Tell students that this is an example of a generative AI application: the application allows you to compose music and then uses AI to generate a harmonisation in the style of classical composers.

(Slide 5)
Display slide 5 and show the students the animated GIF, which shows a preview of the AI application they are about to use (https://craiyon.com). Tell the students that they will use an online AI application to generate art.
Go through the steps they will have to follow to use the tool.

Activity 1 (Slide 6)
Ask the students to go through the instructions for this task on their worksheet.

Allow students 5 minutes to use the application, and highlight the questions on the slide for them to consider while using the application.

(Slide 6)

Note:
- As with any web search, inappropriate prompts or terms may produce inappropriate results.
- Search results can take approximately 1 minute to appear.

Teacher prompts for students, mid-activity:

- Try generating the image again with the same prompts and the same art style. Does it generate the same artwork as last time?
- Try changing your prompts. Does it work better if more or fewer words are used?
- Who might use this technology?
- How might artists feel about this technology? Do you think they might be worried?
- Who owns the artwork you created? You or the people who made the application?

Use the last 2 to 3 minutes of this activity to have a discussion about the application using the questions on the slide.

Record answers from the students. You could ask them to write one answer to each question and to share for you to select some answers to discuss.

EXPLORE 10 minutes

AI Applications: Computer Vision (Slides 7–8)

(Slide 7)
Explain what computer vision is. Point out the example image on the slide and highlight that there are objects in the image that have been picked out.

The answer to the question on the slide: The percentages are confidence scores, reflecting how confident the system is that it has correctly identified the object.

Activity 2 (Slide 8)
Ask the students to follow the instructions for Activity 2 on their worksheet.

Open https://ai-activities.raspberrypi.org/computer-vision-ind/ and select one of the sample images to see what the AI system can identify in the image.

(Slide 7)

"**Computer vision** is a field of AI that attempts to gain meaningful information from images."

Teacher prompts for students, mid-activity:

- Why do you think there is a confidence rating? Is that important?
- Why do you think the application is more confident about some elements of images than others?
- Who might use this technology?
- How important is the confidence rating for a driverless car, for example?
- How might blind (visually impaired) people benefit from this?
- Can you see this technology being misused?
- Would you be happy knowing you can be personally identified by a camera when you are walking around, for example?

Ask the students to spend a minute discussing the questions on the slide and worksheet with the person next to them. Record and discuss their answers.

EVALUATE 10 minutes

AI or not AI? (Slides 9–14)

Activity 3 (Slide 9)
Students need to reflect on what they have learned and apply their knowledge to see if they can identify when AI might have been used.

Remind the students to think about whether each example is rule-based or data-driven. If the answer is unclear, they can say, “Could be AI”. Explain that they must give reasons for each answer.

(Slides 10-12)
Once the students have completed the activity, go through the answers.

(Slide 13)
Summarise the key learning from the lesson.

(Slide 14)
Ask the students to consider what they would change about their first description of AI; instruct them to write no more than two sentences.

18

How Computers Learn from Data using Machine Learning

LEARNING OBJECTIVES

Students will:

- Build on the new view of Artificial Intelligence from previous lessons with a particular focus on the use of data in AI systems.
- Think critically about which parts of a system use AI principles, and the role Machine Learning plays in creating the models.
- Consider the functionality of a smartphone voice assistant, to identify which uses involve data-driven techniques and which do not.
- Get introduced to the definition and description of 'Machine Learning' and its role in AI systems.

LEARNING OUTCOMES

Students will be able to:

- Define Machine Learning's relationship to Artificial Intelligence.

TEACHERS: PRIOR PREPARATION

- ☐ Familiarity with and access to:

  Google Home smart speaker example.mp4

  https://youtube.com/shorts/WRCB7liqYgY?si=FU1UpW8oH6W6PTgw

- ☐ Activity 1 worksheet printouts

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1ONqZ1FsYgNvQi-d-5FS-hrFvWjX7mdmu/view?usp=drive_link

Activity Sheet (Answers)

https://drive.google.com/file/d/1aTqz6meSKUWIBtD-nS8_qfBM5Dx3RZxG/view?usp=drive_link

INTRODUCE 3 minutes

Is a Smartphone Voice Assistant an AI Application? Why? (Slides 2–4)

(Slide 2)
Play the video on slide 2 to demonstrate what a 'smart' speaker is and how it works.

(Slide 3)
Display the slide and ask students to discuss their answers and their reasoning with the person sitting next to them.

(Slide 4)
Go through the lesson objectives with the class.

Note:
The aim of this activity is not to arrive at any single answer, but to encourage students to recall the ideas presented in Lesson 17 about rule-based and data-driven applications.

INTRODUCE 7 minutes

Breaking down a Smartphone Voice Assistant (Slides 5-10)

(Slide 5)
This shows two examples from the end of Lesson 17 that the students categorised as 'Not AI' and 'AI'.

(Slide 6)
Remind students about rule-based and data-driven approaches.

(Slide 7)
Ask:

"What can you use a 'Smart' speaker to do?"

Take answers from the class. Students might use language that humanises the 'Smart' speaker, such as "listens" or "understands". Try to challenge this with **responses** such as:

- "Does a microphone 'listen'? Or is that something humans do?"
- "What does 'understand' mean? Can a computer 'understand' anything?

(Slide 7)

Computers process inputs and produce outputs based on the programs running at the time; there is no understanding involved.

Reveal the four example uses. This is not an exhaustive list, and students might have thought of some others (such as using a 'Smart' speaker to interact with other internet-enabled devices, like lights).

Remind the students that these are all things that they use a 'Smart' speaker to do, not things the 'Smart' speaker does itself. Devices like these are tools and do not have the ability to understand or answer questions themselves.

> "Which uses would benefit from a data-driven approach?"

Ask students for opinions on each of the uses on the slide, and remind them to consider the complexity of each of the uses.

(Slides 8-9)
Go through these slides, and make sure to check for understanding of the need for a data-driven approach with a model, and what a search engine is.

(Slide 10)
Emphasize that not every use of these applications uses AI techniques. This should further cement the idea that AI applications are not 'an AI', but rather a collection of processes that can be both data-driven and rule-based.

EXPLORE 15 minutes

What is Machine Learning? (Slides 11–20)

(Slide 11)
Ask the students, "If I wanted the model used in a 'Smart' speaker to accurately interpret commands from as many people as possible, what would I need to train the model?"
Use the animation on the slide to show them that "data" is the right answer.

(Slide 12)
Play the video on the slide:
https://youtu.be/uNjgSruOK_I

(Slide 13)
Go through the definition of Machine Learning. Highlight that the models that the students have been learning about are **created** using Machine Learning techniques. Although we have been calling them 'AI models' so far, a more accurate name is **'Machine Learning models'**. This is the term that is used widely in the field and will be used from this point on in the lessons.

(Slide 14)
The Venn diagram shows how Machine Learning fits into the field of AI. The first animation tells students that Machine Learning is a part of AI and not the whole field.

Students may ask what type of AI does not use Machine Learning, and you can explain that some AI applications rely on extreme amounts of processing power to run complex, rule-based systems that do not use Machine Learning techniques, but that this is an older view of AI.

(Slide 15)
This shows a later part of the definition of 'Machine Learning' focused on **predictions**.

Machine Learning is beneficial when a problem is very complex and the exact steps to solve it are not easily defined; otherwise, you would use a rule-based approach (like the noughts and crosses example from Lesson 01).

(Slide 16)
This is a key learning for the students, as the outputs of machine learning models include some uncertainty. You can ask the students where they have seen signs of this uncertainty already, reminding the class of the **confidence scores** they saw in the computer vision example in Lesson 17.

(Slide 13)

Machine Learning (ML) is a way of building Artificial Intelligence systems using statistics, instead of by writing out the rules in a program. Machine Learning systems are called 'data-driven', because they use a lot of examples - data - to work.

(Slide 17): Activity 1
Distribute the Activity 1 worksheet. Explain that they need to be critical when deciding whether to use Machine Learning models when solving a problem.

This activity will encourage them to think critically about three example uses of an application, evaluating whether a data-driven approach would be beneficial.

Give them 5 minutes to consider the uses and discuss with a partner whether they think it would be best to use instructions or a model for each of them.

(Slide 18)
Gather feedback.

(Slide 19)
It is very difficult to say for certain that any problem **definitely** requires a particular approach. Students should see that calculating the distance to a star could probably be achieved with a rule-based instructions approach and the other two example uses would probably require a model.

(Slide 20)
Ask students to complete the second part of the activity. You can find example answers in the answer sheet to help guide the discussion of the two models and the data required.

Note:
The aim of this activity is not for students to get the answers exactly right, but for them to start thinking about models in more concrete terms, as things that are made and not 'magic boxes' that produce outputs on their own.

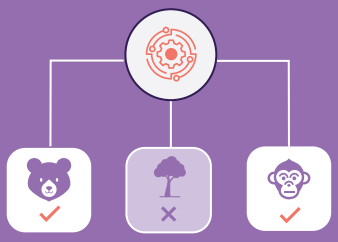
CONCLUDE 2 minutes

Lesson Summary (Slide 21)

Summarise key points from the lesson. Share what students will learn next.

19

Types of Machine Learning



LEARNING OBJECTIVES

Students will:

- Get introduced to the definition and description of 'Machine Learning' and its role in AI systems.
- Learn about the different types of Machine Learning and the problems they can solve.

LEARNING OUTCOMES

Students will be able to:

- Name the three common approaches to Machine Learning.

TEACHERS: PRIOR PREPARATION

- [ ] Familiarity with and access to:

https://youtu.be/yQQKJpmlhO8?si=rnwAfGLCATDlM1QY

- [ ] Teacher question sheet (optional)

https://drive.google.com/file/d/140PLBS20rhU7WgGh_qmTek49baump1jr/view?usp=drive_link

The AI resources in this unit have been adapted from a collaboration between Raspberry Pi Foundation and Google DeepMind.

EXPLORE 10 minutes

Types of Machine Learning (Slides 3–14)

(Slide 3)
Play the video: https://youtu.be/yQQKJpmlhO8

Activity 1 (Slides 4-14)
Use the slide deck to show the questions and answers, or if you prefer, skip the slides and read the questions out using the teacher question sheet.

Students can indicate which type of Machine Learning each statement refers to in a number of ways:

- Holding up coloured paper
- Writing “1”, “2”, or “3” on a whiteboard
- Holding up a number of fingers
- Moving to one of three designated areas in the classroom

The mode of delivery is entirely up to you. The important part is that you can assess the students’ comprehension of the video through this quiz.

Note:
Students are not expected to understand the intricacies of each of the different types of Machine Learning. The rest of this activity is a quiz to help them cement the key knowledge from the video.

RECAP 10 minutes

(Slide 15)
Recap the key characteristics of the different types of Machine Learning.

EXPLORE 10 minutes

Lesson Summary (Slide 16)

Summarise key points from the lesson. Share what students will learn next.

Term 1 Sample Assessment

Problem Solving and Scratch

Problem Statement:
Malaria remains a significant public health challenge in Odisha, with high morbidity and mortality rates despite ongoing efforts. The existing methods for malaria prevention, surveillance, and treatment lack efficiency and fail to achieve desired outcomes. There is a need for a comprehensive DAMaN project to effectively manage and control malaria within the state.
Students are required to apply 5W1H framework to dissect the afore mentioned problem statement and prepare a presentation (PPT) explaining the root cause analysis

Students are required to design a project/solution to address the aforementioned problem, especially using the Scratch technology platform to educate and engage the community to solve the problem

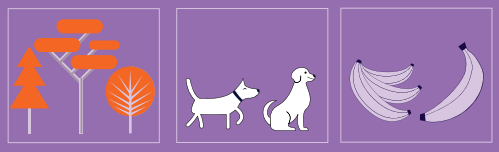
The above problem statement is given teachers reference only. For the Term I Assessment, teachers can ask the students to identify the problem statement on their own and attempt questions A & B.

Blue Print of Term 1 Assessment:

CONTENT	MARKS
Problem Identification	**04**
Planning	**08**
Pulling out the prototype	**08**
Quality of presentation (PPT)	**08**
Presentation	**06**
Viva-Voce (2-3 questions are to be asked)	**06**
TOTAL	**40**

20

Machine Learning & Classification



LEARNING OBJECTIVES

Students will:

- Learn about a specific example of Machine Learning: Classification.
- Learn how algorithms are used to group data into categories ('classes'), and example data, already labelled, must be used to train algorithms.

LEARNING OUTCOMES

Students will be able to:

- Describe how classification can be solved using supervised learning.
- Classify data into categories called 'classes' and use labelled data to train machines.

TEACHERS: PRIOR PREPARATION

- ☐ Activity sheets printouts and answer sheet

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1a-lb5rXFflMuLYoAprN0eTHFm3JJMKBp/view?usp=drive_link

Activity Sheet (Answers) printouts

https://drive.google.com/file/d/1LZhq3Q6XG0KEpy9Akth8_x34p2BvdU7g/view?usp=drive_link

The AI resources in this unit have been adapted from a collaboration between Raspberry Pi Foundation and Google DeepMind.

INTRODUCE 15 minutes

Classification (Slides 3-21)

(Slide 3)
Tell students that you are going to focus on one particular type of problem that Machine Learning can help solve: classification.

Explain that during classification, data is grouped into categories, or classes. There are some key terms to introduce here: classification, class, and label.

Classification uses supervised learning to categorise data.

(Slide 4)
Explain that a classification model is trained with example data (training data). This training data has already been labelled by a human.

Ask the students, "What labels would you apply to these images?"

(Slide 5)
Display the labels for each example image.

(Slide 6)
Expand on the training process. Explain that the more example data used when training a classification model, the more accurate the model will be.

(Slide 7)
Display Slide 7 to show what happens once training is complete. Explain that new data can be fed into the model and it will predict a class from the options it has been trained with. Note the inclusion of a confidence score with the prediction, to further cement the idea of uncertainty.

Different levels of uncertainty are acceptable in different situations!

Ask the students, "Would you be happy to use a model that was 92% confident when identifying an orange?" Then ask, "Would you be happy driving in a car that was 92% confident when identifying a human on the road?"

(Slide 8)
Share the definitions of 'class' and 'label' to reinforce their meanings.

(Slide 9)
Introduce sentiment analysis, which is when a model is trained to label comments and reviews as generally positive or negative by examining the text for keywords and, of course, sentiments. As you mention the text, highlight which part of the review would be used to train the model.

(Slide 10)
Explain that the classes in this case would be Positive and Negative. Share that sentiment analysis models are beneficial because manually reading a large volume of reviews is very time-consuming for a human to do, and these models can generalise from large sets of data whether the product or service is well received or needs improvement.

(Slide 11)
Note: The model can recognise many objects in a single data point (an image, in this example). The model will be trained with images, both of individual objects and of multiple objects, like the image shown on the slide.

(Slide 12)
This shows all the different classes that the algorithm has found in the image, to give students an idea of the breadth of labels that can be applied.

(Slide 13)
Explain that computer vision models are useful because multiple objects can be recognised in a photo or video, which is useful for technologies such as driverless cars.

Ask students what classes of objects a car might need to recognise, for example: Pedestrians, traffic lights, pillars/hurdles, other vehicles, signs.

(Slide 14)
Introduce the activity: students are going to consider three example classification problems, what type of data they would use, and what some of the classes

for each of them could be. Highlight that almost any type of data can be used for a classifier, not just images or text.

(Slide 15)
Distribute the worksheet. Example answers are listed in the answer sheet.

EVALUATE 5 minutes

Classification: Your Turn (Slides 16-21)

(Slide 17): Activity 2
Tell the students that they are going to "help" by pre-labelling some data to use when training a classification model for this project.
The next four slides feature images captured by remote cameras in the Serengeti. These are real images that were actually used to train the classification model used by DeepMind and the conservation team.

For each image, the students need to pick a label from the available classes to apply to the image.

The answers are as follows:
- Slide 18: elephant
- Slide 19: gazelle
- Slide 20: lion
- Slide 21: zebra

CONCLUDE 5 minutes

Lesson Summary (Slide 22)

Summarise key points from the lesson. Share what students will learn next.

21

Building a Machine Learning Model

LEARNING OBJECTIVES

Students will:

- Describe the impact of data on the accuracy of a Machine Learning (ML) model.
- Understand the need for both training and test data.

LEARNING OUTCOMES

Students will be able to:

- Create their own Machine Learning model to classify images of healthy and unhealthy cassava (kanda mula in Odia) plants.
- Discover that their model is flawed due to the limited data set used to train their models.

TEACHERS: PRIOR PREPARATION

- ☐ Access to and familiarity with: machinelearningforkids.co.uk
- ☐ Activity sheet printouts and teacher support video

WORKSHEET

Activity Sheet printouts

https://drive.google.com/file/d/1nlsrlEsam5AN_HN5RM8u4xUsd2YzQi_j/view?usp=drive_link

The AI resources in this unit have been adapted from a collaboration between Raspberry Pi Foundation and Google DeepMind.

RECAP 2 minutes

The Three Different Types of Machine Learning (Slides 2-3)

(Slide 2)
Ask students to discuss their thoughts with the person sitting next to them.

Display (Slide 3) to show the answers.

Note: Slide 4 contains the lesson objectives. Sharing them with the students is optional.

INTRODUCE 5 minutes

Using AI to Identify Disease in Crops (Slides 5-10)

(Slide 5)
When sharing the scenario, stress the word "cameras" so students notice how the data will be collected.

(Slide 6)
Ask if they know other names for this plant.

(Slide 7)
Tell students that they will be required to create a Machine Learning model. The question on the slide is to remind them of the concepts covered in Lessons 1 and 2.

(Slide 8)
Ask the students what type of data they think they will need (here, the data will be collected via cameras). The answer is that they will need images of healthy plants and diseased plants — and lots of them.

(Slide 9)
Highlight that image data will be needed to train their model. As this is training data, ask them which of the three types of machine learning they will be using.

(Slide 10)
Reveals the answer to the question posed on Slide 9: Supervised learning.

EXPLORE 20 minutes

Training a Model (Slides 11-14)

(Slide 11)
When training a Machine Learning model with data, it is important that the data set (introduced as "set of data") is separated into 'training data' and 'test data'. The model is trained using the training data, then the accuracy of the model is tested using the test data that was not used as part of the training process. Once the model has been trained and tested, it is ready to be used with 'unseen data'.

Activity (Slide 12)
Ask students to follow the instructions on their worksheets to train their model. They will need to complete the following tasks:

- Create a project that recognises images.
- Create labels (classes) for healthy and diseased plants.
- Add training data (12 images of healthy cassava and 6 images of diseased plants) from the webpage linked on the worksheet (ai-activities.raspberrypi.org/project-files). Students should use all the images provided for training.
- Train the model.

Allow 5 minutes for the students to complete the training process.

(Slide 13)
Allow 3 minutes for testing. Encourage the students to test their model with as many images from the test data provided as possible.
The students may find that their model is not as accurate as it needs to be. They can determine this by seeing what label the model has applied to the test data, and looking at the confidence score.

Activity (Slide 14)
Encourage them to think about why the model was not accurate enough for the factory. Ask them to share their thoughts with the person sitting next to

them. Once they have had their short discussion, take answers from around the classroom.

The answers that the students give should be around two main issues:

1. Not enough data was used to train the model.
2. The 'right' data was not used:
   a. There were only images of one type of disease in the training data.
   b. The images were not very representative of the effect of different diseases on the plants.

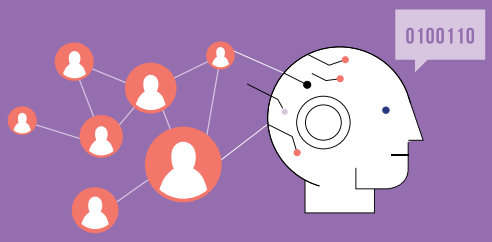
CONCLUDE 5 minutes

Lesson Summary (Slide 15)

Summarise key points from the lesson. Share what students will learn next.

22

Bias In, Bias Out



LEARNING OBJECTIVES

Students will:

- Explore how bias can appear in sets of data used to train models, which makes the models produce biased predictions.

LEARNING OUTCOMES

Students will be able to:

- Recall what 'bias' means.
- Explain how bias can influence the predictions generated by an ML model.

TEACHERS: PRIOR PREPARATION

- ☐ Activity sheet printouts
- ☐ Familiarity with and access

https://youtu.be/-9u-PZpGA5g

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1q6gsdwjtUPVEL1OrrxgunelBksU4ltaG/view?usp=drive_link

Activity Sheet (Answers) printouts

https://drive.google.com/file/d/1viLA1tj21GUUmDEwjS2CE16O4KDEDDIT/view?usp=drive_link

INTRODUCE 5 minutes

Favourite Subject? (Slide 2)

Ask students which subject they like to study the most. Accept everyone's answer and then reveal the Think-Pair-Share question.

Use the animation to reveal how this shows the school's biased decision-making (totally fictional) in favouring one group of students over others.

The purpose of this activity is to introduce them to the phenomenon of bias, which affects certain decisions, like offering computing education only to the group who have chosen Mathematics or English.

EXPLORE 12 minutes

What is Bias? (Slides 4-11)

(Slide 4)
Play the video:
https://youtu.be/-9u-PZpGA5g

(Slide 5)
Read the two examples of Machine Learning bias, but at this stage, do not discuss them.

(Slide 6)
Describe data bias; recall how data bias appeared in the model they made for the farm.

(Slide 7)
Show these questions for them to consider how to avoid data bias.

(Slide 8)
Ask students to think about how societal bias could appear in the data, and get them to share their thoughts. There are many possible answers to this question, such as:
Jobs that exist now might not be in the data set
The data set might not show the diversity of the workforce in this country

(Slide 9)
You could highlight this point further by demonstrating an image search for the jobs on the slide. What if those images were used as part of the training data? What impact would this have on the predictions made by an ML model?

Activity (Slides 10-11)
Revisit the examples and ask students to vote on whether each one is an example of societal bias or data bias. Use the slide animations to reveal the answers.
This activity provides opportunities for discussions where you can assess their understanding of the key differences between data bias and societal bias.

Some students think that the example on slide 11 — a facial recognition system that is less accurate in recognising people with certain skin tones — is an example of societal bias. However, it is an example of data bias that can be caused by societal bias: the model has likely not been trained with enough data from a range of people with different skin tones, which can happen due to societal bias.

EXPLORE 10 minutes

Crop Prediction Model (Slides 12–14)

Activity (Slide 12):
You can assess how the students have applied their understanding of bias to a crop prediction scenario.

(Slide 13)
Reveal what the model has predicted are the most appropriate crop choices for farmers in Bhubaneswar district. Point out that this is an entirely fictional outcome. Ask the students how the model could have made those predictions.

SHOWCASE 4 minutes

Activity (Slide 14)

Ask students to open the worksheet and complete the first task. Allow 5 minutes for the students to evaluate the proposed sets of data and write down which ones they think are suitable to be used in training the model, and which ones they think are unsuitable and why.

Explorer Task: If time allows, students can move on to the Explorer task on their worksheet. They should look at the fields of data included in the data sets, mark which fields they would remove to try to reduce the bias, and explain how using all the data could result in a biased outcome.

EVALUATE 5 minutes

Reducing Bias (Slides 15-16)

Introduce a final scenario: The government wants to use an AI application to recommend the job you should do. Then display (Slide 16) and discuss the answers.

The aim of this activity is to review the learning objectives for this lesson. Ask the students what they should consider about collecting the data and training the model.

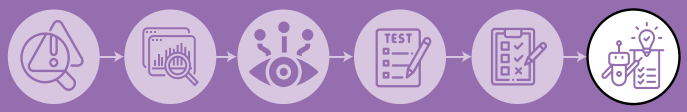
CONCLUDE 5 minutes

Lesson Summary (Slide 17)

Summarise key points from the lesson. Share what students will learn next.

23

Introduction to the AI Project Lifecycle



LEARNING OBJECTIVES

Students will:

- Learn about the AI project lifecycle and its stages.
- Understand the need for a user-focused approach when working on AI projects.
- Use the AI project lifecycle to create a Machine Learning model and solve a problem of their choice.

LEARNING OUTCOMES

Students will be able to:

- Describe the stages of the AI project lifecycle.
- Use a Machine Learning tool to import data and train a model.
- Select a Machine Learning project and train the model.

TEACHERS: PRIOR PREPARATION

- ☐ Starter Activity cutouts or cards of each stage of 'The AI project lifecycle'
- ☐ Access to and familiarity with:
  - Video:

    https://youtu.be/klEE6MJA8NY

  - Machine Learning for Kids

    machinelearningforkids.co.uk

- ☐ Project folder: Fake news
  - Activity 1 - A brief description of the project
  - Worksheet - Project documentation
  - Dataset on news - for classification

WORKSHEET

Activity Sheet printouts

https://drive.google.com/file/d/1RJ2lBEU7VwGjvrS4IoRFMHhhNG6-ebdc/view?usp=drive_link

The AI resources in this unit have been adapted from a collaboration between Raspberry Pi Foundation and Google DeepMind.

INTRODUCE 5 minutes

Project Paper Aeroplane (Slides 2-5)

Starter Activity (Slides 2-3)

Ask students how many of them have made paper planes for fun. Once they respond to your question, explain how the process of making a paper aeroplane requires a set of different steps.
Display Slide 3 and explain that the steps to make a paper aeroplane, shows the journey or life cycle of a fun project of flying paper aeroplanes.

Activity (Slides 4-5)

Divide the class into groups. Distribute one set per group. The groups need to put the stages of the AI project lifecycle in the correct order.

Display the correct order on Slide 5.

INTRODUCE 5 minutes

A User-Focused Approach (Slides 6-9)

(Slide 6)

Explain that in this lesson, they will follow the stages of the AI project lifecycle to create their own Machine Learning model.

(Slide 7)

Explain a 'user-focused approach', then share the question on the slide.

Example answers may include:

- Making sure a wide range of people with different backgrounds, experiences, and opinions are involved in the design process
- Making sure that experts in the field are consulted

- Identifying the risks and planning how each one can be addressed
- Not producing the application if any potential harm to society is identified

You could also relate it to an example of using an AI model to identify disease in crops from Lesson 22.

(Slide 8)
Explain that the 17 goals adopted by the UN General Assembly in 2015, act as a framework to develop a sustainable and equitable future for humanity.

(Slide 9)
Ask the students to look at the goals in more detail.

Can you suggest one way in which you could try to avoid the use of an AI application causing harm?

EXPLORE 20 minutes

Stages 1 and 2: Defining the Problem, Preparing the Data (Slides 10-17)

(Slide 10)
Introduce the project that the students will be working on for the remainder of this lesson and the next lesson.

Briefly describe the project of "Identifying fake news". Allow the students 5 minutes to open the project folder, read the project description, and explore the data set.

(Slide 11)
Use the video to describe the stages of the AI project lifecycle:
https://youtu.be/klEE6MJA8NY

Activity 1 (Slide 12)
Part of this stage has already been carried out for the students, and their task is to go to the project documentation worksheet and complete this stage.

Note: If the data is not 'clean', it is likely that the model will produce less accurate results. Data cleaning involves:
Removing duplicate or irrelevant data
Checking for exceptional or unusual data
Deciding what to do about missing values (such as removing or replacing the data)

(Slide 13)
Explain the process of cleaning data and see if they can identify any problems with the data on the slide.

(Slides 14-16)
Use Slides 14 to 16 to highlight the specific issues that need to be addressed before the data is ready to be used to train the model.

(Slide 17)
The students need to decide on and write down the classes for their Machine Learning model in their worksheets. The classes should be: Real and Fake.

EXPLORE 5 minutes

Stage 3: Training the Model (Slides 18-19)

Activity 2 (Slide 18)
Describe the next task, which is to use Machine Learning for Kids to train their model. Explain that they will need to consider what type of data they will use (text or numbers), as well as what proportion of the data they will set aside for testing.

Demonstrate! (Slide 19)
Demonstrate how to complete the following tasks using Machine Learning for Kids:

- Copy a project from a template
- Select how much training data to use
- Train a model

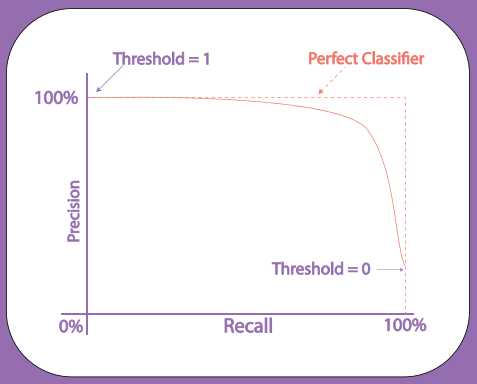
Give them time to complete this process themselves.

CONCLUDE 5 minutes

Lesson Summary (Slide 20)
Summarise key points from the lesson. Share what students will learn next.

24

Testing the Accuracy of AI Models



LEARNING OBJECTIVES

Students will:

- Decide on the right level of accuracy of the AI model being designed.
- Train and test the model and test it to determine its accuracy.

LEARNING OUTCOMES

Students will be able to:

- Test and examine the accuracy of a Machine Learning model.

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1SbvVWAvOm07Tu7LRnHRzHNv1jJa83942/view?usp=drive_link

Activity Sheet (Answers) printouts

https://drive.google.com/file/d/1-F-1clXbIfTveL85arpVfQkUUkALoUHq/view?usp=drive_link

TEACHERS: PRIOR PREPARATION

- [ ] Project folder: Fake news
  - Activity 1 - A brief description of the project
  - Worksheet - Project documentation
  - Dataset on news - for classification
- [ ] Revision worksheet printouts
- [ ] Access to and familiarity with:
  - Video:

    https://youtu.be/klEE6MJA8NY
  - Machine Learning for Kids

    https://machinelearningforkids.co.uk
  - Fake News

    https://drive.google.com/file/d/1hKljcyGlvPkCuT9zrrnH8yj0pM6tadp2/view

The AI resources in this unit have been adapted from a collaboration between Raspberry Pi Foundation and Google DeepMind.

RECAP 15 minutes

Stages of the AI Project Lifecycle

Revise through the stages of the AI project lifecycle completed in Lesson 23.

Students should be given time to continue with the training of the dataset on machinelearningforkids.uk for the project they have chosen.

EXPLORE 15 minutes

Stage 4: Testing the Model (Slides 4-10)

(Slide 4)
Describe how the students will now test their model.

(Slide 5)
Describe how they can measure the accuracy of their model during testing using the example on the slide.

(Slide 6)
Explain how to decide on a minimum confidence score (confidence threshold) to determine if the model's predicted label is correct with an acceptable level of confidence.

(Slides 7-8)
This is to demonstrate that the thresholds might differ between applications.
The model used in an application to help predict the weather might not require an extremely high level of confidence. Depending on who might need to know the conditions, 80% confidence might be acceptable.

The model used by a driverless car to identify pedestrians might require a much lower confidence threshold. For example, you could ask the students to consider a human driver driving at night, and whether

they would want them to be 100% confident that they could see a pedestrian before slowing down, or whether they would hope they slowed down even if they were uncertain.

(Slide 9)

Explain that the students now need to understand accuracy as the proportion of outputs where the label is correct and the confidence threshold is met.

Activity (Slide 10)

Completing Stage 4 using Machine Learning for Kids. They should:

- Decide on a confidence threshold
- Download their test data
- Test their model at least ten times, noting down whether or not it correctly labelled the data and the confidence score met the threshold
- Calculate the accuracy of the model
- Reflect on the results

EVALUATE 3-5 minutes

Reporting on the Accuracy of a Model (Slides 11-12)

(Slide 11)

Use this slide to present a scenario in which two students have created models. Highlight the accuracy of those models. Ask the students to think about what information they might also need to help make their decision.

Answers could include:

- What data was used?
- Was it the same for both models?
- What was the confidence threshold used to measure the accuracy of their model?

(Slide 12)

Explain that in this scenario, both students used the same dataset, but significantly, the students picked different confidence thresholds, which has had an impact on the reported accuracy of their models.

If time allows, ask:
Is this fair?
Has it changed their opinion about which model to use?

Should people who make Machine Learning models show people both the accuracy of the model and the confidence threshold they had decided on?

REVISE + CONCLUDE 15 minutes

Check for Understanding + Lesson Summary (Slide 13)

Use the revision worksheet and the solution at the end of the lesson for students to revisit the main AI concepts from previous lessons.

Summarise key points from the lesson. Share what students will learn next.

25

AI & Problem Solving: Exploring the AI Project Lifecycle

LEARNING OBJECTIVES

Students will:

- Acquire a well-rounded understanding of AI.
- See a practical application of the AI project lifecycle in addressing real-world challenges.
- Understand data acquisition and representation from different authentic sources.

LEARNING OUTCOMES

Students will be able to:

- Grasp the concept of the AI project lifecycle.
- Recall the step-by-step process of the AI project lifecycle to derive value from an AI project and to solve a problem.
- Develop a suitable framework to develop an AI project by using the AI project lifecycle.

LEARNER: PREREQUISITE KNOWLEDGE

- A fundamental knowledge of AI.
- Familiarity with the principles of problem-solving, including problem identification, breaking it down into manageable parts, and proposing a possible solution.
- Collection of data from authentic sources and its analysis.
- Basic coding.
- Revision of Lessons 01, 02, 23, 24.

TEACHERS: PRIOR PREPARATION

- ☐ Access to the Machine Learning for Kids platform
- ☐ Activity sheet printouts
- ☐ Assignment sheet printouts

WORKSHEETS

Activity Sheet printouts

https://drive.google.com/file/d/1WSKq1y3-KUEtiaK-NckElpfGmzfV2Spe/

Assignment Sheet printouts

https://drive.google.com/file/d/1c7IH6If0DnelTnhnPi_JfiDLmrtGU7CQ/

RECAP 5 minutes

Recalling the AI Project Lifecycle (Slide 3)

- Recap the previous lesson with reflective questions:
- What process was used to identify the problem?
- Which problem did you choose to solve?
- How do we give proper data to AI to avoid bias?
- Which project did you create using AI and what steps did you follow?

COMPARE 15 minutes

The Problem-Solving Process and The AI Project Lifecycle (Slides 4-6)

(Slide 4)
Ask students to remember and share what they learned in Lessons 01 and 02, including the steps they followed to identify and solve real-life problems.

(Slide 5)
Display the slide, and go through the steps briefly.

Activity (Slide 6)
Ask them to write what similarities and differences they see in the problem-solving process and the AI project lifecycle in their worksheets. Use these points to lead the discussion:

- "Define the Problem" is the initial stage in both cycles.
- "Prepare data" is similar to doing Root Cause Analysis and solution research: in the "Thinking" part of Problem-Solving.
- "Training the model" is similar to "choose and try" in Problem Solving, but differs in the amount of data that is needed by AI to train the model.
- "Testing and evaluation" is similar to "try and reflect" where we test the function and accuracy of the solution and rework the solution.
- "Sharing/Explain the model" or the solution are common to both.

EXPLORE 15 minutes

Problem Identification, Data Collection and Solution (Slides 7-9)

(Slide 7)
Display the slide and explain: similar to the projects seen in Lesson 23, many of life's problems that students have solved in Lessons 01 and 02, can be done using AI.

They will solve one real-life problem, gender discrimination/bias, using Machine Learning for Kids, over the next 4 lessons. They will follow the same steps of problem solving and the AI project lifecycle to do this.

Activity (Slides 8-9)
Ask students to continue with the tasks in the activity sheet: to define the problem based on Sameera's story, applying the steps they learned about in Lesson 23, then answering the questions that follow.

EXPLORE 5 minutes

Solution Evaluation (Slide 10)

Explain: Just as they calculated confidence scores and measured accuracy to test their AI model in Lesson 24, similarly, when we train any model, we test its performance. The model is evaluated using Testing Data (which was taken from the dataset generated at the Data Acquisition stage) and the effectiveness of the model is determined using the two parameters.

Confidence Score: If Sameera has a negative reaction to a statement, then the score will be high, allowing you to distinguish biased from unbiased.

Accuracy: If the confidence score is high, then we are able to accurately identify which statements are hurting Sameera and which statements make her happy.

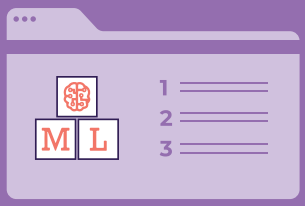
CONCLUDE 5 minutes

Reflection and Assignment (Slide 11)

Ask questions to extract a logical understanding of the concepts taught.
Summarise the discussion, distribute the Assignment Worksheet, and explain that students need to refine their AI project model design and evaluation mechanism based on teacher feedback.

26

Developing a Machine Learning Project to Solve Sameera's Problem



LEARNING OBJECTIVES

Students will:

- Get an overview of what Machine Learning is and its fundamental concepts.
- Understand how machines can learn and make decisions.
- Grasp the use of Machine Learning in different aspects of society.
- Understand how data sets are important to develop a project.

LEARNING OUTCOMES

Students will be able to:

- Gain practical experience of Machine Learning, including key concepts, technologies, and applications.
- Use the skill of problem-solving.
- Learn how to train a machine.
- Navigate the Machine Learning platform.

LEARNER: PREREQUISITE KNOWLEDGE

- A basic understanding of computer science and AI concepts.
- A basic understanding of Machine Learning and its types.
- Revisions of Lessons 20, 21 and 25

TEACHERS: PRIOR PREPARATION

- ☐ Familiarity with students' problems and solutions to align them with the Machine Learning for Kids AI tool for better assistance
- ☐ Access to and familiarity with

machinelearningforkids.co.uk/

- ☐ Activity sheet printouts

WORKSHEET

Activity Sheet printouts

https://drive.google.com/file/d/1axupZSEO7ZeVwwSirPSxjlNhZkJROfzE/view?usp=drive_link

RECAP 5 minutes

Reviewing Lesson 25: The AI Project Lifecycle (Slide 3)

Recap the AI Project Lifecycle introduced in Lesson 25, using the questions on the slide to guide recall.

INTRODUCE 5 minutes

Refining the Problem and the Solution Model (Slide 4)

Briefly review the Lesson 25 Activity Sheet and Assignment Sheet. Discuss any doubts or questions.

Help students extract/ modify their Problem Statements and refine their solutions based on the AI Project Lifecycle and as required by the AI tool. They will build it in **Machine Learning for Kids** in this and the next two lessons.

EXPLORE 15 minutes

Collecting Data for the AI Project (Slides 5-6)

Activity (Slides 5-6)

Explain that this is the process they will follow to design the solution on the Machine Learning for Kids platform. To develop a text-based model, they will prepare the data set, labels, project name, required pictures, text, audio, video, and flow:

- Define Sameera's problem.
- Identify data types (text, numbers, images and sound) affecting Sameera.

- Classify the data into what makes Sameera happy and sad. They can add more labels or change the labels.
- Upload and save pictures, audio, and videos as per the labels.

Distribute the Activity Sheet and ask them to write the data sets for Sameera's problem. Try to collect multiple data sets to design the best model.

RECALL 5 minutes

Collecting Data for the AI Project (Slides 5-6)
Reviewing Machine Learning and the Machine Learning Platform (Slide 7)

Recap Lessons 20 and 21:

- What is Machine Learning?
- Do you remember what we discussed in Lesson 12 about how we train machines to do any task?
- Which type of AI uses Machine Learning?

Demonstrate how to access the platform. Walk through the basic interface and tools available on https://machinelearningforkids.co.uk/

EXPLORE 10 minutes

Initiating the Project (Slides 8-16)

Ask students to follow the steps shown in Slides 8 to 16 to create a new project and labels on the platform.

CONCLUDE 5 minutes

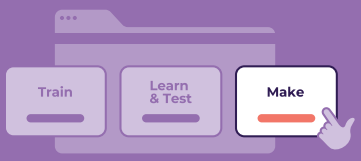
Reflection (Slide 17)

Ask students to share how they are going to use their Machine Learning models and what their logic behind this is. Will their model be able to solve the problem?

27

Developing a Machine Learning Project to Solve our Problem

Training and Testing the Project



LEARNING OBJECTIVES

Students will:

- Understand how to design a Machine Learning model and how to train a machine.
- Learn how to train a simple Machine Learning model.

LEARNING OUTCOMES

Students will be able to:

- Create a Machine Learning application.
- Learn how to train a machine.
- Navigate a new AI-powered educational platform.
- Use Scratch to run the trained model to test and assess it.

LEARNER: PREREQUISITE KNOWLEDGE

- The fundamentals of AI, such as reasoning, knowledge representation and algorithms
- AI applications
- Block Based Coding

TEACHERS: PRIOR PREPARATION

- ☐ Access to and familiarity with:
  - Make me Happy.mp4
  - Machine Learning for Kids AI tool
  - The Scratch platform
- ☐ Assignment sheet printouts

WORKSHEET

Assignment Sheet printouts

https://drive.google.com/file/d/1XrD8s9kAklriy5r4mZ7FmEMGP6jHqBKU/view?usp=drive_link

RECAP 5 minutes

Reviewing Your ML Project and Solution (Slide 3)

Recap the previous class activity and discuss why data sets are important to train a Machine Learning model.

EXPLORE 35 minutes

Training and Testing the Project (Slides 4-12)

(Slide 4)
Play the Make me Happy.mp4 video to show how an AI model can solve Sameera's issue. Use this video as reference to guide the students through the process, step by step.

Demonstrate! (Slides 5-6)
Demonstrate on the platform itself.

(Slide 7)
Ask for inputs to check the accuracy by seeing the confidence score. If the score is less than 60%, add more data to the training model to make it perform better.

(Slides 8-9)
Walk them through the process of training an AI model using Scratch, the simple, drag and drop, block-based coding platform.

(Slide 10)
Go through the details of the extension and blocks which will be added in Scratch for this project.

(Slide 11)
Write the code (add the same code as shown in slide 9) in Scratch to test the model. Students can try adding different codes if they want to explore the how it works further.

(Slide 4)

Note:
This is just one possible solution. Students are encouraged to find others.

(Slide 12)
Demonstrate how to test the trained model by inputting new examples and observing how well the computer recognises them.
Here, three different costumes of a sprite are used. You can make your own sprite and can change the costumes as per your choice. Also, some new extensions like: Speech to text, text to Speech and Make me Happy are used. You can use those extension code blocks by clicking on “Add extension” just below the code blocks.

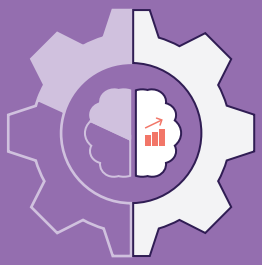
CONCLUDE 5 minutes

Reflection and Assignment (Slide 13)

Activity
Ask students to share how their model will help them in their daily lives.
They need to write the difficulties and challenges they faced in the creation and testing of their model in the class.

28

Bias in Developing a Machine Learning Project



LEARNING OBJECTIVES

Students will:

- Understand the importance of data collection.
- Understand how bias in data can affect Machine Learning models.
- Identify bias in ML model development and recognise its potential consequences.

LEARNING OUTCOMES

Students will be able to:

- Discuss the benefits of unbiased model development.
- List how to collect holistic data for an ML model from different groups.
- Train the machine to detect gender bias around them.

LEARNER: PREREQUISITE KNOWLEDGE

- The fundamentals of AI and Machine Learning
- Data and data analysis skills

TEACHERS: PRIOR PREPARATION

- [ ] Familiarity with and access to:

https://www.youtube.com/watch?v=x2mRoFNm22g&t=4s

https://drive.google.com/file/d/10dQ_uJ_kOyf0ujECtK69bvoqQ1qTjROf/view?usp=sharing

- [ ] Activity sheet printouts
- [ ] Assignment sheet printouts

WORKSHEETS

Assignment Sheet printouts

moschool.in/wp-content/uploads/2024/04/Assignment-Sheet-1.pdf

Activity Sheet printouts

moschool.in/wp-content/uploads/2024/04/Activity-Sheet-1.pdf

RECAP 3 minutes

Reviewing Developing an ML Model and Data Bias (Slides 3-4)

Set the context with a brief recall of the last class and how these concepts relate to daily life occurences of bias around them.

Show this video to recap the importance of unbiased data in AI:
https://www.youtube.com/watch?v=x2mRoFNm22g&t=4s

EXPLORE 30 minutes

Developing a Model to Identify Biased Data (Slides 5-20)

(Slide 5)
Explain: Just as an AI model was created to help Sameera, we will create a model to detect gender bias in different scenarios and contexts to raise awareness of gender bias. This also helps eliminate data bias in the AI model as we will be collecting diverse data.

Play the Project Video to show students how the detector is created and works.

Activity (Slide 6)
Form small groups and distribute the activity sheet. Tell them these statements will be the data they will use to make a Bias Detector.

(Slides 7-20)
Open the application and create a new project “Bias Detector”. Add all the statements from the activity sheet under two different labels to create biased and unbiased data sets.

Follow the steps displayed in Slides 7 to 20 and the video to guide the process.

You will:

- Create labels
- Add data from the activity sheet
- Create a project in Scratch interface
- Train the model and test it to detect biased and unbiased statements

Ask students to decide the confidence score for their project and test the model to measure accuracy. If the confidence score is lower than what they have decided, train the model with more data.
You can also ask students to test the model by including statements outside of the training data.

PRESENT 15 minutes

Presentations > Discussions and Feedback (Slide 21) (Two minutes per group)

Each group will showcase both projects created in the last 4 classes.

CONCLUDE 2 minutes

Reflection and Assignment (Slide 22)

Summarise the activity, emphasising the importance of being critical about data collection and recognising potential sources of bias.

Discuss how awareness of bias in data can help improve AI systems and make them fairer and more ethical.

Distribute the assignment sheets, asking them to identify some biased and unbiased statements.

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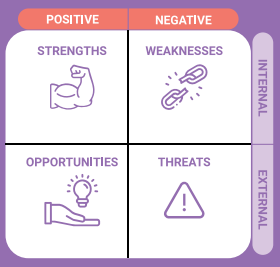
Self-Awareness & Decision-Making



LEARNING OBJECTIVES

Students will:

- Get clarity on their career objectives.
- Pursue their opportunities and face challenges more effectively.
- Be resilient and find ways to recover from setbacks.

LEARNING OUTCOMES

Students will be able to:

- Apply SWOT analysis using case studies.
- Learn to make informed career choices aligned with their aims.
- Identify their strengths, discover development opportunities, and areas in which they may need support.

TEACHERS: PRIOR PREPARATION

- ☐ Case studies print-outs
- ☐ Activity sheet print-outs

https://drive.google.com/file/d/1yqmMXUUXbHdQWtrunDL6XO0C3n4cJs2M/view?usp=drive_link

WORKSHEET

Activity Sheet printouts

https://drive.google.com/file/d/1xmTZ1pbvkZmYocgYbOJJi8lHXZ4Xooml/view?usp=drive_link

RECAP 5 minutes

Recap (Slide 3)

Recap the previous lesson on developing the AI model of the Bias Detector. Use the questions on the slide to guide the discussion.

ANALYSE 15 minutes

Sharing the Story (Slide 4)

Activity

Divide the students into 4 groups. Give one case study to each group, along with the reflective questions and the SWOT analysis format. Ask each group to do a SWOT analysis of the characters in the case studies, based on the reflective questions.

SWOT is the acronym for the Strengths, Weaknesses, Opportunities and Threats. This is an evaluation strategy to identify weaknesses to overcome them, and make them into strengths. If the number of strengths increase, so do the skills, and therefore more opportunities for the student to explore.

PRESENT 20 minutes

Case Studies: SWOT Analysis (Slide 5)

Now each group will present the SWOT analysis they have done based on the characters of each case study.

Activity

Share why a SWOT analysis is crucial for students to initiate their career journeys, and ask them to try their own SWOT analysis based on this session's experience as part of their activity sheet.

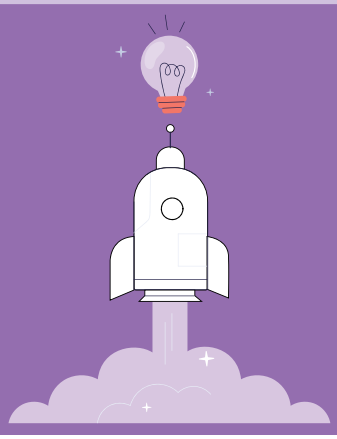
CONCLUDE 5 minutes

Reflections (Slide 6)

Use the questions on this slide to guide a discussion on what the students have learned, and to check their understanding.

30

Future Skills Exploration



LEARNING OBJECTIVES

Students will:

- Gain insights into different career journeys to make informed choices.
- Get exposure to 21st-century skills through exploration.
- Understand the dilemmas and influences in the career decision-making process.

LEARNING OUTCOMES

Students will be able to:

- Learn about different career pathways.
- Identify and recognise the importance of 21st-century skills in making decisions.
- Confidently navigate career-related challenges.

TEACHERS: PRIOR PREPARATION

- ☐ Competency in the SWOT analysis process to support students' analysis.
- ☐ Familiarity with different career pathways.
- ☐ Awareness of the various present and emerging STEM careers.
- ☐ Access to and familiarity with: The Career Quest game and manual

https://careerquestgame.questalliance.net/

RECAP 5 minutes

Recap (Slide 3)

Recap the previous lesson on SWOT Analysis. Use the questions on the slide to guide the discussion.

EXPLORE 30 minutes

Play the Game! (Slide 4)

Activity
Divide the class into groups of 3-4 students each.

Introduce the Career Quest Game.
Demonstrate the game once, then share the link for students to play and explore:
https://careerquestgame.questalliance.net/

Instruct the groups to start by exploring at least one character in the game.
Ask them to write down answers to the questions on the slide.
Tell them to read the experience cards carefully and take notes for better recall.
Encourage students to take their time exploring characters and avoid rushing through a single career path.

If they haven't finished exploring, they can return and resume it on the same device.

"Career Quest" is a digital, self-paced, gamified learning tool created for young people to experience diverse career journeys and decision-making.

REFLECT 15 minutes

Reflections on the Game (Slide 5)

Ask students to share the answers to the questions previously posed.

Explain: Just like the characters in the game, each individual will have their own career journey.

Summarise the key learnings from the game and discussion. Tell students that if they start on their career explorations now, it will help them map their careers smoothly. In the next session, they will dig deeper into their own career journeys.

Since the game is long and can't be completed in one class, the link will be shared on the parents' Whatsapp group. Students will continue playing the game at home and be prepared for the next lesson.

CONCLUDE 5 minutes

Lesson Summary

Summarise the key learnings from the game and discussion. Tell students that if they start on their career explorations now, it will help them map their careers smoothly. In the next session, they will dig deeper into their own career journeys.

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Mapping My Career

LEARNING OBJECTIVES

Students will:

- Set their career goals.
- Identify the people who will support them on their career journeys.
- Reflect on their goals and visual representations of their career journeys.

LEARNING OUTCOMES

Students will be able to:

- Make informed decisions about their careers.
- Create potential career pathways.
- Stay focused on long-term aspirations

LEARNER: PREREQUISITE KNOWLEDGE

- A thorough exploration of the Career Quest game.
- An understanding and familiarity with SWOT analysis.
- Ideas of various career journeys.

TEACHERS: PRIOR PREPARATION

- ☐ Familiarity with different career pathways.
- ☐ Awareness of the various present and emerging STEM careers.
- ☐ Goal Setting template printouts.
- ☐ My Aspiration Card printouts.

https://drive.google.com/file/d/1GftnScS6sdGxj3OWKPKTiilcTVz_6_Z6/view?usp=drive_link

https://drive.google.com/file/d/1D4RpQ2zQlFiSDy31sMqGPR0OUeEg5QsU/view?usp=drive_link

RECAP 5 minutes

Recap (Slide 3)

Ask students to gather in the same groups from the previous lesson. Display the slide and use the questions to guide the discussion. Take one response from each group for each question.

After the discussion, ask students to discuss their own career journeys in their groups. Tell them that they will work individually for the rest of the lesson.

EXPLORE 15 minutes

Setting Goals (Slide 4)

Encourage students to think about things they like to do more often, that makes them curious. Ask two or three students to share their thoughts.

Activity

Distribute the Setting Goals template, and give them 7 minutes to complete it individually.

Ask students to regroup with their previous groups to share their goals with their peers. Elicit key points from the group discussions.

EXPLORE 15 minutes

My Aspiration Card (Slide 5)

Activity

Distribute the My Aspiration Card and give students 10 minutes to complete it.

Ask students to display their aspiration cards on the wall. This will allow everyone to move around the room and see each other's career goals.

You can suggest that students then stick their cards to their study tables for easy reference and revision.

CONCLUDE 5 minutes

Reflections (Slide 6)

Use the questions on this slide to guide the summary discussion, and ask for the sharing of 3 to 4 responses.

Tell the students that while you hope they are clear about their career journeys, it's also okay to diverge from their current path and choose an alternative career, as Pabitra did.

Remind them to stay motivated to achieve their aspirations by regularly reaching out to their identified support systems.

Term 2 Sample Assessment

AI and Machine Learning

Blue Print of Term 2 Assessment:

CONTENT	MARKS
Creativity	**10**
Effective use of data	**10**
Relevance of content	**10**
Viva-Voce (2-3 questions are to be asked)	**10**
TOTAL	**40**

Identifying Crop Disease – Training a model
A local farm growing cassava has asked you to create a machine-learning model that will identify disease in their crops.

Websites to open:

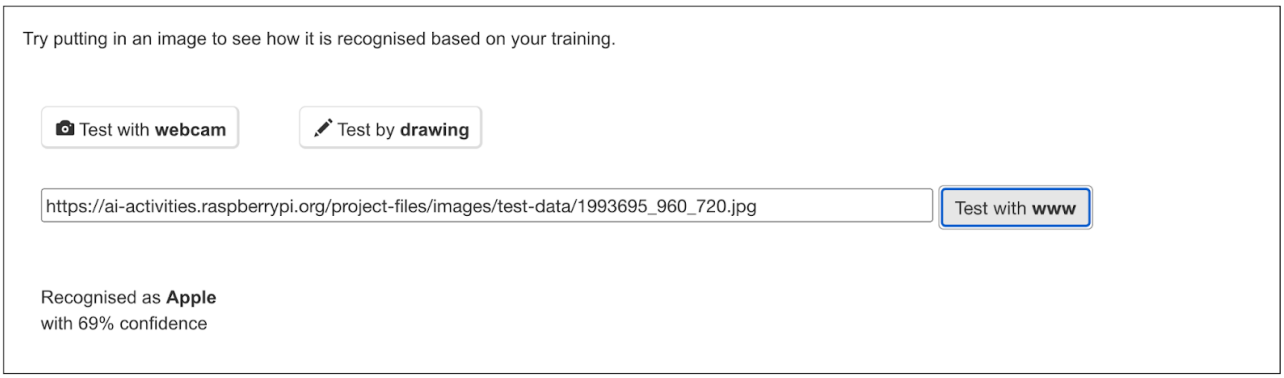
- Machine Learning for Kids (machinelearningforkids.co.uk)
- Training and test data (ai-activities.raspberrypi.org/cassava)

Testing your model
Now that you have trained your model, it is time to test it to see how successful it is.

Some data has been kept aside to use as test data. You can find the images at the bottom of the webpage hosting the data set (ai-activities.raspberrypi.org/cassava).

To see how successful your model is at classifying the test data, test your model with some of the images:

- Drag and drop an image into the link box (next to the **Test with www** button — see the image below)
- Alternatively, you can:
  1. **Right-click** on an image
  2. Select **Copy image address**
  3. Paste the image address into the link box
- Select **Test with www**



Questions

Once you have tested a few of the images, answer the following questions:

Describe the results of your testing	
How could you improve the model?	

Blue Print of Term Assessment

Term -I

CONTENT	MARKS
Problem Identification	04
Planning	08
Pulling out prototype	08
Quality of PPT	08
Presentation	08
Viva-voce (2-3 questions are to be asked)	08
TOTAL	40

Term - II

CONTENT	MARKS
Creativity	10
Effective use of code block/Data	10
Relevance to content	10
Viva-voce (2-3 questions on coding are to be asked)	10
TOTAL	40

NB - In each term the above marks are to be converted to 20 marks.

Information for Teachers on giving feedback

Effective and positive feedback is very important for student development.

How to give constructive feedback?

- It is essential to give feedback to the students for the activities they have done.
- Giving feedback means letting students know what is right and wrong. However, it is important to avoid discouraging the students while giving them feedback.
- Feedback given to students should be positive. Giving them negative feedback can discourage their efforts.
- A teacher should give encouraging and positive feedback.
- Giving positive feedback motivates them to learn.
- Positive feedback creates an environment where students can express their ideas in the classroom. This can boost their confidence and help in their holistic development.
- Feedback should always be informative and timely.
- Let us first appreciate their actions. Then tell them what they can do better and praise again.

Some examples of feedback are

- You did a good job in the project work. You need to pay attention to these (...) aspects. Keeping these aspects in mind will make your project work even better.
- I can see improvement in your project work/homework over time. If you pay attention to these (...) tasks, your project work can be improved in the future.
- You have the potential and In order to achieve better results you will have to work on the (……) weaknesses.
- You are doing well. Keep up with the good work