RoboGenius Pro

6

Teacher's Manual

Extended Support for Teachers

ORANGE
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Teacher's Time Table

Sessions / Days	0	I	II	III	IV	BREAK	V	VI	VII	VIII
Monday										
Tuesday										
Wednesday										
Thursday										
Friday										
Saturday										

Development Milestones in a Child

Development milestones are a set of functional skills or age-specific tasks that most children can do at a certain age. These milestones help the teacher identify and understand how children differ in different age groups.

Age
5 - 8 Years

Physical	• First permanent tooth erupts • Shows mature throwing and catching patterns • Writing is now smaller and more readable • Drawings are now more detailed, organised and have a sense of depth
Cognitive	• Attention continues to improve, becomes more selective and adaptable • Recall, scripted memory and auto-biographical memory improves • Counts on and counts down, engaging in simple addition and subtraction • Thoughts are now more logical
Language	• Vocabulary reaches about 10,000 words • Vocabulary increases rapidly throughout middle childhood
Emotional/ Social	• Ability to predict and interpret emotional reactions of others enhances • Relies more on language to express empathy • Self-conscious emotions of pride and guilt are governed by personal responsibility • Attends to facial and situational cues in interpreting another's feelings • Peer interaction is now more prosocial and physical aggression declines

"If you cannot do great things, do small things in a great way."

Age 9 - 11 Years

Physical	• Motor skills develop resulting in enhanced reflexes
Cognitive	• Applies several memory strategies at once • Cognitive self-regulation is now improved
Language	• Ability to use complex grammatical constructions enhances • Conversational strategies are now more refined
Emotional/ Social	• Self-esteem tends to rise • Peer groups emerge

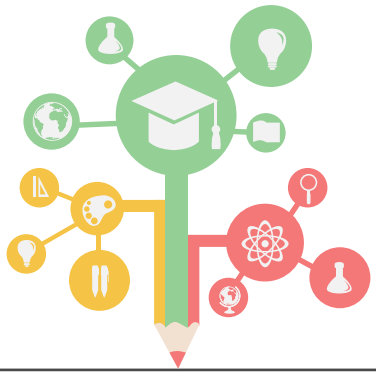
Age 11 - 20 Years

Physical	• If a girl, reaches peak of growth spurt • If a girl, motor performance gradually increases and then levels off • If a boy, reaches peak and then completes growth spurt • If a boy, motor performance increases dramatically
Cognitive	• Is now more self-conscious and self-focused • Becomes a better everyday planner and decision maker
Emotional/ Social	• May show increased gender stereotyping of attitudes and behaviour • May have a conventional moral orientation

Managing the children's learning needs according to their developmental milestones is the key to a successful teaching-learning transaction in the classroom.

"Family is the most important thing in the world."

Teaching Pedagogies



Pedagogy is often described as the approach to teaching. It is the study of teaching methods including the aims of education and the ways in which such goals can be achieved.

Lesson Plans

A lesson plan is the instructor's road map which specifies what students need to learn and how it can be done effectively during the class time. A lesson plan helps teachers in the classroom by providing a detailed outline to follow in each class.

A lesson plan addresses and integrates three key components:

- Learning objectives
- Learning activities
- Assessment to check the student's understanding

A lesson plan provides an outline of the teaching goals:

Before the class

1. Identify the learning objectives.
2. Plan the lesson in an engaging and meaningful manner.
3. Plan to assess student's understanding.
4. Plan for a lesson closure.

During the class

Present the lesson plan.

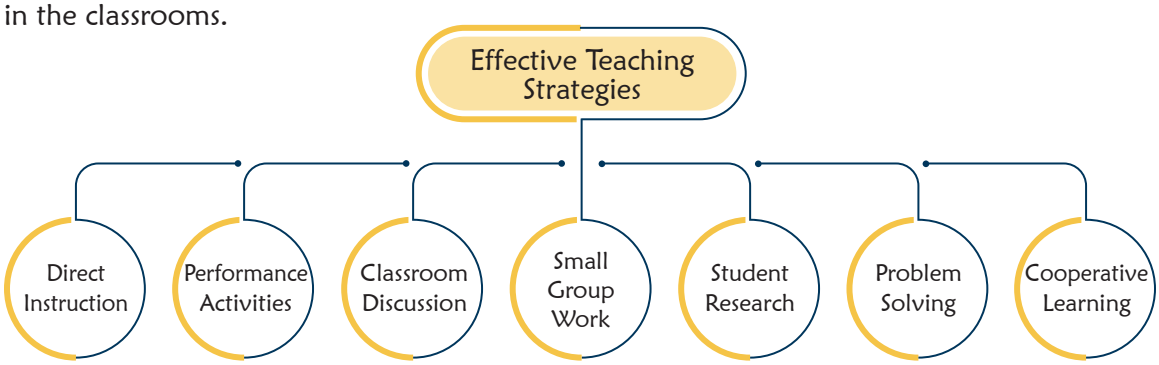
After the class

Reflect on what worked well and why. If needed, revise the lesson plan.

"Knowing yourself is the beginning of all wisdom."

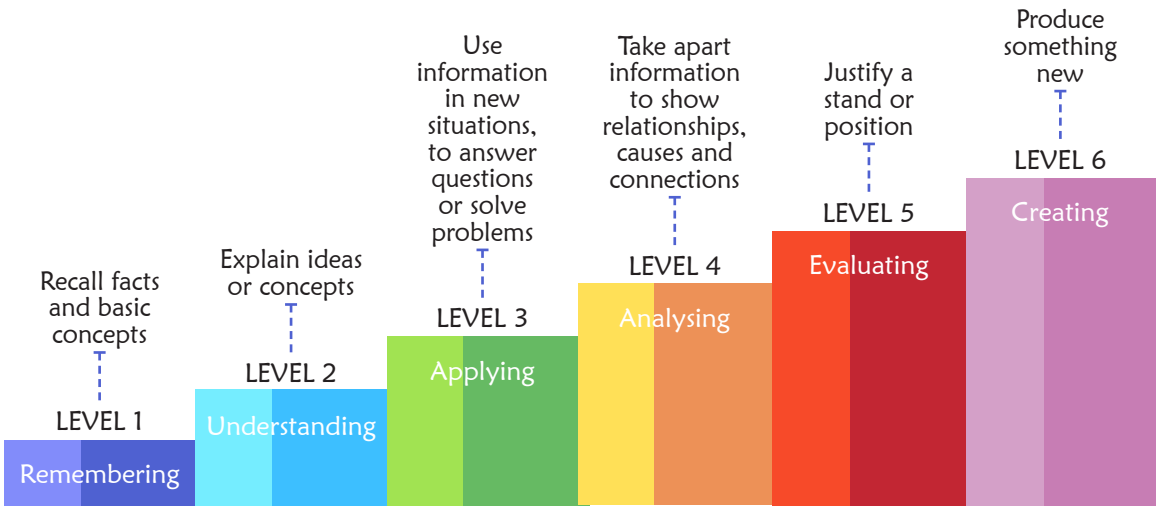
Teaching Strategies

Numerous strategies have evolved over the years to facilitate the teaching-learning process in the classrooms.



Bloom's Taxonomy

Bloom's Taxonomy was created by Dr Benjamin Bloom and several of his colleagues, to promote higher forms of thinking in education instead of rote learning. There are three domains of learning: cognitive (mental), affective (emotional) and psychomotor (physical). However, when we refer to Bloom's Taxonomy we speak of the cognitive domain. Bloom's Taxonomy is a list of cognitive skills that is used by teachers to determine the level of thinking their students have achieved. As a teacher, one should attempt to move students up the taxonomy as they progress in their knowledge.



Teachers should focus on helping students to remember information before expecting them to understand it, helping them understand it before expecting them to apply it to a new situation and so on.

> "If you have no confidence in self, you are twice defeated in the race of life."

CLASS 6

LESSON PLAN

1 Robotics, AI and Electronics

Teaching Objectives

Students will learn about:

- Understanding Robots
- Mechanical and Electronic Components used in Robotics
- Robots and Electricity Connection
- Introduction to AI

Number of Sessions	
Theory	Practical
2	1

Teaching Plan

Discuss what a robot is and how it performs tasks on its own or with minimal human help.

Introduce different types of robots, such as:

- **Industrial robots:** Used in factories for tasks like building cars or assembling parts.
- **Service robots:** Assist people in daily life, like cleaning robots or hospital robots delivering medicines.
- **Exploration robots:** Used for exploring dangerous places like outer space or deep oceans.
- **Humanoid robots:** Designed to look and act like humans, assisting in tasks and interacting with people.

Discuss how robots are made of two main components: Mechanical (e.g., motors, wheels, arms) and Electronic (e.g., microcontroller, sensors).

Discuss the importance of electricity in robots. Explain that robots need power to function—just like food gives humans energy.

Explore how electricity powers the robot's motors, microcontroller and sensors, enabling movement and decision-making.

Mention how robots use batteries or solar panels for energy and how wires and circuits carry electrical signals.

Explain that Artificial Intelligence (AI) is the ability of machines to think and act like humans.

Discuss how AI is used in various devices, like smartphones (Siri), cameras (face recognition) and self-driving cars.

Introduce the difference between normal electronics (devices that follow fixed instructions) and AI electronics (devices that can adapt and make decisions based on what they sense).

Extension

Ask the students some questions based on this chapter.

Q. How do robots move and what parts help them perform tasks?

Q. What are the main differences between industrial robots and humanoid robots?

Q. Why is electricity crucial for robots to function?

Q. How do sensors in robots help them understand their surroundings?

Q. How does AI help robots act smart like humans?

Q. What are the applications of robots in hospitals and factories?

Q. Why do robots need a microcontroller and how does it help them make decisions?

Evaluation

Guide the students to complete the sections, such as **Ask AIRO** provided on page **10**.

Encourage students to think ethically and answer the question given in the **ETHICS EDGE** section on page **11**.

After explaining the chapter, let the students do the **ROBO CHECK** on pages **12** and **13** in the main course book.

Encourage the students to complete the activity like **CASE STUDY** given on page **14**.

Suggested Activity

Design a robot by selecting its type and components. Sketch the robot and label its parts. Explain how AI helps your robot make decisions and perform tasks.

2 3D Shapes in Robotics with Tinkercad

Teaching Objectives

Students will learn about:

- Getting Started with Tinkercad
- Working with 3D Shapes in Tinkercad
- Designing a Simple Robot Model
- Designing a Robot Pet
- Building a Delivery Robot

Number of Sessions	
Theory	Practical
2	1

Teaching Plan

Explain what Tinkercad is a free, easy-to-use online tool where students can design 3D objects, build circuits and learn simple coding.

Guide students on how to sign up and create an account on Tinkercad.

Introduce the Tinkercad Dashboard and explain the main components of the 3D design workspace:

Teach students how to add, resize and modify 3D shapes in Tinkercad. Discuss how shapes like spheres, cylinders, cones and boxes can be used to create robot parts.

Discuss how to resize shapes using the Shape Properties Panel.

Explain the concept of grouping objects to simplify the design process. Students will learn how to group and ungroup shapes to make robots or other objects.

Discuss how to build the robot's head, body, arms, wheels and other parts using Tinkercad's shapes and how to align and resize them.

Guide the students to create a robot model by using basic shapes.

Guide students in designing a Robot Pet using basic shapes such as boxes and spheres for the body, legs and sensors.

Explain how to build a Delivery Robot by using shapes like boxes for the body and cylinders for the wheels.

Discuss adding sensors and headlights to the robot for functionality and aesthetic appeal.

Extension

Ask the students some questions based on this chapter.

Q. How can you use different 3D shapes to build the head of a robot?

Q. How can grouping shapes help in simplifying the design of a robot?

Q. What are the main components of a robot that can be made using Tinkercad?

Q. How does the Workplane in Tinkercad help with designing 3D shapes?

Q. What is the purpose of Bundle Group in Tinkercad and how does it differ from Union Group?

Q. How would you design a robot pet with interactive features?

Q. How would the Delivery Robot function in real life and what are its practical uses?

Evaluation

Guide the students to complete the sections, such as **Ask AIRO** provided on page **22**.

Encourage students to think ethically and answer the question given in the **ETHICS EDGE** section on page **24**.

Ask the students to answer the question in **CHALLENGE CHAIN** section on page **27**.

After explaining the chapter, let the students do the **ROBO CHECK** on pages **29** and **30** in the main course book.

Take the students to the computer lab and let them practice the activity given in the **INNOVATION LAB** section on page **31** in the main course book.

Suggested Activity

Students should build a robot model on Tinkercad with 4–5 shapes for the head, body, arms, legs and wheels, adding features like sensors or antennas and then explain their design.

3 Introduction to Codeblocks in Tinkercad

Teaching Objectives

Students will learn about:

- Understanding Codeblocks
- Benefits of using Codeblocks
- Basic Blocks in Codeblocks
- Build a Tower using Repeat Block
- Design a Pattern with Mixed Shapes

Number of Sessions	
Theory	Practical
2	2

Teaching Plan

Introduce how students can design 3D models, control movements and perform actions by simply snapping blocks together, like solving a puzzle.

Explain that Codeblocks is a visual programming tool that uses colourful blocks to create programs.

Discuss how each block represents a specific command or action, such as moving a robot, playing a sound or rotating an object.

Explain the benefits of using Codeblocks and how they make coding simple, visual and easy for beginners.

Explain the basic blocks used in Codeblocks and how they help in creating and controlling 3D designs.

Demonstrate the use of different Codeblocks and explain how each block helps create shapes, modify designs, control actions and perform calculations in a program.

Guide students through the steps of building a tower using the Repeat Block.

Demonstrate how to customise shapes for the base and adjust height with variables and how to repeat the actions using the Repeat Times Block.

Demonstrate how to design a pattern using mixed shapes by combining different 3D shapes and arranging them using Codeblocks.

Encourage creativity by allowing students to design their own patterns.

Extension

Ask the students some questions based on this chapter.

Q. How can you create patterns using shapes in Tinkercad Codeblocks?

Q. What is the purpose of the Repeat Block in creating designs?

Q. How do Modify Blocks help in changing the properties of a shape?

Q. How does the Math Block assist in adjusting the placement of shapes in a design?

Q. What are the benefits of using Codeblocks over traditional coding methods?

Q. How can Variable Blocks help in controlling repetitive actions in designs?

Q. How do Control Blocks allow you to organise the flow of your program?

Evaluation

Guide the students to complete the sections, such as **Ask AIRO** provided on page **34**.

Encourage students to think ethically and answer the question given in the **ETHICS EDGE** section on page **35**.

Ask the students to answer the question in **CHALLENGE CHAIN** section on page **39**.

After explaining the chapter, let the students do the **ROBO CHECK** on pages **41** and **42** in the main course book.

Take the students to the computer lab and let them practice the activity given in the **INNOVATION LAB** section on page **43** in the main course book.

Suggested Activity

Students should create a 3D design using Tinkercad Codeblocks by combining multiple shapes and using loops to repeat certain actions like stacking or rotating shapes.

Students should then modify the design to make it a pattern and explain the logic behind the pattern design.

4 Basics of Circuits for Robotics

Teaching Objectives

Students will learn about:

- Introduction to Electricity
- Circuit

- Starting with Tinkercad Circuits
- Building a Simple Torch Circuit
- Building a Circuit Using Switch
- Building a Motor Circuit

Number of Sessions	
Theory	Practical
2	3

Teaching Plan

Introduce electricity and how it powers devices like lights, fans and computers.

Discuss conductors (e.g., copper, aluminium, water) and insulators (e.g., rubber, plastic, wood).

Explain how current (the flow of electrons) powers electrical devices and is measured in amperes (A).

Introduce the concept of Direct Current (DC) and Alternating Current (AC).

Discuss voltage (the push that moves current) and resistance (which limits current flow).

Explain that robots need electricity to move, think, sense the environment, communicate and perform tasks.

Define a circuit as a closed path that allows current to flow from a power source to a device.

Introduce the series circuit and parallel circuit.

Introduce Tinkercad Circuits, an online simulator for designing and testing circuits.

Discuss the Tinkercad Circuits interface (workspace, component list, toolbar, simulation button).

Show how to add components like LEDs, motors, switches and batteries to the workspace.

Explain how to build a simple torch circuit by connecting a battery and a light bulb to complete an electrical circuit.

Demonstrate how to build a circuit using a switch and show how the switch controls the flow of electricity to turn the bulb on and off.

Demonstrate how to build a motor circuit by connecting a battery, switch and DC motor to show how electricity makes the motor spin.

Extension

Ask the students some questions based on this chapter.

Q. How does a switch control the flow of electricity in a circuit?

Q. Why is it important to have resistance in an electrical circuit?

Q. How would a series circuit differ from a parallel circuit in terms of device failure?

Q. How do different sources of electricity (batteries, power plants, solar panels) impact the devices they power?

Q. Why do robots need motors, sensors and microcontrollers to operate efficiently?

Q. How does a DC motor convert electrical energy into mechanical motion?

Q. How can Tinkercad Circuits help in designing and testing circuits without real components?

Evaluation

Encourage the students to solve the question in the **VISUAL VAULT** section on page **50**.

Encourage students to think ethically and answer the question given in the **ETHICS EDGE** section on page **52**.

Guide the students to complete the sections, such as **Ask AIRO** provided on page **53**.

Ask the students to answer the question in **CHALLENGE CHAIN** section on page **55**.

After explaining the chapter, let the students do the **ROBO CHECK** on pages **56** and **57** in the main course book.

Take the students to the computer lab and let them practice the activity given in the **INNOVATION LAB** section on page **57** in the main course book.

Suggested Activity

Ask students to build a simple alarm system circuit using a 9V battery, slideswitch and piezo buzzer and simulate it in Tinkercad Circuits to observe how the alarm rings when the switch is turned on.

5 Building the Future with 3D Printing

Teaching Objectives

Students will learn about:

- Introduction to 3D Printing
- Materials used in 3D Printing
- Applications of 3D Printing
- The Future of 3D Printing

Number of Sessions	
Theory	Practical
3	0

Teaching Plan

Introduce the concept of 3D printing and explain how it creates physical objects from digital designs by building them layer by layer.

Discuss how this technology is used in various fields, such as medicine, aerospace, fashion and more.

Introduce the basic process of 3D printing:

- **Create a 3D Model:** Using software like Tinkercad to design objects.
- **Prepare the Design for Printing:** Saving the design as a file (STL format) for the 3D printer.

- **Layer-by-Layer Printing:** The printer builds the object by depositing materials in thin layers.
- **Finishing Touches:** Post-processing may be needed, such as smoothing the surface or hardening the material.

Introduce the different materials used in 3D printing and explain how each material is suitable for creating different types of objects.

Introduce the various applications of 3D printing and explain how it is used in industries like medicine, aerospace, automotive, fashion and more.

Introduce the future of 3D printing and explain how advancements in technology will lead to faster printing, higher precision and the use of innovative materials for even more applications.

Extension

Ask the students some questions based on this chapter.

Q. How does 3D printing create physical objects from digital designs?

Q. What are the differences between PLA and ABS in terms of usage?

Q. What material would you choose for creating a custom prosthetic and why?

Q. How can 3D printing be used to improve the aerospace industry?

Q. In what ways is 3D printing impacting the automobile industry?

Q. How might 3D printing change the way we produce food in the future?

Q. What advancements are needed to make 3D printing more accessible in the future?

Evaluation

Encourage students to think ethically and answer the question given in the **ETHICS EDGE** section on page **61**.

Guide the students to complete the sections, such as **Ask AIRO** provided on page **64**.

Encourage the students to solve the question in the **VISUAL VAULT** section on page **64**.

After explaining the chapter, let the students do the **ROBO CHECK** on pages **65** to **67** in the main course book.

Encourage the students to complete the activity like **CASE STUDY** given on page **67**.

Suggested Activity

Ask students to design a simple object, like a toy or tool, using Tinkercad. They should choose a 3D printing material and explain why. Then, students will research the real-world applications of their design, such as in medicine, aerospace or households.