Computational Thinking & Artificial Intelligence

Part 2 AI

8

Teacher's Manual

Extended Support for Teachers

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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

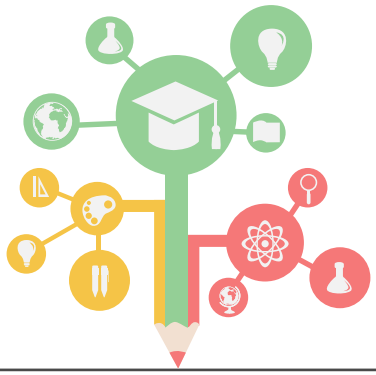
Age 11 - 20 Years

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.

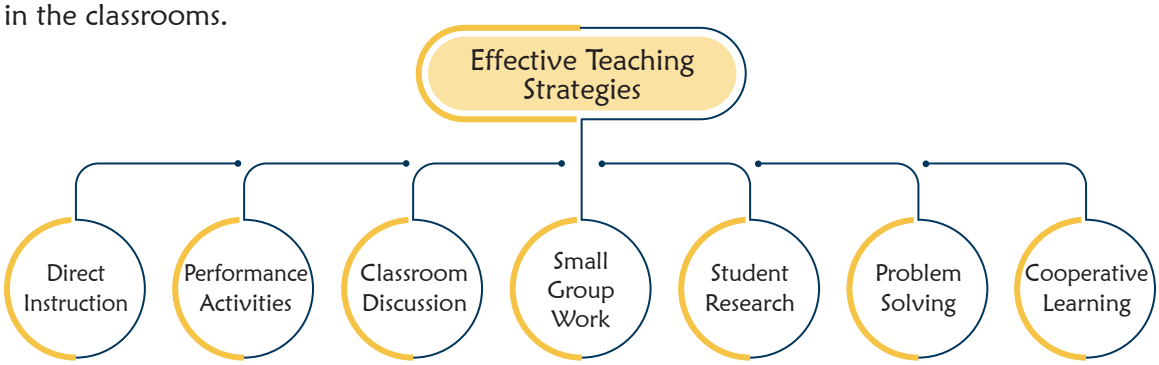
After the class

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

"Knowing yourself is the beginning of all wisdom."

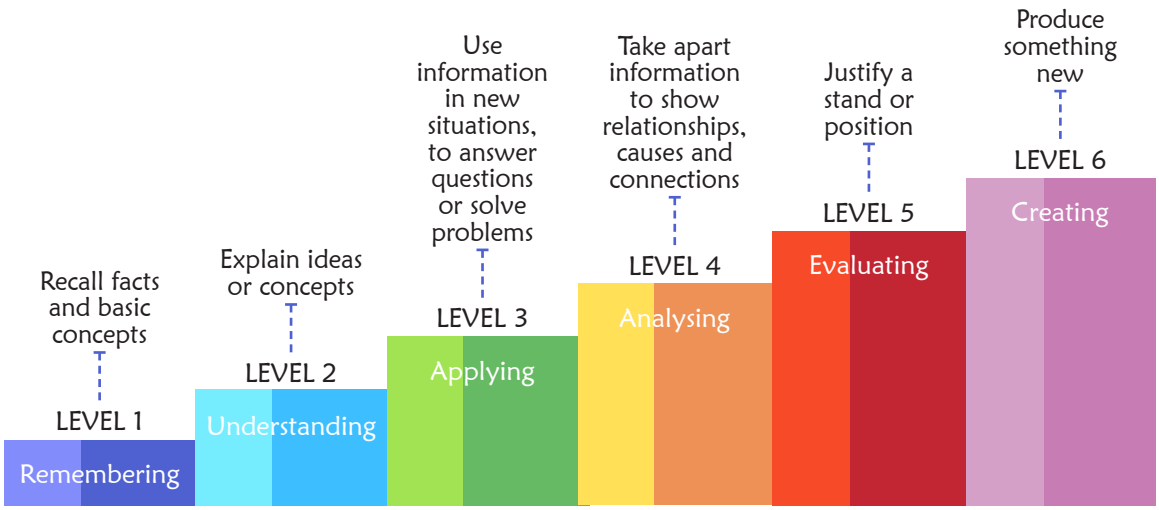
Teaching Strategies

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 8

LESSON PLAN

1 AI Project Lifecycle

Teaching Objectives

Students will learn about:

- Introduction to Artificial Intelligence
- Role of Artificial Intelligence
- AI at Work: It's All Around Us
- How Does AI Learn?
- AI Project
- AI Project Lifecycle
- Defining the Problem (4W's Approach)
- Data Collection and Preparation
- Model Development and Training
- Model Evaluation and Refinement
- Model Deployment
- Monitoring and Maintenance

Number of Sessions	
Theory	Practical
4	2

Teaching Plan

Before starting the chapter, discuss how AI is used in everyday life and ask students to share examples.

Explain the meaning of Artificial Intelligence and how it differs from traditional computer programs. Discuss its importance in solving real-life problems.

Discuss the major functions of AI, such as analysing data, recognising patterns, learning from experience, making predictions, understanding language, recognising images and automating tasks.

Explain the applications of AI in healthcare, education, agriculture, banking, transportation, smart homes, smartphones and other fields. Encourage students to identify AI applications around them.

Describe how AI learns from data. Explain the importance of good-quality data and how it improves

AI accuracy and performance.

Introduce the AI Project and explain the AI Project Lifecycle. Discuss the six stages involved in developing an AI solution.

Explain the Defining the Problem stage using the 4W's approach (Who, What, Where and Why). Demonstrate it with the gadget screen time example.

Differentiate between automation and AI using examples such as smart traffic signals, attendance systems, security systems and smart irrigation.

Explain Data Collection and Preparation. Discuss primary and secondary data sources and the importance of collecting accurate and relevant data.

Demonstrate data preparation by explaining data cleaning, formatting and labelling. Show how missing values, duplicate entries and inconsistent data are corrected before training the model.

Introduce Model Development and Training. Explain how AI models learn patterns from prepared data and use them to make predictions.

Explain Model Evaluation and Refinement. Discuss testing the model with new data and improving its performance by refining the model.

Describe Model Deployment and Monitoring. Explain how AI models are used in real-life applications and why they require regular monitoring and updates.

Discuss the AI-based Smart Waste Management System and AI for Oceans activity to help students understand real-life applications of the AI Project Lifecycle.

Extension

Ask the students some oral questions based on this chapter.

Q. What is Artificial Intelligence?

Q. How does AI learn from data?

Q. What are the major functions of AI?

Q. Name the six stages of the AI Project Lifecycle.

Q. What is the purpose of the 4W's approach?

Q. Differentiate between primary and secondary data sources.

Q. Why is data preparation important?

Q. What happens during model evaluation?

Q. Why is model deployment necessary?

Q. Why is monitoring and maintenance important in AI systems?

Evaluation

Let students complete the **CONCEPT CAPSULE** activity given on page **12**.

Ask students to do the **PROJECT-BASED LEARNING** activity given on page **13 and 23**.

Students will complete the **EXPERIENTIAL LEARNING ACTIVITY** given on page **18**.

Encourage students to solve the **THINK TANK** activity given on page **21**.

Students will attempt the **ASK AI AGENT** activity given on page **22**.

Help students complete activities like **CHECKPOINT** given on page **22**.

Guide students to complete the **AI IN ACTION** activity given on page **23**.

After explaining the chapter, ask students to complete the **CODE DECODE** activity given on pages **24 to 27** in the main course book.

Take students to the computer lab to practise the activity given in the **AI LAB** section on page 27. This will improve their skills and promote creativity and technology literacy.

Suggested Activity

Ask students to identify a real-life problem from their school or surroundings. Let them explain how each stage of the AI Project Lifecycle can be used to develop an AI-based solution. Encourage them to present their ideas using a chart or presentation.

2 Deeper Dive into AI Applications

Teaching Objectives

Students will learn about:

- AI for Environmental Problem Solving
- AI-Assisted Healthcare
- AI and Intelligent Automation
- Smart Transportation
- AI in Agriculture
- AI in Smart Homes
- Applications of AI in solving real-life problems

Number of Sessions	
Theory	Practical
5	1

Teaching Plan

Before starting the chapter, ask the students to discuss examples of AI applications they use in their daily lives, such as navigation apps, recommendation systems and smart devices.

Discuss how Artificial Intelligence helps in solving real-life problems by analysing data, identifying patterns and supporting better decision-making. Explain that AI is used in various fields such as environment, healthcare, automation and education.

Explain how AI helps in environmental problem solving. Discuss environmental challenges such as

plastic pollution, air pollution, waste management, wildlife loss and soil degradation. Explain how AI analyses environmental data, monitors pollution, detects waste using satellite images and supports wildlife conservation.

Discuss AI-based solutions for waste management, including smart bins, AI-powered sorting systems and image recognition technology for identifying recyclable items.

Explain AI-assisted healthcare and discuss how AI supports doctors in disease detection, medical image analysis, predictive healthcare and remote patient monitoring.

Discuss medical image analysis and explain how AI can analyse X-rays, CT scans and MRIs to help detect diseases and health conditions faster.

Explain predictive healthcare and how AI analyses medical records, wearable device data and health patterns to identify possible health risks at an early stage.

Introduce Virtual Health Assistants and explain how AI-powered assistants provide health guidance, answer basic queries and send medicine reminders.

Explain AI and intelligent automation by discussing how AI-powered systems reduce human effort and improve efficiency in daily tasks and industries. Discuss examples such as smart transportation, agriculture and smart homes.

Explain smart transportation and how AI uses data from sensors, cameras and GPS systems to improve traffic management, reduce congestion and enhance road safety.

Discuss AI in agriculture and explain how AI helps farmers through weather prediction, soil analysis, pest detection and smart irrigation systems.

Explain AI applications in smart homes and discuss how AI-powered devices such as smart lights, cameras, appliances and virtual assistants make homes more comfortable, secure and energy efficient.

Extension

Ask the students some oral questions based on this chapter.

Q. How does AI help in solving environmental problems?

Q. What are the major environmental issues discussed in the chapter?

Q. How does AI help in waste management?

Q. Explain the role of AI in healthcare.

Q. What is medical image analysis?

Q. How does predictive healthcare work?

Q. What are virtual health assistants?

Q. How does AI improve transportation systems?

Q. Explain any three applications of AI in agriculture.

Q. How do AI-powered smart homes help users?

Evaluation

Ask students to do the **PROJECT-BASED LEARNING** activity given on page **33**.

Let students complete the **CONCEPT CAPSULE** activity given on page **35**.

Encourage students to solve the **THINK TANK** activity given on page **37**.

Students will attempt the **ASK AI AGENT** activity given on page **42**.

Students will complete the **INTERDISCIPLINARY ACTIVITY** given on page **44**.

Help students complete activities like **CHECKPOINT** given on page **45**.

Guide students to complete the **AI IN ACTION** activity given on page **47**.

After explaining the chapter, ask students to complete the **CODE DECODE** activity given on pages **48 to 50** in the main course book.

Take students to the computer lab to practise the activity given in the **AI LAB** section on page **50**. This will improve their skills and promote technology literacy.

Suggested Activity

Ask students to create a presentation on "AI Solutions for a Better Future".

The presentation should include:

- An existing real-life problem
- How AI can help solve the problem
- Benefits of using AI
- Examples of AI applications

Encourage students to present their ideas and discuss how AI can improve everyday life.

3 Data and Fairness in AI

Teaching Objectives

Students will learn about:

- Role of Data in Artificial Intelligence
- Importance of Training Data
- Balanced and Diverse Data
- Understanding Bias in AI
- Effects of Biased Data
- Fairness in AI Systems
- AI Recommendation Systems
- Human Supervision in AI

- Transparency in AI
- Google Teachable Machine
- Gender Bias in AI Hiring Systems
- Responsible AI Development

Number of Sessions	
Theory	Practical
4	2

Teaching Plan

Begin the lesson by discussing the introductory example and explain that AI learns from the data it is trained on. Emphasize the importance of balanced and diverse data.

Explain the role of data in Artificial Intelligence and describe how AI learns patterns from training data to make predictions.

Discuss the importance of high-quality, balanced and diverse datasets for developing accurate and reliable AI systems.

Introduce the concept of bias in AI and explain how biased or incomplete data can produce unfair decisions.

Explain the effects of biased AI using examples of facial recognition, language translation and recommendation systems.

Discuss how AI systems are used in education, healthcare, recruitment and entertainment, and why fairness is essential in each application.

Explain the methods used to ensure fairness in AI, including balanced data, bias checks, transparency and regular evaluation.

Introduce the concept of Human Supervision and explain why important AI decisions should always involve human judgment.

Demonstrate the Google Teachable Machine activity and allow students to observe how training data affects AI predictions.

Discuss the case study on Gender Bias in AI Hiring Systems and explain the measures used to make AI systems fair.

Conclude the chapter by emphasizing the importance of responsible AI development using fair, transparent and unbiased data.

Extension

Ask the students some oral questions based on this chapter.

Q. 1. What is the role of data in Artificial Intelligence?

Q. Why is balanced training data important?

Q. What is bias in AI? Give one example.

Q. How can biased data affect AI systems?

Q. Explain the importance of fairness in AI.

Q. What is the purpose of bias checking?

Q. Why is human supervision necessary in AI?

Q. How does Google Teachable Machine help in understanding AI?

Q. Explain the gender bias case study discussed in the chapter.

Q. Suggest any three ways to make AI systems fair and responsible.

Evaluation

Let students complete the **CONCEPT CAPSULE** activity given on page **54**.

Encourage students to solve the **THINK TANK** activity given on page **54**.

Students will attempt the **ASK AI AGENT** activity given on page **56**.

Help students complete activities like **CHECKPOINT** given on page **57**.

Guide students to complete the **AI IN ACTION** activity given on page **58**.

Ask students to do the **PROJECT-BASED LEARNING** activity given on page **58**.

After explaining the chapter, ask students to complete the **CODE DECODE** activity given on pages **59 to 60** in the main course book.

Suggested Activity

Divide the students into small groups and ask each group to prepare balanced and unbalanced datasets using images of different objects. Students will train a simple AI model using Google Teachable Machine, compare the results and discuss how balanced data improves fairness and accuracy in AI systems.

4 Ethics and Responsible AI

Teaching Objectives

Students will learn about:

- Introduction to AI Ethics
- Importance of Ethical AI
- Privacy in the Digital World
- Personal Data and Data Protection
- Responsible Data Sharing
- Bias in Artificial Intelligence
- Fairness in AI Systems
- Causes and Effects of AI Bias

- Misinformation and Social Impact
- Fake News and Deepfakes
- Verifying Online Information
- Accountability in AI
- Human Control over AI
- Responsible and Ethical Use of AI

Number of Sessions	
Theory	Practical
4	2

Teaching Plan

Begin the lesson by discussing situations where AI makes decisions and ask students why ethical guidelines are important while using AI.

Introduce AI Ethics and explain how ethical principles help ensure AI is safe, fair and beneficial for society.

Explain the importance of ethics in AI and discuss the need for transparency, fairness, privacy and accountability.

Discuss Privacy in the Digital World and explain how personal information is collected, stored and used by digital platforms.

Explain the importance of protecting personal data and encourage students to follow safe online practices while using digital services.

Introduce Bias in AI and explain how biased datasets can lead to unfair decisions and discrimination.

Discuss the concept of Fairness in AI and explain how balanced data and regular evaluation help reduce bias.

Explain Misinformation and discuss how AI-generated content, fake news and deepfakes can influence people's opinions.

Demonstrate simple techniques for identifying reliable information and verifying online sources before sharing them.

Introduce Accountability in AI and explain why humans should remain responsible for important AI-based decisions.

Discuss Human Control over AI and explain that AI should assist people rather than replace human judgment.

Conclude the lesson by encouraging students to use AI responsibly, ethically and with respect for privacy, fairness and truth.

Extension

Ask the students some oral questions based on this chapter.

Q. What is AI Ethics?

Q. Why is ethics important in Artificial Intelligence?

Q. How can personal data be protected in the digital world?

Q. What is bias in AI? Give one example.

q. How can fairness be ensured in AI systems?

Q. What is misinformation?

Q. Explain the harmful effects of fake news and deepfakes.

Q. Why is it important to verify online information?

Q. What is accountability in AI?

Q. Why should humans always remain in control of AI systems?

Evaluation

Ask students to do the **PROJECT-BASED LEARNING** activity given on page **67**.

Let students complete the **CONCEPT CAPSULE** activity given on page **67**.

Guide students to complete the **AI IN ACTION** activity given on page **70**.

Encourage students to solve the **THINK TANK** activity given on page **72**.

Students will attempt the **ASK AI AGENT** activity given on page **72**.

After explaining the chapter, ask students to complete the **CODE DECODE** activity given on pages **74 to 76** in the main course book.

Take students to the computer lab to practise the activity given in the **AI LAB** section on page **76**. This will improve their skills and promote **information Literacy** and **technology literacy**.

Suggested Activity

Divide the students into small groups and assign each group one topic—Privacy, Bias, Fairness, Misinformation or Accountability. Ask each group to prepare a real-life case study, identify the ethical issues involved and suggest responsible AI practices. Students should present their findings and discuss how AI can be used fairly and responsibly.