FOR GRADE

COMPUTER WHIZ 6

TEACHING GUIDE

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Introduction

Computer Whiz books 6-8 extend the comprehensive *Computer Whiz* series to lower secondary grades. Aligned with the National Curriculum of Pakistan 2022, *Computer Whiz 6-8* is a diligent attempt to provide necessary knowledge, skills, and attitudes compatible with modern developments in computers and technology.

Pupils of today need to learn how technology can be used to tackle with various socio-economic challenges, e.g. global warming, climate change, sustainable development, food shortage, etc. It is imperative for pupils to study computer science because it fosters creativity, critical thinking, and problem-solving skills that will nurture their digital entrepreneurial skills and prepare them for the future job market. This series will enable them to master essential digital skills (word processing, presentation, spreadsheets, photo editing, etc.), the fundamentals of coding and programming, and understand the ethical norms, behaviours, and practices in the digital world.

KEY FEATURES

Each book in this series comprises of six domains.

1. ICT FUNDAMENTALS
2. DIGITAL SKILLS
3. ALGORITHMIC THINKING AND PROBLEM SOLVING
4. PROGRAMMING
5. DIGITAL CITIZENSHIP
6. ENTREPRENEURSHIP IN DIGITAL AGE
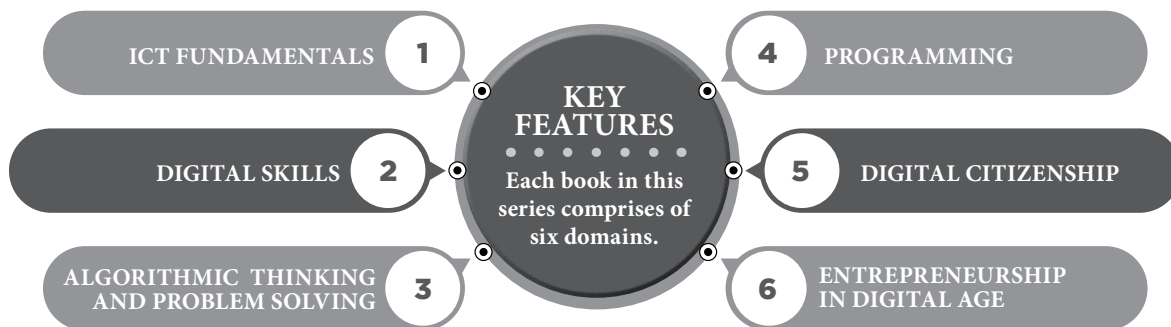
The content in each chapter is supported by

Vocabulary Cloud

Explains essential terminology used in the chapter.

Lesson Plan

Step-by-step and interactive lesson plans that cater to diverse pupil needs

(Depending on available time, resources, and pupils' understanding, the ideas from these lesson plans can be redistributed among lessons. It is recommended to organise the class in such a manner that pupils get some practice time at the end of the class.)

Concept Cloud

Delves into additional/ optional information and intriguing analogies to deepen pupils' understanding.

1. Vocabulary Cloud
2. Lesson Plans
3. Concept Cloud

Class Activity

Fosters an interactive classroom environment with our specially designed activities which are integrated into the curriculum.

Link

Connects theory to real-world applications through relevant weblinks, enabling pupils to explore and expand their knowledge beyond the textbook.

(These are external/third-party links and teachers must watch them before displaying it to the pupils, to make sure that the content is relevant.)

4. Interactive Class Activities
5. Relevant Weblinks

Homework

Step-by-step and interactive lesson plans that cater to diverse pupil needs

(Depending on available time, resources, and pupils' understanding, the ideas from these lesson plans can be redistributed among lessons. It is recommended to organise the class in such a manner that pupils get some practice time at the end of the class.)

Answer Key

Potential responses to end-of-chapter questions, streamlining your preparation and ensuring a well-rounded educational experience for your pupils.

6. Homework For Extended Learning
7. Suggested Answers to End Of Chapter Questions

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01. COMPUTER DEVICES, HARDWARE, AND SOFTWARE

After completing this chapter, pupils should be able to:

- define a computer and explain its functions,
- define ICT and explain its applications,
- describe the five generations of computers,
- explain hardware and software,
- identify and define multiple types of output and input devices,
- differentiate between RAM and ROM,
- identify and define multiple types of storage devices,
- differentiate computers according to size, speed, and functionality,
- describe different types of software.

Introduction for the teacher

In this increasingly technology-driven world, equipping pupils with a foundational understanding of computers, information technology, and related concepts is essential. This chapter will help pupils to become digitally literate. As technology continues to advance, computer skills are becoming prerequisites for various professions. By introducing these topics early, we prepare pupils for future careers that may require a deep understanding of technology.

Computers enable global connectivity. Teaching pupils about information and communication technology (ICT) will empower them to connect with people worldwide, broadening their horizons and exposing them to diverse cultures and ideas.

Understanding the evolution of computers, as taught by the five generations of computers, will provide historical context. It will help pupils appreciate the rapid progress in technology and the impact it has had on society.

Vocabulary Cloud	
ICT	Information and Communication Technology
CPU	Central Processing Unit
GPU	Graphics Processing Unit
HDD	Hard Disk Drives
SDD	Solid-State Drives
RAM	Random Access Memory
ROM	Read Only Memory
USB	Universal Serial Bus
LCD	Liquid Crystal Display

LED	Light Emitting Diode
SMD	Surface-Mounted Display
VGA	Video Graphics Array
HDMI	High-Definition Multimedia Interface
ALU	Arithmetic Logic Unit
CD-ROM	Compact Disc Read-Only Memory

Lesson plan 1

Resources

✓ Textbook pages 2-4

✓ Images of computers and smartphones to display on the softboard or a tablet or multimedia if available. MS PowerPoint, Multimedia display

Starter activity (5 min)

Display the image of a computer and a smartphone on the softboard or a tablet:

- Are these devices an essential part of today's lifestyle?
- What do you understand by ICT?
- Write down as many functions of a computer as you can think of.
- Where do you use ICT in your daily life?

Reading and explanation (30 min)

Read pages 2 and 3. Define computer and ICT and explain its applications. Ask pupils to discuss and identify three different applications of ICT (e.g. communication, data analysis, entertainment).

Tell the pupils that ICT is an integral part of daily life today, for people of all ages. It is like a helpful friend in different parts of our lives. It helps us find our way, make cool stuff, find information, and run businesses smoothly. It makes communication, learning, entertainment, and many other activities more convenient and enjoyable.

You may want to teach this topic with the help of a PowerPoint presentation. You could use the following extended information to create your presentation slides. Also add interesting and relevant pictures to gauge pupils interest:

☁ Concept Cloud ✕

Measurement (GPS): ICT is an amazing tool that helps us find our way and measure distances accurately. GPS stands for Global Positioning System. It is like a super-smart map that uses satellites in space to figure out where you are. You might have used GPS on your family's car trips or your parents' smartphones. It is also used in some games like 'Pokemon Go' to help you find virtual creatures in the real world.

Manufacturing and industry: Think of ICT as a helper for making things in factories. Robots and computers work together to build cars, toys, and even the gadgets you use. For example, in making a toy, robots can paint the toy perfectly, and computers make sure everything is put together just right. ICT helps make the manufacturing process faster and more accurate.
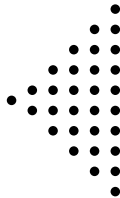
Search engines: ICT helps you find information on the Internet. Search engines are like super-fast librarians that look through all the books on the Internet and give you the right ones when you search for something. Google is a famous search engine. It helps you find answers to your questions, information for school projects, or interesting videos to help you clarify your concepts!

Business: Imagine ICT as a magical toolbox for businesses. It helps people run stores, offices, and all kinds of companies smoothly. Businesses use computers and special software for things like keeping track of money (accounting), talking to customers (customer service), and even selling things online (e-commerce). You might have seen your parents shopping online or using a computer at work. All of that is thanks to ICT.

Communication: ICT allows you to send text messages, make phone calls, and video chat with friends and family using smartphones, tablets, or computers.

Internet browsing: You can use the Internet to research information for school projects, watch videos, play online games, and explore social media.

Entertainment: ICT is used for streaming movies, TV shows, and music. You can also play video games on consoles or computers.

Social media: Many people use platforms like Facebook, Instagram, and Snapchat to connect with friends, share pictures, and post updates.

Email: You can send and receive emails for personal communication or for school-related tasks.

Online learning: Especially relevant during the COVID-19 pandemic, pupils use ICT to attend virtual classes and complete assignments online.

E-books: Instead of physical books, you can read electronic books (e-books) on e-readers, tablets, or computers.

Gaming: Many 6th graders enjoy playing video games on consoles, PCs, or mobile devices.

Photography and Editing: You can take pictures with digital cameras or smartphones and edit them using various apps and software.

Online shopping: ICT allows you to shop for clothes, toys, and other items online.

Smart devices: You might have devices like smart TVs, smart speakers, or smart thermostats that you can control using your voice or a smartphone app.

Safety and security: ICT can be used for home security systems, like video doorbells, which allow you to see who's at your door through your phone.

Gadgets and gizmos: ICT includes fun gadgets like drones, virtual reality headsets, and smartwatches that can be used for various activities.

Cultural and language learning: You can explore different cultures and learn new languages through online resources and language-learning apps.

Health and fitness: ICT is used to track your physical activity and health, such as step counters and fitness apps.

Banking and finance: Online banking apps and websites help you manage your money, check balances, and make transactions.

Video calls: ICT enables you to connect with people worldwide through video calls on platforms like Zoom, Skype, and FaceTime.Top of Form

Conclusion (5 min)

Ask:

- What are some potential future applications of ICT?

- How does video conferencing technology benefit communication in business and education? (Refer to online education during the pandemic of Covid-19)

Homework assignment

✓ Ask pupils to imagine and draw a futuristic computer system that incorporates advanced technologies not yet available.

✓ Ask the pupils to research how ICT has revolutionised the way people communicate with each other. Provide examples of communication tools and platforms.

Pre-reading: textbook pages 4-6

Lesson plan 2

Resources

✓ Textbook pages 4-6

Starter activity (5 min)

Ask:

- Have you ever wondered how computers have changed over the years?

- Can you name some electronic devices other than computers that you think are related to computing?

- Do you know who the inventor of the first computer was or when it was invented?

- How do you think the computers used by your parents or grandparents might be different from the ones you use today?

Reading and explanation (20 min)

Refer to pages 4 and 5 and describe the five generations of computers. Ask the pupils to identify and match the image of ENIAC, vacuum tube, analytical computing engine, punched cards, and old Macintosh (given on pages 4 and 5) to their relevant generation.

Explain to the pupils that each generation brought remarkable speed, size, and capability improvements. For instance, the transition from vacuum tubes to microprocessors paved the way for the widespread use of computers in homes and businesses. The fifth generation continues to evolve, driving innovations in artificial intelligence, machine learning, and natural language processing, shaping our digital world today.

Read the 'LEAP FORWARD' box on page 5 and explain the concept of 'Internet of Things' to pupils. Ask pupils to imagine if everyday objects, like their toys, appliances, and even their pets, could talk to each other and share information using the Internet. That's what we call the 'Internet of Things' or IoT. It's like giving things a special power to communicate. For example, one might have a smart fridge that can tell when you're running out of milk, or a teddy bear that can play your favourite music when you hug it. These things have tiny computers inside that can send and receive information over the Internet.

Refer to the T-chart on pages 5-6 and discuss the advantages and disadvantages of ICT with pupils. Encourage them to add to the given list in the book. You may use the following link to gauge pupils' attention on the matter.

Link

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

Conclusion (5 min)

Ask:

- Can you list some things you can do with a computer that were impossible to do in the past?

- Can you come up with an example of a new, creative way to use IoT technology in your life?

- How can we use ICT responsibly and in a way that maximises its advantages while minimizing its disadvantages?

- Can the disadvantages of ICT be mitigated or overcome? If so, how?

Classwork (10 min)

✓ Have pupils work in pairs to create a timeline of the five generations of computers in their notebooks. Include key developments and advancements for each generation.

Homework assignment

✓ Pupils can add another column to the timeline they created in their classwork and illustrate key developments for each generation.

✓ Have pupils classify computers based on size, speed, and functionality (supercomputers, laptops, smartphones, etc.). They should explain the purpose of each type.

✓ Ask pupils to imagine and draw a futuristic computer system that incorporates advanced technologies not yet available.

Pre-reading: textbook pages 6-10

Lesson plan 3

Resources

✓ Textbook pages 6-10

Starter activity (5 min)

Ask:

- What are the different parts of the computer called and what do they do?

- What is the brain of the computer, that performs calculations and makes decisions? (Answer: Central Processing Unit or CPU)

- What stores files, programs, and operating systems and can be found in both desktops and laptops? (Answer: Hard Drive or SSD)

- What is the temporary storage area of a computer, holding data that is being actively used? (Answer: Random Access Memory or RAM)

Reading and explanation (20 min)

Explain the terms hardware to the pupils. You can say that hardware is like the stuff you can touch and see on your computer, tablet, or smartphone. It's the physical parts of these devices, just like the parts of a bicycle or a toy. So, hardware is all the physical parts that make your devices work.

Moving on, give a brief overview of software. Tell them that, software is like the instructions and programs that tell the hardware what to do. It's not something you can touch; it's more like the rules of a game or a recipe for baking cookie. So, software is the invisible part that makes your computer, tablet, or phone do what you want. It tells the hardware what to do.

Read page 7. Introduce the concept of hardware and its importance in a computer system. Discuss the main components of a computer system: input devices, processing devices, storage devices, and output devices. Engage pupils in a class discussion about the functions of each component.

Read page 7-8. Introduce different types of input devices such as keyboard, mouse/trackpad, joysticks, webcam, microphone, scanner, digital camera, and sensors. Discuss the purpose and functionality of each input device. If possible, engage pupils in hands-on activities to explore and interact with various input devices in the computer lab.

🖳 Class Activity

Conduct a class activity where pupils categorise different devices as input devices and justify their choices.

- ✓ Begin by explaining the concept of input devices. Mention that input devices are tools or devices that allow users to provide information or data to a computer.

- ✓ Display various devices on a table or desk. You can also use images or illustrations if physical devices are not available.

- ✓ Divide the class into small groups or pairs. Instruct each group to examine the devices and categorise them as input devices.

- ✓ Have each group come to the front of the class and place the devices in the appropriate category on the display board (Input Devices and Not Input Devices). Discuss and compare their choices as a class.

- ✓ For each device, ask pupil to provide a brief explanation of why they categorised it as an input device. Encourage them to think about how the device allows information to enter the computer.

Read page 9. Introduce the concept of processing devices including CPU and GPU. Focusing on the central processing unit (CPU). Discuss the role of the CPU in processing and executing instructions. Explain the relationship between the CPU and other components, such as memory and motherboard.

☁ Concept Cloud

Ask pupils to think of the CPU as the 'brain' of a computer. Just as the brain controls how information flows throughout the human body, the CPU controls how data moves within the computer. The CPU processes instructions, which are analogous to 'programs', to execute tasks and calculations.

Read pages 9-10. Introduce different types of storage devices such as hard disk drives, solid-state drives, and external hard drives such as USB drives and flash drives. Refer to the t-chart on page 9 and discuss the advantages and disadvantages of each.

> ☁ **Concept Cloud**   ✕
>
> You may as well introduce Cloud storage at this point as additional information. Cloud storage is a modern way of storing digital data and files on the Internet. Instead of saving your information on your personal computer or local servers, cloud storage utilises powerful, off-site servers maintained by third-party providers. It allows individuals and organizations to store their data on remote servers located in data centers. These servers are often in multiple geographic locations for redundancy and accessibility.
>
> Cloud storage services are offered by companies like Google Cloud and Amazon Web Services (AWS). These providers manage and maintain the servers and infrastructure required for storage. Ask:
>
> What storage device would you recommend for long-term data storage and why?

Differentiate between RAM and ROM. Have pupils refer to the T-chart that explains the differences between RAM and ROM. Explain their definitions and functions. Ask:

- Why is RAM necessary for a computer to function properly?

Discuss the purpose and functionality of each storage device. Take pupils to the computer lab and show them the external and internal storage devices and discuss their respective functions. If that is not possible, use the images of storage devices given on pages 9 and 10. Conduct a class discussion on the advantages and disadvantages of different storage devices.

Conclusion (3 min)

Ask:

- How do input devices like cameras and microphones contribute to making technology more interactive and user-friendly?
- How might advancements in technology impact the speed and efficiency of future CPUs?
- Can you explain why having sufficient memory is crucial for the smooth functioning of computers and electronic devices?

Classwork (12 min)

✓ Do Part A and B from the workstation.

✓ Do Questions 3 and 4 from Part D.

Homework assignment

✓ Do Questions 1, 3, and 4 from Part E.

Pre-reading: textbook pages 11-13

Lesson plan 4

Resources

✓ Textbook pages 11-13

✓ Cards with the names of output devices (e.g. printer, monitor, speaker)

✓ Cards with descriptions of functions (e.g. displays information, produces sound, prints documents)

✓ Large board or wall space for matching

✓ Prepare cards with the names of output devices on one set and their corresponding functions on another set.

✓ Ensure that the number of cards for each set matches so that every output device has a corresponding function.

Starter activity (5 min)

Ask:

• What is the difference between an output and an input device?

Reading and explanation (20 min)

Read pages 11-12 Briefly explain that output devices are tools that display or produce information from a computer. Review common output devices such as different types of display screens, multimedia projectors, speakers/headphones, and printers. Discuss the purpose and functionality of each output device. Engage pupils in a hands-on activity, in the lab, where they interact with different output devices and observe their outputs, such as:

✓ typing on a keyboard while looking at the display on the monitor,

✓ recording one's voice via a microphone and listening to the recorded audio via speakers,

✓ printing a few pages and taking the hard copy of a typed document.

🖳 Class Activity ✖

Conduct a class activity where pupils match output devices with their corresponding functions.

✓ Distribute the cards randomly among the pupils. Each pupil should have at least one output device card and one function card.

✓ In pairs or small groups, have pupils work together to match the output device cards with their corresponding function cards.

✓ Encourage discussions among pupils about why they think a particular output device corresponds to a specific function.

✓ Bring the class together for a discussion. Ask groups to share their matches and the reasoning behind them.

✓ Clarify any misconceptions and highlight the correct matches, providing brief explanations for each.

Ask the pupils to imagine they have a group of friends who all want to play a game together, share pictures, or chat. Then, think of networking devices as the tools that helps them connect with their friends and share things.

Read pages 12-13. Describe different types of software. Help pupils categorise different types of software (e.g. operating systems, application software, programming software). Include examples and brief descriptions.

Explain this to the pupils using examples such as, an operating system, like Windows or macOS,
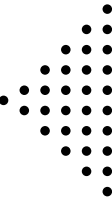
is a type of system software. It manages all the tasks and makes sure your computer is ready for action. Whereas, application software are the programs or apps that are used for specific tasks. For example, if you want to write a story, you can use a word processor (like Microsoft Word). If you want to edit pictures, you can use a photo-editing app (like Photoshop). These tools help you do different jobs with your computer. Games, word processors, browsers, and drawing apps are all examples of application software.

So, to put it simply, the system software is like the behind-the-scenes helper, making sure everything works smoothly, while the application software is like the tools you use to get specific jobs done.

Conclusion (5 min)

Ask:

- Can you give an example of something that is both hardware and software?

- Give an example of an operating system and explain its purpose.

- How important is it to understand the different components of a computer when using technology for various tasks?

Classwork (10 min)

✓ Do Part C from the workstation.

✓ Do Questions 1 and 2 from Part D.

Homework assignment

✓ Do Questions 2 and 5 from Part E.

✓ (Optional) Ask pupils to create posters that explain the various components of the computer, such as:

    o **Explaining hardware and software:**

Use a split layout. On one side, illustrate computer hardware components like CPU, motherboard, etc. On the other, showcase software icons or screenshots. Include concise descriptions for both.

    o **Input and output devices:**

Create sections highlighting various input devices (e.g. keyboard, mouse) and output devices (e.g. monitor, printer). Use icons and labels for clarity.

    o **RAM vs. ROM:**

Design a comparison chart or Venn diagram to highlight the differences between RAM and ROM. Include brief explanations and examples.

    o **Types of storage devices:**

Arrange various storage devices like HDD, SSD, USB drives, and cloud storage in a grid. Add brief descriptions to each device.

    o **Differentiating computers:**

Create a size-speed-functionality spectrum with illustrations of devices like laptops, desktops, servers, and supercomputers. Briefly describe the characteristics of each.

o **Types of software:**

Divide your poster into sections for system software (e.g. operating systems) and application software (e.g. word processors). Include icons or images representing each type of software.

Suggested answers to end-of-chapter questions on pages 14 to 15

A. Fill in the missing blanks

1. Printer

2. Program

3. Output

4. Central Processing Unit (CPU)

5. Coordination

B. True/false statements

1. True

2. False. CPU stands for Central Processing Unit and is used to execute instructions and perform calculations.

3. True

4. False. Storage devices like hard drives or SSDs are used for permanent storage of data.

5. True

C. Choose the correct option

1. b

2. a

3. B

4. a

5. c

D. Short-answer questions

1. A microphone captures sound and voices, allowing you to record audio or communicate with others through voice. A speaker plays sound and audio, so you can hear music, videos, and other audio content from your computer.

2. The five categories of hardware with examples are:

Input Devices: Keyboard, Mouse, Webcam

Output Devices: Monitor, Printer, Speaker

Storage Devices: USB Storage Stick, HDD (Hard Disk Drive)

Processing Units: CPU (Central Processing Unit), GPU (Graphics Processing Unit)

Communication Devices: Network Card, Modem

3. The hardware components of a computer system include the CPU, memory (RAM), storage (HDD/SSD), input devices (e.g. keyboard, mouse), output devices (e.g. monitor, printer), and more.

4. The full forms are as follows:

CPU: Central Processing Unit

ICT: Information and Communication Technology

RAM: Random Access Memory

ROM: Read-Only Memory

SSD: Solid-State Drive

VGA: Video Graphics Array

HDMI: High-Definition Multimedia Interface

ALU: Arithmetic Logic Unit

USB: Universal Serial Bus

CD-ROM: Compact Disc Read-Only Memory

E. Long-answer questions

1. An input device is an information and communication technology (ICT) device that receives data from the user and transmits it to the computer. A good answer will include the following details:

   Examples: Keyboard, Mouse, Webcam, Scanner, Joysticks, Microphone, etc.

   Data Entry: Input devices enable users to input text, numbers, and other data.

   Commands: They allow users to give instructions to the computer, like opening a program.

   Interaction: They facilitate user-computer interaction, enabling tasks such as gaming or graphic design.

   Different Types: Input hardware comes in various types, from traditional keyboards to touchscreens and motion-sensing devices.

2. Output hardware provides users with information and results from the computer. It presents data processed by the computer. A good answer will include the following details:

   Examples: Monitor, Printer, Speaker

   Display: Output devices display text, images, and videos to users.

   Hard Copy: Printers produce hard copies of digital documents.

   Audio Output: Speakers and headphones allow users to hear sound and music.

3. Processing hardware consists primarily of the Central Processing Unit (CPU) and the Graphics Processing Unit (GPU). Their functions are:

   CPU: Executes instructions, performs calculations, and manages data processing tasks.

   GPU: Specialised in rendering graphics, handling video playback, and accelerating certain calculations.

   A good answer will discuss the above-mentioned information in detail.

4. Storage hardware is responsible for storing data and programs on a computer. It includes devices like Hard Disk Drives (HDDs) and Solid-State Drives (SSDs). Pupils can discuss these drives in detail to demonstrate their understanding.

5.
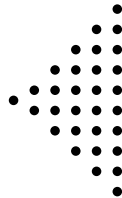
02 THE SYSTEM SOFTWARE AND OPERATING SYSTEM

After completing this chapter, pupils should be able to:

* define the term Operating System,
* list the functions of files, folders/directories, shortcuts, and a drive (with examples),
* differentiate between the functionality of Operating System and Application Software,
* list the types of Operating System,
* analyse the functions of an Operating System,
* differentiate between types of operating systems (Windows, MAC, Linux, and Android).

Introduction for the teacher

Pupils should remember the processing devices from the previous chapter. They should now be curious to learn how these devices work to process data. How does the computer know what to do with the data it receives as input? Where do these instructions come from?

The purpose of this chapter is to introduce pupils to the system software and operating systems. For these concepts, it's essential to lay a strong foundation as it will fuel their curiosity and understanding of technology. Operating systems are like the brains of computers, and learning about them helps pupils comprehend how computers function and how they can interact with them more effectively. This will lead pupils to explore the functions of operating systems, the different types that power various devices, and the uses of files, folders, shortcuts, and drives. By providing relatable examples and interactive activities, you can empower your pupils to navigate the digital world confidently and make the most of their technological experiences.

Vocabulary Cloud	
Kernel	A part of the operating system that controls the communication between software and hardware
GUI	Graphical User Interface
OS	Operating System
CLI	Command Line Interface

Lesson plan 1

Resources

✓ textbook pages 16-19,

✓ copies of the screenshot of a 'Windows Desktop', Installed operating systems (Windows, macOS, Linux, Android) in the lab.

Starter activity (5 min)

* Ask pupils to recall their previous knowledge about computer systems, including hardware and software components.

- Activate prior knowledge by asking pupils to share their understanding of how files and folders are organised on a computer.

Ask:

- What is an operating system?
- Identify the operating systems you use on different devices such as the computer in our lab or our mobile phones.

Reading and explanation (20 min)

Draw the flowchart given on page 17, on the board. Explain the 4 basic tasks of a computer. You may use the following analogies:

☁ **Concept Cloud**

- **Input** is akin to the ingredients you gather before cooking. It's the raw data that enters the system, like the vegetables and spices.

- **Processing** represents the actual cooking process. This is where the computer, like a chef, transforms the raw ingredients into a finished dish. It computes, manipulates, and organises data, like a chef cooking and combining ingredients.

- **Output** is like the plated meal served to the diners. It's the result of the computer's processing, presented in a format that users can understand, much like the final dish is presented on a plate.

- **Storage** is like the pantry or refrigerator where you store leftover ingredients and prepared dishes for later use. Computers store data, programs, and files for future retrieval, just as a kitchen stores ingredients and leftovers.

Differentiate between system software and application software using the Query box on page 17.

Read page 18. Introduce the concept of an operating system (OS) as software that manages computer hardware and software resources and provides common services for computer programs. Discuss the importance of operating systems in managing computer operations efficiently. Discuss how an OS allows users to interact with the computer.

Discuss the parts of an operating system. Summarise with the following analogies:

☁ **Concept Cloud**

- The kernel is the heart of the operating system.
- Device drivers facilitate hardware communication.
- A GUI provides a user-friendly interface for interacting with the computer or software.

Use real-life examples (in the lab) to illustrate OS (e.g. Windows, macOS, Linux, Android). Ask the pupils to identify GUI among them.

Read pages 19 to 20. Introduce files, folders, shortcuts, and drives. Explain how files organise information, folders keep files organised, and shortcuts provide quick access. Describe drives as storage locations (e.g. C: drive, USB drive). You may summarise:

Functions of Files, Folders, Shortcuts, and Drives:

a) Files - Store data (e.g. documents, images, music)

b) Folders - Organise files into categories (e.g. Documents, Pictures)

c) Shortcuts - Create quick links to files/apps (e.g. desktop shortcuts)

d) Drives - Provide storage space (e.g. C: drive for the OS)
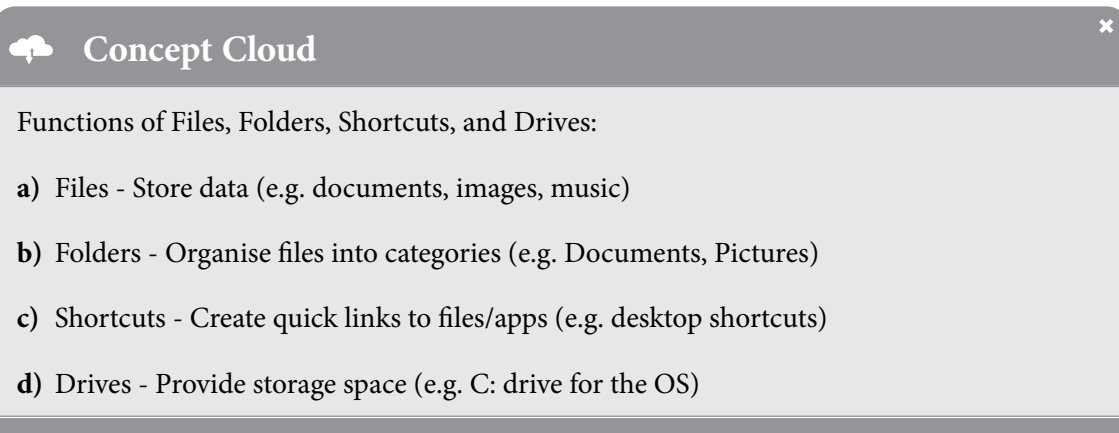
Make copies of the screenshot of a 'Windows Desktop'. Distribute it among pupils and ask them to identify the 11 features mentioned on page 21.

Then take the pupils to the lab and have them practice and identify the start-up process, file and folder management, and Desktop features on the systems individually.

Conclusion (5 min)

- Review key points about operating systems and file management.
- Discuss how understanding OS concepts helps in everyday computer use.

Classwork (10 min)

✓ Do Part A and B from the workstation.

✓ Do Questions 3 from Part D.

Homework assignment

✓ Do question 4 from Part D.

✓ You may ask pupils to create a multimedia presentation highlighting the functions and importance of operating systems in different industries.

✓ You provide pupils with a set of files and folders and ask them to organise them effectively within an operating system. They can explain their organisational choices to the class.

Pre-reading: textbook pages 21-25

Lesson plan 2

Resources

✓ Textbook pages 21-25

✓ Image of a computer desktop showing icons of different applications

✓ Image of a smartphone

✓ Multiple operating systems (Windows, macOS, Linux) installed on the computer in the lab

Starter activity (2 min)

Display an image of a computer desktop showing icons of different applications on the softboard or available computer/tablet and ask:

- What is the purpose of these applications and how do they interact with the computer?
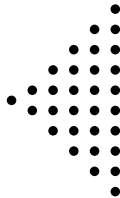
Show an image of a smartphone on the soft board or available computer/tablet and ask:

- What do you think is the main software running on it?

Reading and explanation (20 min)

Refer to page 22. Differentiate between the operating system and application software. Use relatable examples like a computer's brain and applications as tools.

Divide your white/black board into two columns. Label them as Operating System and Application Software, respectively. Ask pupils to write one feature of each on sticky notes and paste it in the right column. Use the following examples:

Operating system

a. Manages hardware resources like memory, CPU, and peripherals.

b. Provides a user interface for interaction with the computer.

c. Examples: Windows, macOS, Linux.

Application software

a. Performs specific tasks or functions for users.

b. Relies on the operating system for resources and services.

c. Examples: Microsoft Word, Adobe Photoshop, Google Chrome.

Provide a list of software applications and ask pupils to identify whether each one is an Application Software or an Operating System.

Refer to the chart on pages 24-25. Compare Windows, macOS, Linux, Android, and iOS based on user interface, compatibility, and usage (e.g. desktop vs. mobile). Highlight the strengths of each OS (e.g. Windows for gaming, macOS for creativity).

Take the pupils to the lab and provide them with access to different operating systems. Ask them to perform basic tasks like file management, changing settings, and installing software. Discuss their experiences and challenges faced during the hands-on activity.

Conclusion (3 min)

Conclude the lesson by asking the following questions:

- Can you give an example of a task that an operating system handles but application software cannot?

- Which operating system is commonly used on personal computers?

- In what scenarios might you find Android operating systems?

Classwork (15 min)

✓ Do Part C from the workstation.

✓ Do Questions 1, 2, and 5 from Part D.

Pre-reading: read page 28

Homework assignment

✓ Do part E from the workstation

✓ Conduct a group-based activity where you could assign one operating system to each group. Have them research the assigned OS and its impact on technology and ask them to prepare a brief presentation about it.

Suggested answers to end-of-chapter questions on pages 26 to 27

A. Fill in the missing blanks

1. Operating System   **2.** Device Driver   **3.** Bootloader

4. Android   **5.** iOS

B. True/false statements.

1. True

2. False. Operating System is the master software program that enables a user to smoothly run and complete all computer programs.

3. False. Android is the most common Operating System available on smartphones.

4. True

C. Choose the correct option

1. a   **2.** d   **3.** c

4. a   **5.** b   **6.** d

D. Short-Answer Questions.

1. Operating System is a system software that manages the computer's memory and processes, as well as all of its software and hardware. It allocates computer resources to ensure that the programs run in a smooth and efficient way.

2. Computers: Windows, macOS, Linux Smartphones: Android, iOS

3. Kernel: Core part of the OS, manages memory and tasks. Device Driver: Special software to control specific hardware.

4. When a new hardware device, e.g. a new keyboard or a new web camera, is connected to the computer, it is first recognised, and then its device drivers are installed by the set of instructions already available to the kernel.

5. Refer to page 25 and 26 of the chapter.

E. Long-Answer Questions

1. An Operating System (OS) controls computer access by acting as an intermediary between users and hardware. It manages resources like memory, processing power, and storage, ensuring that multiple programs run smoothly. It also enforces security measures like user authentication, file permissions, and encryption, controlling who can access what on the computer. Pupils can build on this response to demonstrate their understanding.

2. A computer cannot function without an OS because the OS manages hardware and software interactions. It provides an organised environment for software programs to run, allocates memory, manages files, and enables user interactions. Pupils can build on this response to demonstrate their understanding.

3. The main reason for the popularity of Android OS is its free availability and ability to customise it for various mobile companies, e.g. Samsung, Oppo, Huawei, and Vivo, etc. Pupils can refer to the table on page 25 and 26 for more pointers.

4. Refer to page 23 of the chapter.

5. Pupils can touch upon factors such as screen space, battery, usage patterns, processing power, permission controls and powerful hardware to answer this question. A collective understanding of the various topics covered in the chapter is required to answer this question.

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03 APPLICATION SOFTWARE (PAINTING WITH COMPUTERS)

After completing this chapter, pupils should be able to:

- understand image processing software (e.g. Paint, 3D Paint, Tux, etc.) for creating and editing images,
- install Tux Paint and colour in it,
- draw in Microsoft Paint,
- identify the main features of MS Paint 3D,
- perform basic functions like opening a file or saving a picture in 3D Paint,
- use the keyboard shortcuts of Paint Software.

Introduction for the teacher

As you prepare to guide your pupils in exploring the exciting world of digital creativity, this topic covers essential skills in image processing software. The focus includes understanding popular tools like Paint, 3D Paint, and Tux Paint, enabling pupils to create and edit images.

Tux Paint is a simple drawing program suitable for young artists, as they will use it to craft drawings. Bill Kendrick created Tux Paint with a user-friendly interface designed for children. Guide them to grasp the fundamentals of Tux Paint, such as opening the program and utilizing magic effects and shape tools for creative enhancements.

Additionally, explore Microsoft Paint for drawing and delve into the main features of MS Paint 3D. Ensure that pupils can perform essential functions in 3D Paint, such as opening files and saving artwork. With these skills, pupils will explore artistic expression and gain digital proficiency.

Vocabulary Cloud	
Microsoft Store	A digital distribution platform owned and operated by Microsoft. It is an online marketplace for purchasing and downloading various software applications.
User interface	The point of interaction between a user and a computer program or device.
2D art	Two-dimensional art refers to artwork that exists within two dimensions: length and width.
3D art	Three-dimensional art, refers to artwork that exists in three dimensions: length, width, and depth.

Lesson plan 1

Resources
- ✓ Textbook pages 28-36
- ✓ Hand-made drawings or posters made by pupils
- ✓ Tux Paint, MS Paint, and Paint 3D installed in the computer systems in the lab

Starter activity (5 min)

- As a pre-requisite, ask pupils to bring an art drawing that they made themselves. Pupils could also re-use any poster they might have made for any other subject. Ask the pupils to enlist the tools that they used to make their artwork such as paints, paint brushes, pencils, erasers, etc.
- Now tell the pupils that they can also paint digitally on a computer using different software tools such as Tux, MS Paint, and Paint 3D. Display the logos and interface of these tools in the lab and ask pupils if they have used them before.

Ask the following questions to gauge the pupil's understanding:

1. What do you think paint software is, and how do you imagine it can be useful for creativity and learning?
2. Have you used any painting or drawing tools before? If yes, which ones, and what did you create?
3. Can you name any famous artists who have used painting as a form of expression?
4. How do you think technology can enhance the process of creating art?
5. Why do you think learning to use paint software might be important in today's world?

Reading and explanation (25 min)

Introduce the concept of image processing software and its usage in different industries, such as publishing, packaging, marketing, and advertising. Explain that image processing software allows users to edit, enhance, and manipulate digital images. Provide a brief overview of popular image processing software programs such as Paint, 3D Paint, Tux, etc. You may refer to the explanation given on pages 28, 31, and 34 of the textbook for this.

Instruct pupils to follow the instructions given on page 30 and install Tux Paint Software. Ask them to explore the software interface and identify its main features, as given on page 30. Ask pupils to follow the instructions on page 31 to select an image and colour it in Tux paint.

Ask pupils to open MS Paint on their computers and read through the text MS Paint on pages 32-35. While they are reading the text, ask them to practice hands-on on the software's user interface as well.

A step-by-step procedure for drawing a cottage in MS Paint is given on pages 33-34. Ask pupils to follow these steps and refer to the images in the book, which would give them an idea of how the cottage should look after every step. Let the pupils work independently but scaffold where needed by taking a round, while they are reading and working at their computers at the same time.

Read pages 35-36. Introduce the concept of MS Paint 3D and explain that it is an updated version of the traditional MS Paint software. Demonstrate how to open MS Paint 3D on the computer and navigate through the different tools and options.

Walk through the main features of MS Paint 3D, such as the 3D shapes, brushes, textures, and effects. Explain how each feature can be used to create 3D artwork. A list of 10 features has been shared in the book. Refer to page 37 and have pupils practice opening and saving a picture in MS Paint 3D. The screenshots for each are given on the same page.

(This activity would require the class to continue for 1 additional period).

Divide pupils into small groups and assign each group a specific feature of MS Paint 3D to explore in more depth. Have each group create a short presentation or demonstration showcasing their assigned feature and its uses. Allow groups to share their findings with the class and encourage discussion and questions about each feature.

Conclusion

Conclude the lesson with a brief recap of the main features and functions of the image processing software. Assess pupils' learning by asking the following questions:

- Name three main features of each of the software we explored today.
- Explain three tasks you were able to complete using the software.
- How does MS Paint 3D differ from traditional MS Paint in terms of features and functionality?
- Why is it important for digital citizens to have basic image editing skills?
- Can you think of any real-world applications or industries where MS Paint 3D could be useful?

Classwork (5 min)

✓ Do part A, B, and C from the workstation

Pre-reading: textbook pages 39-41

Homework assignment

✓ Do part D and E from the workstation.

✓ Give pupils a simple drawing task to practice using the basic drawing tools in MS Paint 3D, such as creating a 2D shape or drawing a simple object.

✓ Assign a task that involves using the 3D features of MS Paint 3D, such as creating a 3D shape or adding textures to an object.

✓ Provide a more complex assignment that requires pupils to combine multiple features and tools in MS Paint 3D to create a more detailed artwork or design.

✓ Provide a list of specific tasks for pupils to practice at home, such as:

- Use the selection tool to isolate a specific object in an image.
- Experiment with different colour options and fill tools to change the appearance of an image.
- Utilise drawing tools to add details or annotations to an image.
- Apply basic image manipulation functions, such as resizing or rotating an image.
- Practice using keyboard shortcuts to navigate the software more efficiently.

Ask pupils to try doing all of these in Tux, MS Paint, and MS Paint 3D. Ask them to evaluate which of these software is more efficient and user-friendly.

Suggested answers to end-of-chapter questions on pages 37 to 38

A. Fill in the missing blanks

1. Canvas
2. Eraser
3. Line
4. Magic
5. Lighting

B. True/false statements

1. True
2. True
3. True

4. False. Tux offers ready-made drawings.

5. False. There is more than one tab in MS Paint; not just the Home Tab.

C. Choose the correct option

1. c
2. c
3. a

4. c
5. d
6. d

7. c
8. d

D. Short-Answer Questions

1. Pupils can include the following points:
   - Allows editing and enhancing images.
   - Enables creative expression.
   - Offers various tools for drawing and colouring.

   Supports adding special effects and filters.

2. Features that make MS Paint 3D advanced:
   - Ability to create and manipulate 3D objects.
   - Enhanced tools for drawing and colouring in 3D space.
   - Integration of 2D and 3D elements in projects.

3. Brush, Stamp, Lines, Shapes, Text, and Eraser.

4. When the 'Close' button is clicked, a dialogue box appears asking if the user wants to quit or save this artwork. Click on the 'Save' button to save your drawing.

E. Long-Answer Questions

1. Pupils can include the following points:

   a. Line Tool: Is used to draw straight lines of various thicknesses. It's handy for creating boundaries, divisions, or simply adding lines to your drawing.

   b. Oval Tool: Helps you create circles and ellipses. It's useful for drawing shapes like faces, wheels, and other rounded elements.

   c. Rectangle Tool: Is for drawing squares and rectangles. It's great for creating boxes, frames, and structured shapes.

   d. Text Tool: Allows you to add text to your image. You can use it to label parts, add captions, or create textual elements in your artwork.

   e. Eraser Tool: Lets you remove parts of your drawing or correct mistakes. It's useful for fixing errors without having to start over.

2. The user interface of Tux Paint typically includes a large drawing area, a variety of tools on the side or top, and a colour palette at the bottom. There are icons for different tools like brushes, shapes, stamps, text, and more. Pupils can build on this answer to demonstrate their understanding.

3. In MS Paint 3D, you can use 3D shapes, stickers, and textures to make cool posters. Add 3D objects for depth, use stickers for decorations, and textures to make things feel real. It helps your posters stand out and look interesting. Pupils can elaborate on this answer and give examples to demonstrate their understanding.

4. Yes, 3D models and tools can be used to tell a story through visual storyboarding. With 3D models, you can create scenes, characters, and objects in a three-dimensional space, allowing for dynamic and engaging visual narratives. This can be particularly effective in depicting complex scenarios or environments that traditional 2D drawings might struggle to convey. Pupils can build on this answer to demonstrate their understanding.

04. PROBLEM SOLVING AND ALGORITHMS

After completing this chapter, pupils should be able to:

- define and identify a problem,
- analyse different techniques to deconstruct a problem,
- differentiate between simple and complex problems,
- describe Algorithmic thinking and enlist its benefits,
- recognise algorithms are sequences of precisely described instructions,
- recognise problem-solving using, sequence, selection, and iteration,
- define conditional statements/ selection statements,
- identify loops, and analyse how they allow instructions to be repeated,
- describe a problem statement and its parts.

Introduction for the teacher

Teaching problem-solving, designing a problem statement, and fostering algorithmic thinking is crucial in education and beyond.

Problem-solving is a foundational life skill. It equips individuals with the ability to analyse complex situations, identify challenges, and develop effective solutions. This skill is invaluable in both personal and professional life.

Teaching pupils to design problem statements encourages them to think critically about real-world issues. This process sparks creativity as pupils explore innovative ways to address problems.

In an increasingly digital world, algorithmic thinking is essential. It involves breaking down problems into logical steps and is fundamental in fields like computer science and data analysis. Preparing pupils with these skills ensures they are ready for the jobs of the future.

Problem-solving and algorithmic thinking empower individuals to adapt to changing circumstances. They become better equipped to handle unexpected challenges and find opportunities in uncertainty. Moreover, understanding the ethical implications of problem-solving is vital. Pupils need to learn how their solutions impact society, aligning with ethical responsibilities. Incorporating these skills into education fosters well-rounded individuals who can navigate a complex world with confidence and contribute positively to society.

Lesson plan1

Resources

✓ Textbook pages 39- 43

Starter activity (5 min)

Begin the class with a short video clip or an engaging question related to problem-solving. For example, either show a video of a real-life problem being solved or ask:

- Have you ever faced a challenging problem you had to solve, like a tricky math puzzle or a real-life situation?
- What do you think of when you hear the word 'problem'? Can you give an example?
- Have you used a computer or a device to solve problems or play games?

Reading and explanation (20 min)

Introduce the concept of problem-solving and its importance in everyday life. Emphasise that problem-solving is a skill that evolves with practice.

Highlight the practicality of problem-solving in daily life. Use relatable scenarios to illustrate problem identification and deconstruction techniques. Ask pupils to think of a problem like a math puzzle. It's a situation where something doesn't work or quite fit, just like when you have a puzzle with missing pieces or a math equation with an unknown number. So, a problem is like a challenge that needs solving. It's a discrepancy and you use your skills and knowledge to make it right again. Just like you enjoy completing a puzzle or solving a math equation, you can also enjoy solving real-life problems.

Explain that problems can be simple or complex and that they can be deconstructed into smaller parts to make them easier to solve. You may use the following analogy and tell the pupils that simple problems are like easy puzzles, and complex problems are like challenging, intricate puzzles.

☁ Concept Cloud ✕

- **Simple Problems** can be compared to putting together a basic jigsaw puzzle. Just like when you have a few large pieces with obvious shapes and colour, simple problems have clear and straightforward solutions. For example, solving a basic addition math problem or finding a missing item in your room is like finding where a puzzle piece fits easily.

- **Complex Problems,** on the other hand, are more like solving a massive, intricate jigsaw puzzle with thousands of tiny, similar pieces. These problems have many parts and require careful thinking and patience to solve. Just as it takes time to fit all those small puzzle pieces together to reveal the big picture, complex problems, like understanding a complex science concept or finding solutions to global issues, require a lot of thought and effort to solve.

Read the step-by-step problem-solving steps on page 40. Refer to the 'Problem solving process' diagram given on the same page. It can be made in the form of a flowchart on the board as well. Discuss the problem-solving processes with pupils. Use the following example:

☁ Concept Cloud ✕

Problem-solving can be compared to repairing a malfunctioning car:

1) **Defining a Problem:** Imagine you're a mechanic diagnosing a car issue. You begin by listening to the owner's description (defining the problem). This step helps you understand what's wrong with the car.

2) **Determining the Cause of the Problem:** To fix the car, you must identify the root cause of the issue. It's like searching for the faulty engine component causing the problem. You examine, test, and analyse (determining the cause) until you pinpoint it.

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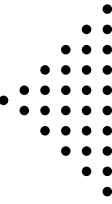
3) **Identifying, Prioritizing, and Selecting Alternative Solutions:** Once you know the cause, you consider various repair options. These could include repairing the part, replacing it, or trying alternative solutions like adjusting other engine settings. You prioritise and select the best solution based on cost, time, and effectiveness.

4) **Implementing a Solution:** With the chosen solution in mind, you take action. You repair or replace the faulty component (implementing a solution) to get the car back on the road.

Just as a mechanic follows these steps to ensure the car runs smoothly, individuals and teams use problem-solving steps to address issues effectively in various contexts, from troubleshooting a vehicle to resolving complex business challenges.

Write the word 'algorithm' on the board and ask pupils to brainstorm what they think it means. Discuss their ideas as a class and write down their responses. Provide a simple definition of an algorithm and explain its importance in problem-solving from page 41.

Show examples of real-life algorithms, such as a recipe or a set of instructions for assembling furniture. Ask pupils to identify the characteristics they notice in these examples. Discuss their observations as a class and guide them towards the three basic characteristics of algorithms - finiteness, precision, and efficiency. Refer to page 41 for exact definitions. Discuss real-life examples of algorithms (e.g. recipes, routine instructions like 'morning schedules') and emphasise their sequence of precise steps.

Now read pages 41-43 and introduce the idea of solving problems using sequences, selections (choices), and iterations (repetitions). Discuss the examples given in the book.

Clarify conditional statements/selection statements as choices made based on certain conditions. Give relatable examples (e.g. if it's raining, take an umbrella) and relate them to coding decisions.

Explain loops as a way to repeat instructions multiple times, highlighting their significance in efficient problem-solving processes. Show how loops help solve repetitive tasks efficiently. Provide examples of loops in real life (e.g. tying shoelaces) and explain their relevance in coding.

Remember, connecting these concepts to real-world examples and engaging activities will facilitate a comprehensive understanding among your pupils. Use online resources to help clarify these concepts. Use online videos to help pupils visualise the building blocks of algorithms. Following resources can be helpful:

👆 Links

- https://www.youtube.com/watch?v=eSYeHlwDCNA

- https://edu.gcfglobal.org/en/computer-science/sequences-selections-and-loops/1/

- https://www.khanacademy.org/computing/ap-computer-science-principles/algorithms-101/building-algorithms/a/the-building-blocks-of-algorithms

Conclusion (5 min)

To assess pupils' understanding, ask:

- What is a problem?

- How can problems be deconstructed?

- What is an algorithm?
- Why is it important for an algorithm to have a clear endpoint or goal?
- How does precision contribute to the effectiveness of an algorithm?
- Why is efficiency an essential characteristic of algorithms in problem-solving?

Classwork (10 min)

✓ Do Part B and C from the workstation
✓ Do questions 3, 4, and 5 from part D

Pre-reading: textbook pages 43- 44

Homework assignment

✓ Do Question 1 and 3 from part E.

✓ Provide pupils with a simple problem (e.g. arranging books in order). Have them create a step-by-step algorithm to solve the problem.

Lesson plan 2

Resources

✓ Textbook pages 43- 48

Starter activity (5 min)

Start by asking questions to understand pupils' interests and experiences related to problem-solving. For example, ask:

✓ Based on what you know, what do you think algorithmic thinking means?
✓ What kind of problems do you think algorithmic thinking can help solve?
✓ Do you have any questions about algorithmic thinking or problem statements?

Reading and explanation (20 min)

Begin by asking pupils to think about a time when they had to follow a step-by-step process to complete a task (e.g. baking a cake, assembling a toy). Show a short video or present examples of everyday activities that involve algorithmic thinking, such as following a recipe or solving a Rubik's Cube.

Algorithmic thinking is also called computational thinking. There are various online resources on the topic which include free activities, online worksheets, and interactive discussion ideas; all of which are based on modern teaching pedagogies. It is highly recommended that you explore them.

Discuss algorithmic thinking as a structured approach to solving problems. Discuss the benefits of this method in improving logical reasoning and systematic problem-solving. Illustrate algorithms as step-by-step instructions, touching on the importance of precise descriptions to achieve desired outcomes.

Describe the components of a problem statement: input, facts, and output. Show how to break down a problem using a relatable scenario (e.g. making a sandwich) and identify its components. Now read pages 44-48 and apply algorithmic thinking in all the given examples in the book.
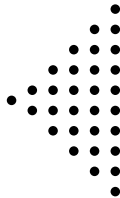
Conclusion (5 min)

To ensure pupils have grasped the objective. Ask:

- What are the benefits of algorithmic thinking?

- What are the parts of a problem statement?

- How does algorithmic thinking relate to problem-solving in real-life situations outside of computer science?

- What are the benefits of breaking down complex tasks into smaller steps when developing an algorithm?

- How can algorithmic thinking be applied to improve efficiency and accuracy in various fields?

Classwork (10 min)

✓ Do part A from the workstation.

✓ Do question 1 and 2 from part D.

Pre-reading: textbook pages 50-53

Homework assignment

✓ Do question 2 from part E.

✓ Encourage pupils to think about algorithms in their daily lives and share instances. Ask pupils to find an example of an algorithm and a loop at home and be ready to share it in the next class.

✓ Assign pupils a problem-solving task that requires them to create a simple algorithm, such as sorting a list of numbers in ascending order.

✓ Provide pupils with a set of instructions and ask them to identify the algorithmic steps involved.

Suggested answers to end-of-chapter questions on pages 48 to 49

A. Fill in the missing blanks

1. End	**2.** Problem Statement
3. Input	**4.** Defining

5. Loop (A _____ is a sequence of steps or instructions that gets executed several times.)

B. True/false statements

1. True	**2.** True

3. False. An algorithm cannot be vague and infinite. It needs to be clear and well-defined.

4. False. Finding a person's phone number in a telephone directory can be solved with a specific algorithm, like binary search.

C. Choose the correct option

1. b	**2.** d

D. Short-Answer Questions

1. A variable is a placeholder with a given name that stores the value (a number or a text) inside

it.

For example, a variable called 'name' may be used to keep the names of a person, object, or other things during the algorithm.

2. **i.** Input

   ii. Some given facts or assumptions about the input.

   iii. The expected output for the given input.

3. A simple problem can be solved with a few steps and cannot be simplified further. On the other hand, a complex problem is broken down into two or more simpler problems therefore their solution requires multiple steps.

4. Loops help to repeat tasks without writing the same steps again and again. They save time and make code shorter.

5. Sequence: Doing things step by step, one after the other.

   Selection: Choosing what to do based on a condition, like 'if something is true, do this; otherwise, do that.'

E. Long-Answer Questions

1. Pupils can answer this question by following the given steps:

   a. Understand the problem.

   b. Break down the problem into smaller steps (decompose).

   c. Arrange these steps in a sequence.

   d. Use selection (if-else) to decide based on conditions.

   e. Use iteration (loop) for repetitive tasks.

   f. Test the algorithm with different scenarios.

2. Refer to the examples given under the heading 'Problem Statements' and answer accordingly.

3. Pupils can answer this question by following the given steps:

   Input a positive number.

   Use selection: if the number is divisible by 2 with no remainder, it's even.

   If not, it's odd.

   Output the result.
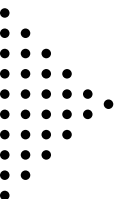
05 COMPUTER PROGRAMMING

After completing this chapter, pupils should be able to:

Teaching Objectives

- define Computer program and its applications,
- determine the need for a programming language,
- identify programming languages and their uses,
- differentiate between an Algorithm and a programming language,
- enlist ways of debugging a computer,
- list the fundamental programming constructs,
- describe the interface of Scratch,
- identify different Blocks on Scratch,
- design a simple game in Scratch,
- do basic programming in Python.

Introduction for the teacher

Computer programming introduces pupils to the fundamental concept of what a computer program is. Computer programming skills open a world of possibilities. Pupils can develop applications for a wide range of fields, from creating video games to solving complex scientific problems. This versatility prepares them for future careers in technology and beyond. Understanding programming languages equips pupils with the knowledge of how to communicate with computers effectively. This is a crucial skill as it forms the backbone of software development.

Teaching the distinction between an algorithm and a program hones logical thinking. Algorithms are step-by-step problem-solving methods, while programs are implementations of these algorithms. This differentiation fosters computational thinking. Debugging Proficiency is yet another essential skill. It helps pupils identify and rectify errors in their code. It promotes problem-solving abilities and resilience in the face of challenges.

Pupils will be introduced to 2 programming softwares in this chapter, i.e., Scratch and Python. Incorporating both Scratch and Python into the curriculum provides a well-rounded programming education. It fosters creativity, critical thinking, and practical skills that will benefit pupils academically and professionally in an increasingly digital world.

Python is a versatile, real-world programming language widely used in various industries, from web development to data science. Teaching Python equips pupils with skills directly applicable in the job market. Python's simplicity and readability make it an ideal choice for teaching pupils programming. They can quickly grasp the language's syntax and focus on problem-solving and algorithmic thinking. Learning Python sets a solid foundation for pupils interested in pursuing more advanced areas of computer science and technology.

Scratch offers an engaging and visually oriented programming environment that makes learning programming concepts accessible and enjoyable for pupils of all ages. It allows pupils to create interactive stories, animations, and games while fostering creativity and collaboration. Working

on Scratch will help them to learn to reason systematically and solve problems logically. They gain a strong foundation in computational thinking, which is transferable to other subjects and real-world challenges.

Coding in Scratch can be difficult to teach as it is a relatively new language. However, it is imperative that you go into the classroom with confidence so that the pupils don't perceive coding as difficult. You can follow the following steps to self-learn Scratch from the official website:

Here's a step-by-step guide for teachers to use the Explore tab effectively:

Step 1: access the explore tab

1. **Open scratch:** Log in to the Scratch website using your teacher account. (https://scratch.mit. edu/)

2. **Navigate to explore:** Once logged in, locate and click on the 'Explore' tab. This tab is typically found in the top menu bar of the Scratch website.

Step 2: explore projects and studios

1. **Browse projects:** Start by exploring various projects created by the Scratch community. Look for projects related to game development to gain insights and inspiration.

2. **Check studios:** Visit different studios that focus on game development. Studios are curated collections of projects centered around a specific theme or topic.

Step 3: filter and search

1. **Use filters:** Utilise the search and filter options to narrow down projects based on difficulty level, coding concepts, or specific game types.

2. **Keyword search:** If you have a specific topic or game idea in mind, use the search bar with relevant keywords to find projects related to your interests.

Step 4: analyse and learn

1. **Review project code:** Open projects that catch your attention and review the code. Take note of how different programming blocks are used to create various effects and functionalities.

2. **Examine comments:** Pay attention to any comments left by the project creators. Comments often provide insights into the coding choices and solutions.

Step 5: experiment and remix

1. **Remix projects:** Feel free to remix existing projects. Remixing allows you to experiment with and modify the code, gaining hands-on experience with different coding techniques.

2. **Save remixes:** Save your remixes to your account. This creates a personal library of projects that you can refer back to later.

Step 6: join scratch educator community

1. **Explore educator resources:** Visit the Scratch Educator Community within the Explore tab. Find resources, lesson plans, and support specifically designed for educators teaching Scratch.

2. **Connect with educators:** Engage with other educators in the community. Share your experiences, ask questions, and learn from the collective knowledge of the Scratch teaching community.

Step 7: plan for teaching

1. **Adapt projects:** Choose projects that align with your lesson objectives and the skill level of your pupils. Consider adapting projects to suit your specific teaching goals.

2. **Create studios:** Assemble studios with projects that form a coherent curriculum or learning path for your pupils.

Lesson plan1

Resources:

✓ Textbook pages 50-54

✓ A popular game downloaded on the lab computers such as Pac-man.

Starter activity (5 min)

Before diving into the topics of computer programming and related concepts, it's essential to engage pupils curiosity and lay a solid foundation. Here are some introductory questions to spark their interest:

• Have you ever wondered how your favourite computer games work?

• Can you think of everyday activities where a computer is involved? How might programming be used to make these activities better or easier?

• Have you ever used a smartphone app? Do you know that someone had to write code to create it?

• Have you ever had to fix a mistake in your homework or artwork? What did you do to correct it? How might we 'fix' mistakes in computer programs?

Show pupils a short video clip of a popular video game such as Pac man and ask them to think about how the game works and what makes it possible for the characters to move and interact with the environment.

Reading and explanation (25 min)

Read page 50. Explain to pupils that computer programming is the process of writing instructions for a computer to follow. Introduce the concept of a computer program as a set of instructions that tells a computer what to do. Discuss the need for programming languages to communicate with computers and how different programming languages are used for different purposes.

Refer to the text on page 51 and help them understand applications of computer programming. Provide examples of different applications of computer programming, such as creating websites, developing mobile apps, designing video games, and analysing data. Discuss with pupils how programming can be used to solve real-life problems, such as predicting weather patterns or improving healthcare.

Explain the difference between algorithms (step-by-step solutions) and programming languages (tools to express solutions) given on page 53. Understanding the difference between algorithms and programming languages can be linked to building a recipe (algorithm) and choosing a language (programming language) to write it in.

☁ **Concept Cloud** ✕

Algorithm:

Imagine you want to bake a cake. Your recipe, or algorithm, is a precise set of instructions that tells you what ingredients to use, in what quantities, and the exact steps to follow. It's like having a detailed list of tasks, from mixing the batter to setting the oven temperature and baking time. This recipe can be written on a piece of paper and followed by anyone, regardless of their language.

Programming language:

Now, consider the programming language as the choice of the language in which you write your recipe. Just as you can write the cake recipe in English, French, or Spanish, you can write a computer program in different programming languages like Python, Java, or C++. Each language has its own syntax and rules, much like different human languages. However, the core logic (the algorithm) remains the same—the steps to achieve the desired outcome.

So, the analogy is that the algorithm is the recipe's logical sequence of steps, while the programming language is the language in which you write and communicate those steps. Regardless of the language chosen, the underlying algorithm guides the computer on what to do, just as the recipe guides the baker in making the cake.

Discuss the need for programming languages, relate to spoken languages as communication tools. Identify examples of programming languages (Python, Java, R, C/C++, C#, and Visual Basic) and their uses (web development, data analysis etc.). Refer to the table on pages 51-52 for details. Provide pupils with scenarios and ask them to choose the appropriate programming language to solve a specific problem.

Enlist ways of debugging a Computer Program. Pupils could evaluate different debugging techniques and explain their effectiveness in finding and fixing errors in a computer program. Refer to pages 52-53.

From page 53, introduce fundamental programming constructs such as statements, variables, and conditionals. The following online links are grade-appropriate to teach this concept in a visual manner.

Links

- https://code.org/
- https://blockly.games/

Conclusion (5 min)

Take feedback by asking questions such as:

- What is the difference between an algorithm and a programming language?
- How can you debug a computer program?
- What is the purpose of using variables in programming?
- What are the potential future advancements and challenges in the field of computer programming?
- How can debugging techniques be applied outside of computer programming, in problem-solving situations?

Classwork (5 min)

✓ Do question 6 from part E.

Homework assignment

✓ Do questions 1,2,3, and 5 from part D.

✓ Ask pupils to compare and contrast an algorithm with a programming language, highlighting their differences and similarities. Ask them to create a diagram illustrating the relationship between an algorithm and a programming language.

Lesson plan2

Resources

✓ Textbook pages 54-65

✓ Computer systems for pupils' use with Internet connectivity

Starter activity (3 min)

Ask:

- Have you ever wondered how your favourite video games or animations are created?

- What if you could create your own interactive stories and games?

- What do you hope to achieve by the end of this Scratch adventure?

Reading and explanation (25 min)

✓ Ask pupils to download Scratch themselves. Let pupils look for the correct link on their own under supervision. Provide support where needed.

✓ Have pupils explore the Scratch interface and identify all key features and blocks given on pages 57-59, one by one. A labelled diagram of 13 basic features and blocks of the Scratch interface is given on these pages. It would be a good idea for pupils to familiarise themselves with these features before moving on to hands-on practice.

Help them with the initial ones for example:

✓ Introduce the menu bar by discussing its purpose and the different options it provides.

✓ Demonstrate how to navigate the code tab and explain its function in organising and editing scripts.

✓ Guide pupils through an exploration of the script area, explaining how it is used to write code and create instructions for sprites.

Now ask them to follow the instructions given on pages 59-61 step-by-step and develop the game 'Cat walking in the jungle'. Monitor them closely and provide assistance where required. They may develop the second game, 'A ball following the mouse in the Arctic' given on pages 62-65 as class practice or homework.

☁ Concept Cloud ✖

Coding concepts like loops, conditionals, and variables are fundamental in Scratch and play a crucial role in game development:

- **Loops:** Loops are like repeating instructions. In Scratch, they help create actions that occur multiple times, such as moving characters or animating sprites. For example, you can use a loop to make a character continuously move across the screen.

- **Conditionals:** Conditionals are used for decision-making. They enable you to create scenarios in your game, such as 'if the character touches the treasure, they win'. Conditionals make games interactive and responsive to user actions.

- **Variables:** Variables store data that can change during the game. They are essential for keeping track of scores, lives, or any changing information. For instance, you can use a variable to count the player's score as they collect items in the game.

These concepts provide the building blocks for creating dynamic and engaging games in Scratch. They empower pupils to control the behaviour of their sprites, add interactivity, and manage game state. By understanding and applying these concepts, pupils can bring their creative game ideas to life while gaining valuable programming skills.

Conclusion (5 min)

After teaching game development on Scratch, it's essential to conclude the lesson with reflective questions to reinforce learning. Here are some concluding questions:

- What unique features or elements did you add to your game to make it fun and engaging?
- During the game development process, what obstacles did you face, and how did you overcome them?
- Think about your game's design and functionality. If you were to do this project again, what would you improve or add to make it even better?
- Game development often involves solving challenges creatively. How did you apply problem-solving skills while creating your games?

Classwork (7 min)

✓ Do part A and B from the workstation

✓ Do question 4 from part D

Homework assignment

✓ Do Questions 1, 2, and 3 fro part E

✓ Ask pupils to follow the step-by-step instructions given on pages 62-66 to develop the game 'A ball following the mouse in the Arctic' in Scratch. Reflect on the coding concepts you used in Scratch, such as loops, conditionals, and variables. How did these concepts help you build your game?

✓ Think about your game's design and functionality. If you were to do this project again, what would you improve or add to make it even better?

Lesson plan 3
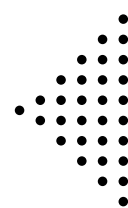
Resources

✓ Textbook pages 66-72

✓ Computer systems for pupils' use with Internet connectivity

Starter activity (5 min)

Ask:

- Why do you think learning Python is important?
- How might it open up exciting opportunities in the future?
- Python can be used to build games, websites, and even robots! What kind of projects or inventions would you like to create with Python?

Reading and explanation (25 min)

Introduce Python as a popular programming language used for a wide range of applications including web development, data analysis, and artificial intelligence. Explain that Python is known for its simplicity and readability, making it a great language for beginners. Share the following information with pupils to gauge their interest:

☁ **Concept Cloud** ✕

Python is a versatile computer programming language widely used for various purposes, including:

a) **Web development (server-side):** Python is employed to build web applications. Frameworks like Django and Flask simplify web development tasks, making it an excellent choice for web development.

b) **Software development:** Python is utilised in software development to create desktop applications, graphical user interfaces (GUIs), and other software tools. Its simplicity and readability make it suitable for rapid application development.

c) **Mathematics:** Python is a preferred language for scientific computing, data analysis, and mathematical modeling. Libraries such as NumPy, SciPy, and pandas provide extensive support for mathematical and statistical operations.

d) **System scripting:** Python serves as a powerful scripting language for automating tasks, managing files, and interacting with the operating system. It simplifies administrative and repetitive operations.

e) **Database interaction:** Python can connect to various database systems, allowing developers to manipulate data, retrieve information, and perform database-related tasks efficiently.

f) **File handling:** Python is capable of reading and modifying files, making it valuable for data processing and file management.

Python's versatility and extensive libraries contribute to its popularity, making it a general-purpose language suitable for diverse programming needs.

Have the pupils follow instructions on pages 66-68 and initiate coding in Python. Explain that variables are used to store and represent data in programming languages. In Python, variables can hold different types of data such as numbers, text, or Boolean values. Ask pupils to imagine that they have a box where they could keep different things. This box is like a variable in Python. When you want to keep a toy car in the box, you give the box a name like 'toyBox'. Similarly, in Python, when you want to store a number or a word, you create a variable and give it a name. For example, you might have a variable called 'score' to keep track of your game score. Arithmetic operators are used to perform mathematical operations on variables and values.

Conclusion (5 min)

Conclude by taking feedback with the following questions to assess pupils' understanding and to encourage further exploration:

- Can you explain the concept of variables and how they are used in Python?

- What are Python data types, and can you provide examples of each?

- Explain the difference between 'if' and 'while' statements in Python.

- What resources or tools can you use to continue learning Python?

Classwork (5 min)

✓ Do part C from the workstation

✓ Do Questions 6 and 7 from part D

Homework assignment

✓ Do Questions 4 and 5 from part E.

✓ Create a simple game where the player controls a character that collects coins. Write a Python program that allows the player to move the character up, down, left, or right on the game screen using the arrow keys on the keyboard. Additionally, when the character collects a coin, the score should increase by 10 points. How would you implement this functionality in your program?

Suggested answers to end-of-chapter questions on pages 72 to 74

A. Fill in the missing blanks

1. Character	**2.** Stop	**3.** Costumes
4. Y	**5.** Database	**6.** Costumes
7. type()	**8.** Identation	

B. True/false statements

1. False. A computer program doesn't understand English. It follows instructions in programming languages.

2. False. Scratch is designed for kids, but people of all ages can use and learn from it.

3. True	**4.** True	**5.** True

C. Choose the correct option

1. a	**2.** a	**3.** c
4. d	**5.** a	**6.** a
7. d	**8.** c	**9.** a
10. a	**11.** a	

D. Short-Answer Questions

1. A computer program is a set of instructions written in a specific order and language to complete a specific task.
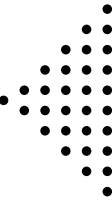
2. Building blocks are small pieces of code that perform specific tasks. Types include input, processing, output, and control blocks.

3. Variables are used to store input and data. They hold different values like numbers, text, or more.

4. Refer to page 55 of the chapter.

5. Python, Java, JavaScript, C++

6. Input is taken from the user in the console area on an online Python website OR The Coding Area (double-check).

7. One example is: user_input = int(input('Enter an integer: ')

E. **Long-Answer Questions**

1. Refer to page 59 and 60.

2. Script Area: This is where you drag and snap blocks together to create your program. It's like putting together puzzle pieces to make things happen.

   Main Menu: This is at the top of the Scratch interface. It has options like File, Edit, and more. You use it to control various aspects of your project.

   Backdrop Pane: This is where you can choose different backgrounds for your stage. You can pick from the library or upload your own.

3. In Scratch, x and y coordinates represent positions on the stage:

   x (horizontal) is the left-right position. Larger values move right.

   y (vertical) is the up-down position. Larger values move down.

   Pupils can build on this to demonstrate their understanding.

4. Refer to page 69 of the chapter.

5. i. Open a web browser.

   ii. Search for 'Online Python compiler' or use a specific website (like repl.it or Google's Python editor).

   iii. Open the editor on the website.

   iv. Paste your Python code into the editor.

   v. Press the 'Run' or 'Execute' button to see the output.

6. Conditional Statement: It makes a decision based on a condition. For example, 'If it's raining, take an umbrella.' It's like choosing between options based on something being true or false.

   Repetition Statement: It repeats a task multiple times. For example, 'Keep jumping 10 times.' It's like doing the same thing over and over again until a condition is met.

   Pupils can build on this response to demonstrate their understanding.

06. DIGITAL CITIZENSHIP

Introduction for the teacher

As educators, we play a crucial role in shaping responsible and ethical digital citizens. It involves teaching pupils how to navigate the online world safely and responsibly. It encompasses understanding the importance of online etiquette, respecting others' digital rights, and being aware of the consequences of one's online actions. Digital ethics goes hand in hand with digital citizenship. It involves instilling ethical values in pupils when it comes to using technology. This includes addressing issues like intellectual property, privacy, and responsible content creation and sharing.

Plagiarism is a critical topic in the age of easy access to information. Teaching pupils about plagiarism helps them develop proper research and citation skills and emphasises the importance of academic integrity.

Likewise, cyberbullying is a pressing concern. Educators should equip pupils with the knowledge and skills to recognise and prevent cyberbullying, fostering a safe online environment.

ICT lab rules are essential to ensure that pupils use technology responsibly within the school environment. These rules promote good practices and help maintain the equipment. Health-related issues tied to ICT device usage, such as eye strain and posture problems, need attention. Teaching pupils about these issues encourages responsible screen time and digital well-being.

Vocabulary Cloud	
Citizenship	The status of being a member of a particular country or nation and enjoying the rights, privileges, and responsibilities that come with that membership.
Bullying	Repeated aggressive behaviour intended to hurt, harm, or intimidate someone who is perceived as weaker or more vulnerable.
Piracy	The unauthorised use, reproduction, or distribution of someone else's intellectual property or content.

Lesson plan 1

Resources

✓ Textbook pages 75-80

✓ Internet access in the lab

Starter activity (5 min)

Ask:

- What is bullying? Have you experienced any red flags of negative behaviour from your peers?

- If yes, how did it make you feel?

- How important do you think it is to be polite online?

- Is it important to have rules and guidelines for using ICT devices in the lab? Why?

- What are some potential health-related issues that may arise from excessive use of ICT devices?

Reading and explanation (20 min)

Explain that being a responsible digital citizen involves understanding the ethical responsibilities and behaviours required when using technology. Discuss the importance of respecting others online, being mindful of the information shared, and following copyright laws.

🖥 Class Activity ✕

This activity will require a separate 40 min session, where pupils could display their prepared role-plays

✓ Divide pupils into small groups.

✓ Provide each group with a scenario related to digital ethics and the responsibilities of digital citizenship. Examples include encountering cyberbullying, finding a website with copyrighted material, or receiving a suspicious email with malware.

✓ In their groups, pupils should discuss the appropriate actions to take and create a short skit or role-play to demonstrate their understanding.

Explain key concepts: copyright, plagiarism, piracy. You may use the following analogies to elaborate upon each concept.

☁ Concept Cloud ✕

Imagine you have a dairy with your own stories and pictures.

1. **Copyright:** Think of copyright like a shield around your dairy. It means only you (or people you allow) can make copies or use your stories and pictures. It's like having a special lock that only you have the key to.

2. **Plagiarism:** Now, let's say your friend loves your dairy so much that they copy some parts of it and pretend it's their own work. That's like your friend wearing a mask and pretending to be you. It's not fair because they're taking credit for something you made.

---

3. Piracy: Imagine someone else takes your dairy without asking and starts making copies to sell to others. It's like they're stealing your book and making money from it. That's called piracy, and it's not allowed because it's like taking something that doesn't belong to them.

So, copyright protects your work like a shield, plagiarism is like someone pretending to be you, and piracy is like someone stealing and selling your work without your permission. It's important to understand these concepts to respect others' creative work and protect your own.

Teach how to find and use online information ethically. Provide pupils with different online sources and discuss their credibility. Point out factors that may help them confirm the credibility of online sources.

Present common ethical challenges while using technology. Help pupils brainstorm solutions to issues like cyberbullying. Discuss the importance of being safe, responsible, and respectful online. Reinforce that cyberbullying is not okay, and there are things one can do to stop it or help someone who's going through it.

☁ Concept Cloud　　　　　　　　　　　　　　✕

Possible Solutions to Cyberbullying

a) **Tell an adult:** If you or someone you know is being cyberbullied, it's important to tell a trusted adult, like a parent, teacher, or school counselor. They can provide support and take steps to address the issue.

b) **Block and report:** On social media or messaging apps, you can block the person who is cyberbullying you. You can also report their behaviour to the platform. This helps prevent further harassment.

c) **Don't respond:** Cyberbullies often want a reaction. Don't respond to mean messages or comments. By ignoring them, you take away their power.

d) **Save evidence:** If you receive hurtful messages or see cyberbullying, take screenshots or save the messages. This evidence can be useful if you need to report the bullying.

e) **Be kind online:** Treat others as you would want to be treated. Kindness goes a long way in making the Internet a better place.

f) **Support friends:** If you see a friend being cyberbullied, offer your support and encourage them to talk to an adult about it.

g) **Use privacy settings:** Adjust your privacy settings on social media to control who can see your posts and interact with you.

h) Remember, cyberbullying is never your fault, and there are people who want to help you. Don't be afraid to reach out to them.

Highlight potential health concerns related to excessive technology use. Refer to the infographics on pages 79 and 80. Encourage pupils to share their experiences and thoughts.

Links

Here are some video resources that can provide helpful content for effective teaching.

Internet safety tips

- https://www.youtube.com/watch?v=X9Htg8V3eik&ab_channel=CommonSenseMediaforFamilies

Cyberbullying

- https://www.youtube.com/watch?v=6ctd75a7_Yw&ab_channel=CommonSenseEducation

Power of words

- https://www.youtube.com/watch?v=kRHjmYO-c6w&ab_channel=CommonSenseEducation

Digital trail

- https://www.youtubea.com/watch?v=7bRZdUtmH8k&ab_channel=CommonSenseEducation

Copyright

- https://www.youtube.com/watch?v=XzzkSZ0Jrko&ab_channel=GCFLearnFree

Plagiarism

- https://www.youtube.com/watch?v=PzZsButRaHs&ab_channel=GCFLearnFree

How is your Phone changing you?

- https://www.youtube.com/watch?v=W6CBb3yX9Zs&ab_channel=AsapSCIENCE
- https://www.youtube.com/watch?v=7rbDIx69ORE&ab_channel=VideoWritingPrompts

Conclusion (10 min)

- Use the following website to reinforce the covered concepts.

Link

- https://beInternetawesome.withgoogle.com/en_us/interland/landing/reality-river

It has a game kit that pupils will enjoy and learn from. The different games available in the Kit are:

1. Reality River
2. Mindful Mountain
3. Tower of treasure
4. Kind Kingdom

Classwork

✓ Do part A, C, and D from the workstation.

Homework assignment

✓ Do part C and E from the workstation.

✓ Make an interactive poster on one commitment to being responsible digital citizens.

✓ Write a short paragraph reflecting on a recent online experience, discussing whether it aligns with responsible digital behaviour.

✓ Have the pupils make a PPT presentation on 'Ways to establish a healthy balance between technology use and taking care of our physical and mental well-being.'

Suggested answers to end-of-chapter questions on pages 81 to 82

A. Fill in the missing blanks

1. Online/global   **2.** Interact   **3.** Copyright

B. True/false statements

1. True

2. False, Cyberbullying is a term we use for online harassment and abusive behaviour, not for hacking different Google accounts.

3. True

4. False, Plagiarism is the act of reproducing another person's work without proper attribution, not necessarily in your own words.

5. True

C. Choose the correct option

1. c   **2.** b   **3.** a

4. b   **5.** a

D. Short-Answer Questions

1. Digital ethics encompasses how users and participants in online environments interact with each other and the technologies and platforms are used to engage. They are the norms dedicated to ensure that the autonomy and dignity of users is respected on the Internet. Digital ethics are also called nettiquettes.

2. Plagiarism is defined as the act of using someone else's ideas, work, or data without giving credit to the actual source and showing that this idea, work, or data was developed by you.

3. Cyberbullying is when people use the Internet and technology to hurt, embarrass, or be mean to others.

No, we should not do cyberbullying because it is hurtful and wrong to be mean to others online, just like it's wrong to be mean in person.

4. Refer to page 78 of the chapter.

E. Long-Answer Questions

1. Online surfing is when you use the Internet to explore websites, search for information, watch videos, and more. It's like navigating through the digital world. Cyberbullying, online scams, malware are some of these issues that can occur while online surfing. Pupils can build on these to demonstrate their understanding.

2. Refer to page 81 of the textbook.

3. The definitions are as follows:

Copyright is the act of registering one's work officially in your name so that it is the intellectual property of the writer/designer of the work.

Digital piracy is defined as the act of using, reproducing, or sharing digital material owned by another person or company without getting permission from the owner.

Plagiarism is defined as the act of using someone else's ideas, work, or data without giving credit to the actual source and showing that this idea, work, or data was developed by you.

Cyberbullying is when people use the Internet and technology to hurt, embarrass, or be mean to others.

After completing this chapter, pupils should be able to:

• define Entrepreneurship and Entrepreneurs,
• describe characteristics and types of Entrepreneurs,
• describe the Entrepreneurship process,
• differentiate between traditional and digital entrepreneurship,
• explain the importance of technology for traditional businesses.

Introduction for the teacher

The digital age is shaping our world rapidly. The concept of entrepreneurship in the digital age empowers pupils with essential skills, technological literacy, and a forward-thinking mindset, preparing them to thrive in the digitalised world ahead. It fosters critical thinking and problem-solving skills. These abilities are invaluable as pupils learn to create innovative solutions to real-world challenges.

Digital entrepreneurship often transcends geographical boundaries. Teaching this concept helps pupils understand the global nature of business and opportunities for international collaboration.

Entrepreneurship involves risk-taking and resilience, essential qualities in a rapidly changing digital world. Teaching these concepts early instils confidence in pupils to face uncertainties. Moreover, fostering entrepreneurial skills ensures career preparedness. As pupils grow, they need skills beyond academics. Teaching entrepreneurship at a young age broadens their career perspectives, encouraging creativity and self-motivation. This requires incorporating real-life case studies and projects into the class to help pupils see the practical application of entrepreneurship in the digital age.

☁ Vocabulary Cloud	
Entrepreneur	An individual who takes on the responsibility of starting and managing a business, typically with the goal of making a profit.
Entrepreneurship	The process of starting and operating a new business, typically with the goal of making a profit.

Lesson plan1

Resources

✓ Textbook pages 83-86

Starter activity (5 min)

Before teaching this chapter, it's essential to engage pupils with thought-provoking questions to

spark their curiosity and interest. Here are some introductory questions:

- What does the word 'entrepreneurship' mean to you, and can you think of any examples?

- Have you ever had an idea for a product or service that you think could help people?

- Can you name some famous entrepreneurs or companies that started small and became successful?

- Do you believe that anyone can become an entrepreneur, or are there specific qualities that make someone a good entrepreneur?

- Have you ever used digital tools or platforms like social media for a project or hobby? How did it help you?

Reading and explanation (20 min)

Introduce the concept of entrepreneurship and entrepreneurs. Define entrepreneurship as the process of creating and managing a business to make a profit. Use an interesting tone such as saying entrepreneurship is like a journey where you turn ideas into reality by creating and managing a business.

Define entrepreneurs as individuals who start and operate businesses, taking financial risks in the hope of making a profit. Use real-world examples or stories of successful entrepreneurs to illustrate the concepts. Make sure to incorporate both local and global examples. Discuss small-scale business start-up examples specifically, so that pupils view them as achievable targets. Refer to pages 83 and 84 for examples of some famous international and Pakistani entrepreneurs. You may use the following examples too:

☁ Concept Cloud

- One inspiring example of a successful entrepreneur from Pakistan is Zia Imran. Zia Imran is an inventor, entrepreneur, and motivational speaker in Pakistan. He is currently involved in a project focused on building home automation and energy-saving devices based on IoT (Internet of Things) technologies. His journey showcases the potential of innovative thinking and technology in entrepreneurship. Zia Imran's story highlights how someone in Pakistan used their creativity and knowledge to create practical solutions for modern challenges. In this case, he leveraged IoT to improve home automation and energy efficiency, which are increasingly important in today's world.

- Another remarkable example of a successful digital entrepreneur is Elon Musk, the co-founder of companies like Tesla and SpaceX. Musk's journey demonstrates how innovation and digital technologies can revolutionise industries. Elon Musk's ventures include electric vehicles, renewable energy solutions, and space exploration. Tesla, his electric car company, has disrupted the automotive industry with cutting-edge technology and sustainable transportation. SpaceX, on the other hand, aims to make space travel more accessible through innovative rocket designs and reusability. Musk's entrepreneurial success is rooted in his ability to harness digital technology for transformative purposes. He used digital platforms and engineering expertise to create groundbreaking solutions, from electric vehicles that reduce carbon emissions to rockets that could enable interplanetary colonization.

These examples can encourage young pupils to explore their own ideas, think creatively, and realise that even at a young age, they can begin their entrepreneurial journey with determination and innovative thinking.

Introduce the characteristics of entrepreneurs given on page 86. Discuss each characteristic briefly, providing relatable examples. You may refer to the following points to break it down further:

☁ **Concept Cloud**   ✕

1. **Power of visualization:**

- Imagine you have a fantastic idea or a big dream. The power of visualization is like using your imagination to picture what it would be like if your idea or dream came true.

- It's like creating a mental movie where you see yourself succeeding and feeling really happy. This helps you believe in yourself and your goals.

2. **Customer feedback:**

- Think of customer feedback as getting advice from your friends or classmates about something you made or did.

- If you want to sell something or have an innovative idea, you ask people what they think. Their thoughts and opinions help you make your idea even better and more appealing.

3. **Passion and innovation:**

- Passion is like having a super strong love for something. If you really love drawing, playing a sport, or helping others, that's your passion.

- Innovation is when you use your creativity to come up with new and awesome ideas. Entrepreneurs often have a lot of passion for what they do, and they love coming up with new and exciting things.

4. **Learning from failure:**

- Failure is like when you try something, and it doesn't work out the way you planned. But here's the secret: every time you 'fail', you actually learn something important.

- Entrepreneurs know that not everything works perfectly the first time, and that's okay. They use their mistakes to figure out how to do things better next time.

5. **Curiosity and inquisitiveness:**

- Curiosity is being super interested and wanting to know more about everything around you. It's like asking a lot of questions because you're excited to learn.

- Entrepreneurs are like explorers; they're always curious and asking questions. They want to find out how things work and how they can make things better.

6. **Creativity:**

- Creativity is like having a special power to think of new and exciting things. It's when you use your imagination to come up with cool ideas.

- Entrepreneurs are like artists; they use their creativity to make new products or find better ways of doing things. They think outside the box and make the world a more interesting place.

Explain various types of entrepreneurs defined on pages 86-87. Give a brief description of each type.

> **☁ Concept Cloud**   ✖
>
> - **Small business:** Examples of local shops or restaurants.
> - **Scalable startup:** Examples of tech companies that can grow rapidly.
> - **Social entrepreneurship:** Examples of businesses that address social issues.
> - **Large scale:** Examples of multinational corporations.
> - **Innovative entrepreneurship:** Examples of businesses that introduce new products or services.

Describe the stages of the entrepreneurship process given on page 87. Use simple scenarios to help pupils understand each stage. Keep the tone exciting to gauge pupil's interest.

> **☁ Concept Cloud**   ✖
>
> Here are fun facts about various stages of the entrepreneurship process:
>
> - Idea Generation: Entrepreneurs often get creative inspiration from everyday problems they want to solve.
> - Opportunity Evaluation: Entrepreneurs research to understand if their ideas are viable by considering factors like demand, competition, and resources.
> - Planning: Successful entrepreneurs carefully plan each step, from budgets to marketing strategies.
> - Execution: Execution means putting plans into action. Just like bringing a story to life and it's where the real adventure begins.
> - Growth: Businesses can grow and expand with hard work and smart strategies.

Differentiate between traditional and digital entrepreneurship, for example:

✓ **Traditional:** Brick-and-mortar stores, local customers.

✓ **Digital:** Online stores, global customers.

Discuss the advantages and challenges of both types.

Explain how technology helps traditional businesses such as:

✓ online presence

✓ reaching more customers

✓ streamlined operations

✓ improved customer experience

Conclusion (5 min)

Assess pupils' understanding with the following questions:

- What is entrepreneurship?

- Give an example of how an entrepreneur can use customer feedback.

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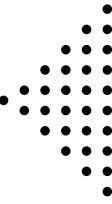
- Why is learning from failure important for entrepreneurs?

- Explain the difference between traditional and digital entrepreneurship.

- What are the benefits and challenges of starting a scalable startup?

Classwork (10 min)

✓ Do Part A and B from the workstation.

✓ Do questions 1 and 2 from Part D.

Homework assignment

✓ Do Part C and E from the workstation.

✓ Ask pupils to research and write a short paragraph about a famous entrepreneur they admire.

✓ Ask pupils to brainstorm examples of businesses they are familiar with.

✓ Assign a creative activity, like designing a business logo or coming up with a business idea, incorporating the characteristics discussed.

Suggested answers to end-of-chapter questions on pages 87 to 88

A. Fill in the missing blanks

1. Capital

2. Entrepreneurship

3. Innovation

4. Resilient

5. Small business enterprises

B. True/false statements

1. False, Venture capital investors get a share of profit in the startup.

2. True

3. True

4. False, Innovative entrepreneurs bring new and unique ideas to the market.

5. False, Idea generation is one of the initial stages of the entrepreneurship process.

C. Choose the correct option

1. a

2. c

3. d

4. d

5. d

D. Short-Answer Questions

1. An entrepreneur is a person who organises and manages a business by investing capital, to make a profit and risks losing that investment. Their main characteristics include power of visualization, customer feedback, curiosity, passion, innovation and more. Pupils can build on these pointers and give examples to demonstrate their understanding.

2. Refer to page 86 and 87 of the chapter.

E. Long-Answer Questions

1. To answer this question, pupils can consult online sources. They can include examples such as Uber (ride-hailing), Airbnb (accommodation), and Amazon (online marketplace). These businesses target the service and e-commerce sectors.

2. Refer to page 88 of the chapter.

3. The entrepreneurship process consists of the following steps: Idea generation, opportunity evaluation, planning, execution and growth. Pupils can elaborate on these stages to demonstrate their understanding.

Notes