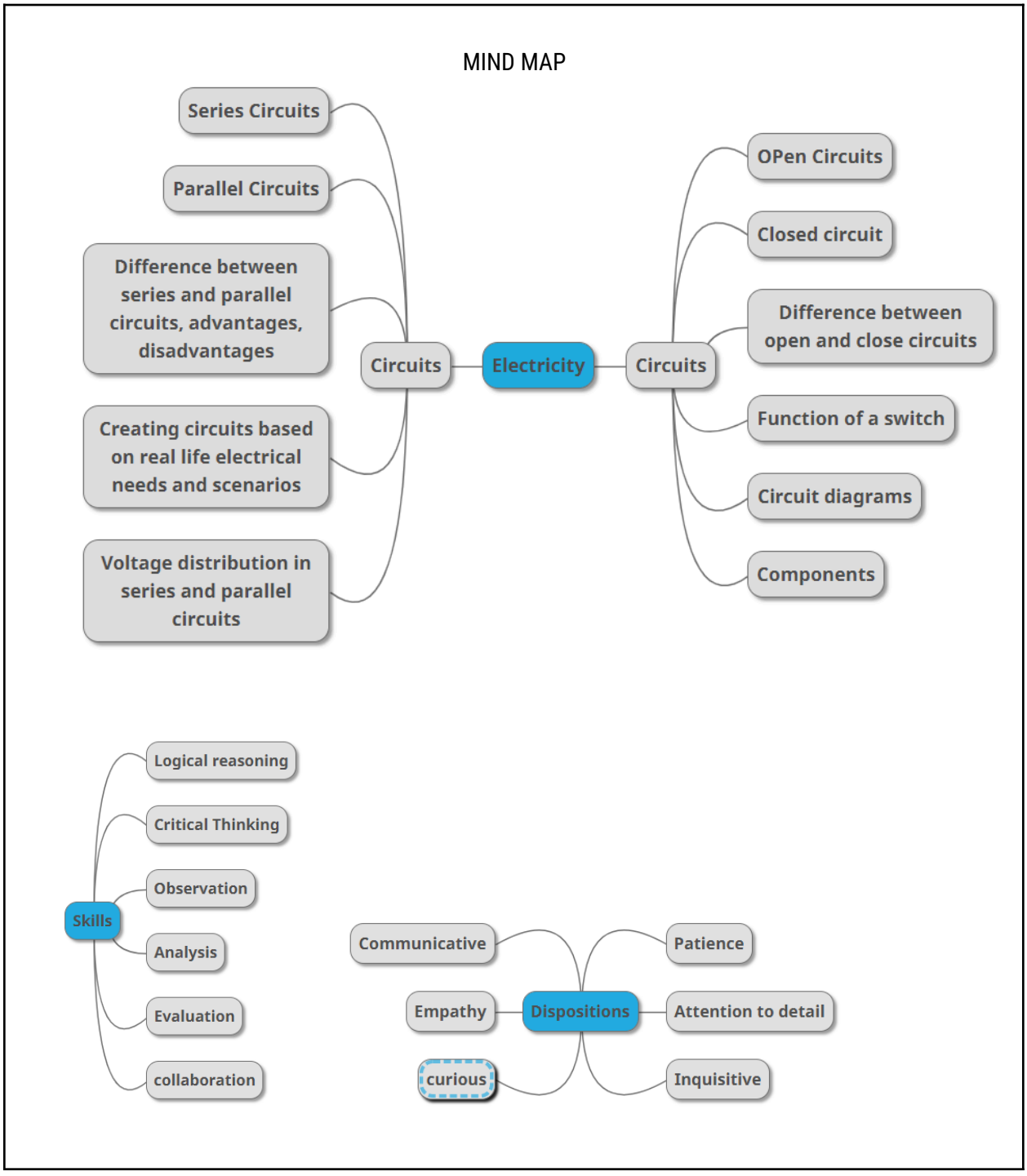
SCIENCE UNIT PLAN

By

Swarna Gunasekaran

MIND MAP



Teacher: Swarna Gunasekaran	
Subject and Grade: Module 6th grade	
Duration: 50 minutes ; Number of Days 11 days @ 50 minutes per day	
Topic/Unit/Chapter/Inquiry/Expedition: Circuit Electricity! Let's light it up!	
STAGE 1: WHAT DO WE WANT CHILDREN TO KNOW?	
Essential Question How do things work by the touch of a switch? How do we control, manipulate and consume energy as we use our everyday appliances?	Enduring Understanding: Electricity is a form of energy that is a result of flow of electric current. The flow of electric current can be stopped started, divided and distributed by controlling the path through which it flows. Electricity follows different kinds of paths in complete loops to create the form of energy we need, from any appliance.
Rationale/Transfer Electricity is one of the major inventions of the modern world. Electricity is the foundation source that enables the use of modern technology. Electricity is a robust form of energy. It is essential to understand the approaches to control and distribute it to make maximum use of the same.	
Unit Objectives/Targets ● **S**tudents will be able to create a circuit using a wire, LED and a button cell, and make an LED glow ● Students will be able to explain the meaning of a circuit ● Students will be able to identify different components of an electrical circuit and their functions. ● Students will be able to identify the direction of the flow of current in a circuit. ● Students will be able to differentiate between the 2 terminals of the cell ● Students will be able to analyse why current does not flow in an open circuit. ● Students will be able to apply the example of a train in a railway track to explain the concept of open and closed circuit. ● Students will be able to analyse the connections to quickly open and close a circuit as need be. ● Students will be able to explain the purpose of a switch in a circuit. ● Students will attempt a quiz on all the concepts that were covered so far ● Students will be able to observe the effect of 2 LEDs in a circuit.	

- Students will be able to explain the meaning of a series circuit.
- Students will be able to infer the need for more energy with more LEDs in a series circuit.
- Students will be able to analyse, experiment and create a circuit that allows them to control 2 LEDs separately, in a circuit
- Students will be able to identify and create a parallel circuit.
- Students will be able to analyse the voltage/energy distribution in a parallel circuit. (P.S. Voltage/ the volts value mentioned in the cell is introduced as voltage to the students)
- Students will be able to compare and evaluate the advantages and disadvantages of series and parallel circuits
- Students will be able to visually represent the circuits based on different scenarios.
- Students will be able to analyse and create different circuits based on real life needs and scenarios

Knowledge:	Skills and Dispositions
I can identify electricity as an energy source I can create a simple circuit I can explain the need for an open and a closed circuit I can create open and closed circuits using switch I can differentiate between series and parallel circuits I can evaluate the advantages and disadvantages of series and parallel circuits I can determine the total voltage required in a circuit to generate adequate energy Electricity as an energy source Circuits - Open and Closed Circuits - Series and parallel	refer to 21st century skill doc by CBSE/PYP Skills Observation Hypothesis Inference Application Experimentation Prediction Dispositions: Critical Thinking Logical Reasoning Attention to Detail Collaborative Inquisitive

Prior Knowledge: Students already know the different kinds of energy
Students already know that electricity is a source that makes gadgets work

Misconceptions: Electricity, similar to light, loses energy as it travels through long distances.
If a circuit needs to be closed for the flow of current, it means that electricity is reused within the same circuit.

STAGE 2: HOW DO WE KNOW CHILDREN HAVE LEARNT?	
Summative Assessment	The items required: 2 Yellow LEDs 1 Blue LED 1 Green LED 1 DC Motors 2 or 3 safety pins / switches Conducting wire/copper wire Create an electrical circuit for the study room of your house: Your living room has the following appliances: 2 ceiling lights (2 Yellow LEDS) 1 night lamp (Blue LED) 1 reading lamp (White LED) 1 fan (DC Motor) The circuit should be connected for the the following scenarios in mind: Scenario 1: You are reading a book on a cold winter night: The ceiling lights are OFF The fan is OFF The reading light is ON and night light is ON Scenario 2: You are getting ready for school on a busy morning: The ceiling lights are ON (both the ceiling lights must be operated by a single switch) The fan is ON Both the reading light and night light turned OFF

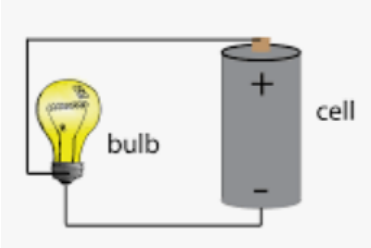
	● Connect a circuit for each scenario and take a short video and upload it in Teamie. ● The video must show the respective components in the ON and OFF status. ● Write the list of the connected components and classify it as series or parallel connection. ● Mention which of the components circuits are open and which are closed. ● Draw circuit diagrams for both the scenarios Success Criteria: ● The number of cells chosen lead to a total voltage of 9v or more ● The Yellow LEDs are connected in series ● The Blue, White LEDs and the motor are connected parallel ● There is only one switch for both the Yellow LEDs ● There is 1 switch each for the Blue, White LEDs and the motor. ● The components of the circuit where series and parallel connections are mentioned as a part of the extended response. ● The components with open and closed circuits are mentioned in the extended response. ● The circuit diagrams are created with appropriate connections and labeling of the symbols

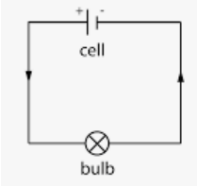
Formative Assessment	1. Classroom observation based on participation and the questions being asked. 2. Day 2 - Creating an Illustration of the circuit they had connected. 3. Day 3 - Creating a mind map of the concepts that were covered 4. Day 4 - students to fill in the table about Open and Closed circuit 5. Day 5 - Kahoot quiz 6. Day 7 - Students' observation and inference about the behaviour of LEDs in parallel circuit 7. Day 8 - students create different circuits based on different scenarios given

STAGE 3: HOW WILL CHILDREN LEARN		
TIME	LEARNING EXPERIENCES	RESOURCES
50 mins	Day 01 **Learning Objective/Target** **T**he students will be able to create a circuit using a wire, LED and a button cell, and make an LED glow Students will be able to explain the meaning of a circuit **Success Criteria** The students will be able to use all the components in the resources and make a circuit. Students will be able to write their understanding of the relationship between electricity and circuit in their own words Teacher to ask the students to bring Copper wire LED	Copper wire LED Button Cell. (*All the references to cells in this plan refers to button cells*)

	Button Cell T to ask the students to use all the components and make the LED glow. Students to connect the components through trial and error methods and eventually make the LED glow. <After 15 mins.> Those students who have made the LED glow will be paired with those who could not make the LED glow and help their peers. If the students still weren't able to make the LED glow, T to help the students with the process. T then introduces that cell creates the **electrical energy which is the flow of electric current,** which is then converted to light energy. T says that the entire setup of connections that they had created is called a **circuit.** Circuit is a path created for the electric current to flow. Students write about circuits and electricity in their own words. T to address any questions, doubts or comments before closing the class	
100 mins 50 mins each day	Day 02 and 03 **Learning Objectives** The students will be able to identify different components of an electrical circuit and their functions. Students will be able to identify the direction of the flow of current in a circuit. Students will be able to differentiate between the 2 terminals of the cell **Success Criteria:** Students will be able to connect a circuit and analyse the reason why the wires are connected only to the corresponding terminals on the cell and the LED. T to start the class by asking the students how they enjoyed working on making their first circuit. T asks the students what was the use of the cell. Why was it necessary to make the LED glow. EA: It is the energy source. Energy from the cell makes the LED glow. There is a class discussion around this question. T consolidates by saying that the cell is the energy source. The energy source from the cell produces electrical energy that makes the LED glow	Cell, LED, Copper wire

	T asks students what will happen if they swapped the sides of the cell and make the connection to the LED. Students can predict and respond. T asks to make the swapped connection in their circuit and try it for themselves and check what happens. Bulb doesn't doesn't glow. T asks why does the LED not glow if the cell is connected the other way round? There are a few responses from the students. T prompts to look for some markings in the cell that may help them guess the reason. Students observe and mention the "+" and "-" on the sides of the cell T consolidates by saying that the "+" and "-" denotes the positive and the negative terminal in a cell. It is mentioned in the cell because electrical current flows from the positive terminal to the negative terminal. T asks one of the students to show his/her work where he made the LED glow. T asks why is the positive side connected to the longer end of the LED and the shorter end of the LED. There are multiple answers from the students. Teacher brings a TV remote or a toy and asks: "Whenever you fix a cell in a toy, you make sure you are placing the positive side of the cell to the place where it is marked as "+" in your remote and the other side is marked with a "-" symbol. Similarly, in the LED, the longer end denotes the "+" side and the shorter end denotes the "-" side". T asks students to remove the wire and try to make the LED glow by directly connecting to the cell. Students connect the LED and the cell directly and the LED glows. T asks why is the wire necessary? Can't we do without the wire? Students discuss some responses. T says that the lamp or any electrical appliance has to be placed at different places from the source and the wire is the component that will carry the electric current from the source to the lamp. **Home assignment:** Teacher asks students to draw the diagram of their circuit in their notebook.	

	They could draw the components just as how they look. T addresses questions and doubts from the students before ending the class.	
	Day 04 **Learning Objectives** Students will be able to apply the symbols for each component to draw a circuit diagram. Students will be able to analyse why current does not flow in an open circuit. Students will be able to apply the example of a train in a railway track to explain the concept of open and closed circuit. **Success Criteria:** Students will be able to draw a circuit diagram with corresponding symbols along with the direction of current flow Students will be able to show in their circuit that when there is a gap in connection it is an open circuit T asks about the home assignment from the day before. Some students have done and some haven't. Students go into breakout rooms and share their diagrams with each other. 1 or 2 students share their diagrams in the main session  Teacher then shares the symbols for the components and asks the students to make a circuit diagram with their symbols Symbol for cell:  Symbol for bulb:  Students draw their circuit diagrams with symbols:	LED, Copper Wire, Cell

	 T: “Since current flows from positive terminal to the negative in a circuit, the arrow of the flow of current should always be shown fas coming from the positive and moving towards the negative terminal of the cell in the circuit.” T addresses any questions or doubts from the students T now asks the students to connect the circuit and make the LED glow. Students connect the circuit, and make it glow. T asks to Turn the LED off. Students disconnect the wire and the LED turns OFF. T asks why did the LED turn OFF? One end of the source is still connected to the LED. Why did it still turn OFF? Students say “because the circuit is disconnected.” “ the wire is broken” “There is not electrical energy sent to the LED” T writes the word circuit and says it is derived from the word “circle” Just like in a circle, the circuit has to be connected without any gaps to make the bulb glow. Such a circuit is called a “closed circuit”. If there is a gap, in the circuit, it is called an “Open Circuit”. T: “Why does the circuit need to be closed?” “Imagine a toy train set. You first fix the tracks and then you run the train on it. Do you think the train could keep moving if the track is broken in between? Similarly the circuit is the train track and the electrical energy is the train. The circuit needs to be connected and closed for an uninterrupted flow of electric energy. If the circuit is broken or has a gap in it, the flow of electric current will stop just like how the train stopped running.”	

	 T addresses any questions or doubts from the students before closing the class. **Home Assignment:** T asks the students to create a mind map about all the concepts and facts that they had learned about electricity so far.	
50 mins	Day 05 **Learning Objective:** Students will be able to analyse the connections to find a solution to quickly open and close a circuit as need be. Students will be able to explain the purpose of a switch in a circuit. **Success Criteria:** Students will be able to fill in the table given to them at the end of the class, where position of the switch and its effect on the circuit on the circuit need to be mentioned Teacher asks students to get their circuit and make their LEDs glow. Now T asks the students to turn the LED OFF. T suggests they play a game. As T says ON, the students should be able to make their LED glow. When T says OFF they should turn it off immediately. T goes "ON OFF, ON, ON, ON, OFF, ON, OFF, OFF" Students try to quickly make the change as the teacher calls out ON/OFF. T asks, how was the game? Were the students able to keep up. Some students say it was difficult to keep up. T to ask the students to find an easy way to turn the LED ON and OFF in a circuit. Some students show their circuit and come up with ideas.	LED, Copper Wire, Cell, Switch

<table>
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<td>T prompts if they could bring another new material in the circuit that could make it easier.

Students come up with some more responses

T brings a metal paper clip/safety pin and shows the method to ON and OFF the LED.
T brings in the term “switch”

A switch is a component that is used to open and close an electrical circuit.

T asks the students to take the switch from their electrical kit and connect it to the circuit.

Now they try the game ON OFF and observe the quick transition.
Students to write the purpose of the switch in their notebook in their own words.
Home Assignment
T to show this table and ask the students to fill this table:
<table>
<tr><td>What happens when the switch is in ON position?</td><td>Circuit is Open/Closed?</td><td>Reason:</td></tr>
<tr><td>What happens when the switch is in OFF position?</td><td>Circuit is Open /Closed?</td><td>Reason:</td></tr>
</table>
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<tr>
<td>50 mins</td>
<td>Day 06
Learning Objective:
Students will attempt a quiz on all the concepts that were covered so far
Success Criteria:
Students will be able to draw the circuit diagram with an open and a closed switch.
Students attempt the Kahoot Quiz- an MCQ quiz and score at least 4 out 6 questions

T starts the class with a discussion about the table that was given as a home assignment.

T shows the symbol of a switch to the students:</td>
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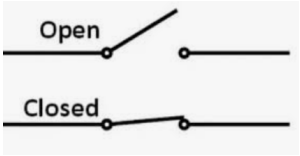
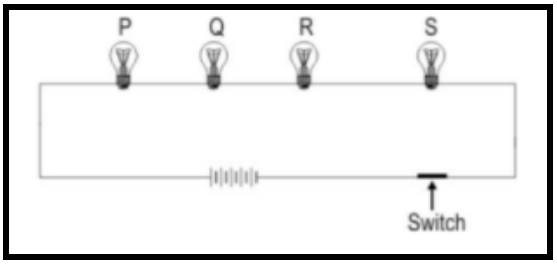


T to ask the students to make circuit diagrams with switches. Students should make a circuit when the LED is ON and when the LED OFF.

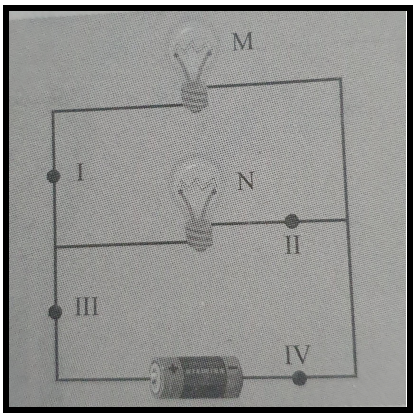
T plays the video to consolidate the concept of open and closed circuits: https://www.youtube.com/watch?v=vUw_bQ1An8Q

T takes a Kahoot quiz to check students understanding

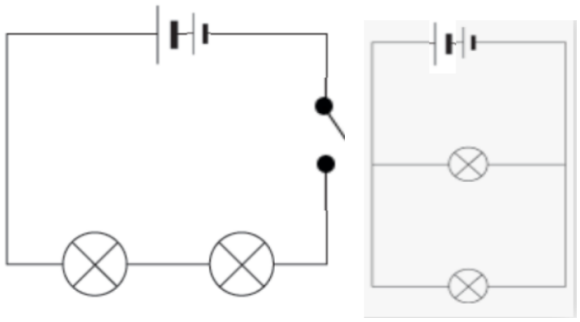
1. The path that electricity takes to flow continuously in an electrical device is called _____
2. There are 4 bulbs in the circuit given below. What will happen if bulb P fuses?



3. The figure below consists of a simple electrical circuit that consists of 2 bulbs and a battery. One open switch has to be added to the circuit in order to operate only bulb M.
   At which point will you place the switch?



4. The purpose of the switch is to_____
5. Which of the following represent a closed parallel circuit?

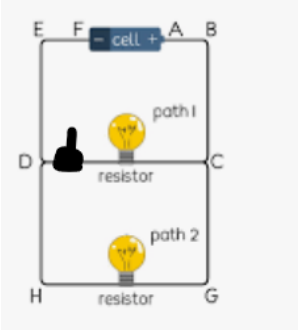
	A B  6. Match the circuit components with their symbols.  T discusses answers for the questions from the quiz before wrapping up the class	

50 mins	Day 7: **Learning Objective:** Students will be able to observe the effect of 2 LEDs in a circuit. Students will be able to explain the meaning of a series circuit. Students will be able to infer the need for more energy with more LEDs in a series circuit. **Success Criteria:** Students will be able to connect 2 or more LEDs in a series. Students will be able to add an extra cell to make the LEDs glow. brighter. Students will be able to draw a circuit diagram of a series circuit with symbols. T asks students to connect 2 LEDs in the circuit in a way that they are connected one next to another. T asks what did the students observe	Cell, 2 LEDs, Copper wire

	Those students who connected the LEDs in series notice that the LEDs are not glowing. Some students notice that the LEDs are very dim. T asks the students to guess the reason - students give some responses. T consolidates by saying “When the LEDs are connected one next to another, the voltage is shared between the 2 bulbs. That is why some LEDs don't glow and some are dimmer.” T asks “What could be done to make the LEDs glow brighter?” EA: “Give more energy through the source.” T prompts “Connect 1 more cell and check the difference.” With an extra cell connected both the LEDs glow bright. T consolidates by saying that when there is more energy from source, more LEDs could be lit. T consolidates by saying that when there is more energy from source, more LEDs could be lit. T: “What kind of a name could we give to this circuit”. EA: Students discuss a few responses T: “Since the LEDs are connected one next to another in a series it is called a **Series Circuit**. Series circuit, there is only one path for the current to flow.” T shows a diagram of Series Circuit with 2 LEDs: Students to note down the diagram in notebook. Students to create a circuit diagram for the same with proper symbols for components.  T addresses students’ questions before closing the class	

50 mins	**Day 8**	Cell, 2 LEDs,

	LEarning Objectives Students will be able to analyse, experiment and create a circuit that allows them to control 2 LEDs separately. Students will be able to identify and create a parallel circuit. Students will be able to analyse the voltage/energy distribution in a parallel circuit. (P.S. Voltage/ the volts value mentioned in the cell is introduced as voltage to the students) **Success Criteria:** Students will be able to create a circuit with 2 different paths from the cell to the 2 LED separately and identify it as a parallel circuit. Students will be able to connect a circuit where 1 LED is ON and the other LED OFF with the help of a switch T asks the students to bring their series circuit from the day before. T gives a challenge: Asks the students to keep both the LEDs connected in the circuit. Without removing any LED from the circuit, students make one LED glow and another LED must be OFF. Students try different strategies individually. T prompts the students to use a switch. Students experiment with different connections and some are able to create a circuit where 1 LED is ON and the 1 is OFF. If any of the students were able to make it work, they will help others with the connections. T asks, what could we name this circuit? Students discuss a few responses. T consolidates by saying that, here there are 2 paths from the cell to the LEDs. Hence even if the electric current doesn't pass through 1 path, it could take the other path to light the 2nd LED. This circuit is called a **Parallel circuit.** T shows diagram of parallel circuit with 1 LED on and 1 LED OFF would be. The proper placement of the switch is essential to achieve this. The switch must be placed only in the path that will only control the 1st LED. The switch should not be positioned in a place where it will control both the LEDs	Copper wire, switch

	 T asks the students to draw a circuit diagram of this parallel circuit in their notebook. T asks the students why the LEDs in the parallel circuit did not dim and why the LEDs in the series circuit became dim. Or Why did the series circuit need an extra cell and a parallel circuit did not need an extra cell to power both the LEDs **Home Assignment:** Students will observe the brightness of the LEDs when connected in parallel. If they are bright/dim and predict the reason for their brightness.	

50 mins each Total 100 mins	Day 9 and Day 10 **Learning Objectives** Students will be able to compare and evaluate the advantages and disadvantages of series and parallel circuits Students will be able to visually represent the circuits based on different scenarios. **Success Criteria:** Students will be able to mention the characteristics of a series circuit as the voltage/energy being distributed between the 2 LEDs They can realize the connection of series circuit is simpler than parallel They can explain that in a parallel circuit, even if 1 bulb stops working the rest of them will work They can draw circuit diagrams for different combinations of open, closed and series, parallel circuits. T starts by asking the students about the home assignment. They discuss why the LEDs in the parallel circuit did not dim and why the LEDs in the series circuit became dim.	

Or
Why did the series circuit need an extra cell and a parallel circuit did not need an extra cell to power both the LEDs

Students talk about energy source and distribution through the circuit.

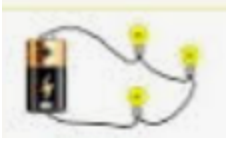
T consolidates “In parallel circuit, the voltage/energy that goes to both the LEDs are the same.
However in series circuit the energy is divided between both the LEDs”

T asks the students to list advantages and disadvantages of series and parallel circuits.
Students break into crews and make the list together.

Series	Parallel
If 1 bulb stops working the entire circuit will stop working	If one bulb fuses the rest of the components in the circuit will work
Easier to connect components in series	Circuit connection needs more attention and becomes complex
The 2 or more bulbs will glow dimmer with the same energy source.	The bulbs will glow with the normal brightness when connected in parallel

T asks students to draw series and parallel circuits with 2 or more LEDs. Class is divided into 2 groups. 1 student from each group to show his/her circuit and the other group will identify it as series/ parallel and open or closed.
Some samples:






T gives the students some scenarios and asks students to create a circuit diagram:

	Scenario 1: 2 LEDs in series closed circuit 3 LEDs in Parallel open circuit 2 LEDs in parallel with 1 LED ON and the other LED OFF	

50 mins	Day 11 **Learning Objective** Students will be able to analyse and create different circuits based on real life needs and scenarios **Success Criteria:** Students will be able to use only 1 switch if 2 lights need to be controlled together Students need to create parallel circuits if any 2 or more components need to function independent of each other Students need to calculate the total amount of Voltage required from the source based on the number of components in the circuit T asks the students to create a circuit for their classroom electric appliances. The classroom has 4 lights and 2 fans Each light can be represented by a different colour LED. Red, Blue, Yellow, White. Each fan will be represented by a motor in the circuit. Students work in crews for this task. Teacher creates different scenarios for the circuit. Students will recreate the scenarios by representing the connections in the circuit Scenario1: In the classroom there are: 2 lights ON 2 lights OFF 2 Fans OFF Scenario2: 4 lights ON 2 Fans OFF Scenario 3 4 lights ON 1 Fan OFF 1 Fan ON	4 LEDs 2 Motors 3 Switches Copper wires Cells with a combined voltage of 12v or more

	Students draw the circuit diagrams before experimenting the with the connections in the circuit Students recreate these scenarios in their circuit by following their circuit diagrams. They show and explain it to the rest of the crews. Crew members are allowed to have a questions session, so that they answer their peers doubts/comments T to also give feedback on each crews work	