Concept Presentation by:

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Series vs. Parallel Circuits



**Teaching the Concept of Series vs. Parallel Circuit**

**Background information**

The molecules of all types of conductors impede, or resist, the flow of electrons to some extent. This ability to impede the flow of electrons in conductors is called electrical resistance. Some kinds of electrical devices used in circuits are designed for this purpose and are called resistors. The symbol for electrical resistance is R, and the SI unit is the ohm (Ω)

When electrons flow through a conductor the electric resistance causes a loss of electric potential (voltage). Physicist refer to this loss as electric potential difference, or more simply, potential difference.

**Prior Knowledge/Challenges**

Students have some background knowledge of electricity from the previous years and they are familiar with terms such as load, source, switch, conductor, insulator etc.

The assessment of prior knowledge will be done on continuous basis during the time the concept is taught. Students have developed some inquiry and communication skills previously through research, experimentation and presentations. They are expected to be in different stages of their learning and some concepts will have to be reintroduced to them.

Some students may have difficulty distinguishing an ammeter from a voltmeter and how they can be used; therefore special attention will be paid to the units and measurements.

New and previously learned vocabulary will also be part of focused attention to ensure usage of scientific language

**Curriculum Expectations**

E2.1 use appropriate terminology related to electricity, including, but not limited to: ammeter, amperes, battery, current, fuse, kilowatt hours, load, ohms, potential difference, resistance, switch, voltmeter, and volts [C]

E2.5 design, draw circuit diagrams of, and construct series and parallel circuits

E2.6 analyse and interpret the effects of adding an identical load in series and in parallel in a simple circuit [AI, C]

E2.7 investigate the quantitative relationships between current, potential difference, and resistance in a simple series circuit [PR, AI]

E2.8 solve simple problems involving potential difference V, electric current I, and resistance R, using the quantitative relationship V = IR [AI, C]

**Lessons Sequence**

**Lesson 1**

Review Schematic Diagrams and types of Electrical Circuits

Using schematic diagrams to simplify circuit graphical representation

**Lesson 2**

Electrical Resistance and Ohm's Law

Relationship amongst Current, Voltage and Resistance

**Lesson 3**

Properties of Series Circuits

Total Resistance in Series Circuits

**Lesson 4**

Properties of Parallel Circuits

Total Resistance in Parallel Circuits

**Lesson 5**

Combined Circuits and Applications

Equivalent Resistors of Combined Circuits

**Differentiated Assessments**

The teacher will use different assessment tools to help students with different learning styles and intelligences (auditory, visual, musical, kinesthetic, interpersonal and logical). Students with auditory intelligence will have the opportunity to do a group debate about differences of series and parallel circuits. In the debate students will summarize the properties of the two circuits and can give some applications about lighting and wiring's.

Individual tasks also will be implemented during a presentation targeting students with visual intelligence. The class will take part in a poster making contest that will be used as a warning sign for safety. Writing a song/poem might be useful to students with musical intelligence. The song provided from YouTube can serve as an inspiration. Other activities such as building and testing different kinds of circuits will help students with Kinesthetic intelligence helping them learn through this hands-on approach. As part of activities of teaching the concept of series and parallel circuits, will also be a Gizmo group work. This activity will be more attractive to students with interpersonal intelligence. During this Gizmo activity students will apply their knowledge and improve their problem-solving skills. Last, but not least students will compare circuits, record and classify data and calculate results. This activity will be more attractive to students with logical Intelligence

**Practical Applications**

Students will learn about circuits and their applications in their daily life. Applications such as dimming a light using a potentiometer, building a circuit with two independent switches, wiring Christmas lights etc. will help students make connections to real life problems. Students will also learn about circuit breakers and their use and applications. They will be able to understand basic principles of wiring and connection of different appliances. Students can also apply what they have learned about lighting and the relationship among voltage, current and resistance. Through problems, they will be introduced to the concept of power that will help them better understand the concept of energy later on. Students will investigate the difference of a series and parallel circuits by building their own project using simple circuit materials such as bulbs, battery and wires. They will also use the circuit simulator to improve their circuit building skills by virtually building a circuit and check if their circuit works. This method of learning is safer as it does not require real electrical power in the circuit.

**Annotated References/Internet Resources**

***Books:***

Plumb, D. A. (1999). Science 9. Scarborough, Ont.: Nelson Canada.

Wolfe, E. (1999). Sciencepower 9: science, technology, society, environment. Toronto: McGraw-Hill Ryerson.

Reid, M. (2009). Investigating Science 9: Canada

Nelson, (2010). Science Perspective 9: Toronto: Nelson Educ Ltd.

These texts served as sources for background information, and setting lesson sequence.

***Web sites:***

<http://www.allaboutcircuits.com/vol_1/chpt_5/1.html>

<http://physics.bu.edu/py106/notes/Circuits.html>

<http://www.explorelearning.com/> (This website is used for gizmo activities).