# SOLVING THE PROBLEM FACED BY VIII STANDARED STUDENTS IN UNDERSTANDING THE TYPES OF CIRCUIT USING MODEL MAKING METHOD

*Action Research Report Submitted to*

**STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING, CHENNAI - 600 006.**

**by**

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**TIRUNELVELI DISTRICT**

**2023-2024**

# ACTION RESEARCH

Title : SOLVING THE PROBLEM FACED BY VIII STANDARED STUDENTS IN UNDERSTANDING THE TYPES OF CIRCUIT USING MODEL MAKING METHOD

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Date of Submission :

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# ACKNOWLEDGEMENT

I thank the Almighty God, for the providence and guidance provided to me in my profession as a teacher educator.

I express my gratitude to The State Council of Educational, Research and Training, Chennai, for proving me an opportunity to undertake this action research.

I register my sincere thanks to P. GOLDA GRENA RAJATHI, Principal, DIET, Munanjipatti, for his guidance and support to complete this action research.

It is my pleasure to convey my sincere thanks to T.KRISHNAVATHI, Science teacher for their co-operation in the interventions.

Place: Munanjipatti

Date: (S.Sahayaponmalar)

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## CERTIFICATE

The Action research entitled "**Solving the Problem faced by VIII Standared students in understanding the types of Circuit using Model Making Method"** submitted by **Dr S. SAHAYAPONMALAR** Lecturer, District Institute of Education and Training, Munanjipatti, funded by the State Council of Educational, Research and Training, Chennai-600 006 is a record of bonafide research work done by her and it has not been submitted for the award of any degree, diploma, fellowship of any University/ Institution.

Place: Munanjipatti
Date: Signature

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# 1.BACKGROUND OF THE STUDY

Model Making Method" as a unifying theme for science and mathematics education. Students in Model Making Method classrooms experience first-hand the richness and excitement of learning about the natural world. The Modeling method of instruction corrects many weaknesses of the traditional lecture-demonstration method, including the fragmentation of knowledge, student passivity, and the persistence of naive beliefs. Models are often used by teachers to help explain difficult concepts or demonstrate how different components interact with each other.

For example, a teacher may use models while teaching, students can better visualize what they are learning about. Furthermore, models also provide an opportunity for hands-on exploration, which helps engage learners more deeply in their studies. By using models in teaching enables students to gain a deeper understanding through kinesthetic experiences rather than just reading text from books alone represented visually as diagrams allowing learners to explore how different components interact with each other and understand their functions more easily than if they were just presented with text explanations alone. A physics model in the physics-education community is considered as a simplified and idealized physical system, phenomenon, or idealization. Building a physics model always starts from some fundamental principles.

A major role for you as a teacher is to elicit student ideas and guide their thinking. To continuously diagnose and assess your students' understandings and confusion, you need to use teaching strategies that will make your student thinking visible to you. This study presents an action research project on the teaching and learning of fundamental ideas about electric circuits.

## 2. PERCEPTION OF THE PROBLEM

- The action researcher has perceived that the main problem is that the lecture method is not sufficient in teaching the circute and its types to the students effectively.
- By being mindful when selecting appropriate models for teaching purposes, instructors can better facilitate learning by making sure students are exposed not only to content but also how it relates back into real world contexts through modelling activities during class time.
- Modeling plays an important role within science education since it provides opportunities for visualizing abstract ideas while promoting active engagement among learners through hands-on activities.
- This systematic review found that using models as part of instruction has been shown to improve student understanding, particularly with regards to abstract concepts and processes.
- Students were found to have low long-term retention of the circute and its type when using the lecture method while teaching.
- One indicator of learning success can be measured from student learning outcomes. Student learning outcomes are relatively low in natural science learning. Abilities such as higher-order thinking skills (HOTS) are needed in natural science learning
- Understanding the circute and its type is low in the students, when using a model making method, self -made videos and powerpoint should provide our students with clear directions on what to do.

## 3. ANALYSIS OF THE PROBLEM

- Difficulties may either result directly because of the learner's inability to handle abstract concepts or possibly be a result of the teaching.
- Teachers may not feel well prepared to teach the topic in a way which is 'easy' for students to understand.
- To make the class effective and creative, the upper primary science teachers must change their way of teaching about the topic circute and its types in their class rooms.
- Lack of interaction with student regards to any doubts or clarification while teaching the concept using lecture method.
- Student thinking can also be revealed through their hands-on work with science materials.
- We can elicit student thinking when they work on independently or we engage them individually or in small groups.
- The research has identified some specific learning challenges for students related to the topic electric circuit, and has suggested some teaching approaches that might help to overcome them.

## 4. PROBABLE CAUSES

One of the probable reasons, why the upper primary science teachers are unable to teach the science concept innovatively and successfully, is the lack of preparing self-made videos and using web resources related to science subject matter. To successfully engage the students and inculcate an interest in them for the electric circute, the teachers must be well versed in not only the subject matter but also in the preparation of various activities and videos for the students understanding.

Among various reasons, the researcher has made out the following as the probable causes for the problem under study. It may be due to

- The research has identified some specific learning challenges for students, and has suggested some teaching approaches that might help to overcome them. Most of the teachers are selecting lecture method while teaching.
- Lack of facility to use Web resources in teaching circute.
- Lack of ability to prepare self-made videos in teaching simple circute and its types.
- Find it difficult to create self-made videos, making models related to circute in their regular class-room teaching.
- The 21st century requires students to be able to analyse problems. These problems can be analysed if students have the correct understanding.
- Lack of interest in teaching physics by the teacher who had taken Biology in their graduation level.
- Very little opportunity to interact with the learner in their class room.

This is not an exhaustive list of causes and these are causes presumed by the researcher that may contribute to the problem in their own way.

## 5. DEVELOPMENT OF PROPOSITIONS

Despite the fact that the researcher has classified the probable causes, she is aware that various facts are operating together in enhancing the effectiveness of teaching methods among the upper primary science teachers. Hence the following approaches are proposed:

- Teachers can use handson model making method to deliver course information that can be extremely helpful in opening up class time. Lectures and other introductory information can be viewed before class, which allows for more practice- and skill-related class activities.
- Technology has brought rapid changes in the field of teaching and learning processes. Each Teacher must practice to develop their practical skill, and also make possible arrangements in using learning kits and technology available in their school campus
- Guidance would be provided effectively for the teachers in relation to preparing self-made ppt related to difficult science concept.
- PPT increase student engagement, which in turn helps boost achievement. If students are interested in the material, they will process and remember it better.

As a Practitioner, the researcher feels that she can attempt to teach a model class explaining the electric circute and its type. The researcher felt that all the above said skills of upper primary students can easily be enhanced through model making method.

# 6. ACTION HYPOTHESIS

Solving the Problem faced by VIII Standared students in understanding the types of Circuit using Model Making Method.

If Model Making Method is used in teaching simple circutes and its type and the skill of utilizing common Computer Software (Videos and Power point), will be enhance the understanding of the topic.

## 7. PLANNING FOR INTERVENTION

The prime aim of doing any action research in the field of education is improving the school practices. As a matter of fact, action research is widely used in education, especially by teachers who use it to improve their teaching and learning process. Having this view in mind, the researcher had opted 14 upper primary students (VIII standared) from Panchayat Union Middle schools, Kumarapuram, Radhapuram block, Tirunelveli district, constitute the target group for the present study.

The awareness of the suitable uses of web resources, handson model making method in teaching Electric circute and its type is minimal. They all felt that lecture method of teaching alone would enhance teaching skills.

Since this action research is to enhance the skill of understanding upper primary students themselves it was decided to have a motivation session.

# 8. EXECUTION OF INTERVENTION

## 8.1. Stages Involved

The following stages have been involved in the action research

1. Preparation of the assessment items.
2. Identifying the problem in framing questions.
3. Conducting pre-test.
4. Planning of intervention.
5. Execution of intervention.
6. Conducting post-test.
7. Comparing the performance of the pre-test and post-test scorings.
8. Finding the effects of using model making methodand self-made videos in teaching.

## 8.2. Target Group

Fourteen upper primary students in Panchayat Union Middle schools, Kumarapuram, Radhapuram block, Tirunelveli district constitute the target group for the present study. The target group includes 7 male students and 7 female students.

## 8.3. Tools Used

In order to produce effectiveness in teaching the concept simple circute and its types, the researcher prepared ppt, self-made videos for the physics concept circute and its types. Pre-test was prepared and administered at the entry. For each students the circulatory elements were given to make a model of simple circute, series circute, parallel circute. Post-test is conducted at the exit level to compare the effectiveness, before and

after interventions. The test consisted of ten multiple choice questions includes lower order and higher order questions.

## 8.4 Statistical Techniques Applied

The following statistical techniques were used for analysing the collected data in the form of Pre-tests and Post-tests.

### 8.4.1 Percentage Analysis

The percentage analysis has been made use of in this action research.

## 8.5 Procedure of Interventions

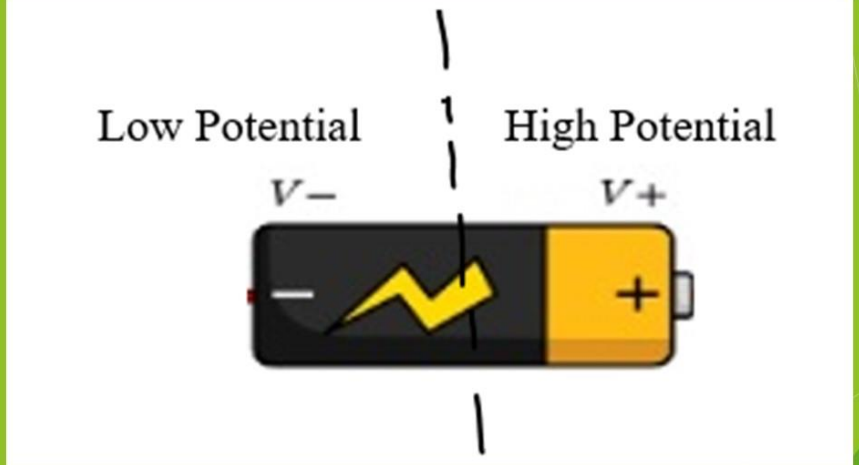
The following stages have been involved in the action research

- Interventions, the interventions planned to adopt in this study are,
    a) Power point presentation
    b) Self-made Videos made by the investigator
    c) Materials are given to each target group and gave guidelines for making models of Simple circute, Sereis circute and parallel circute.

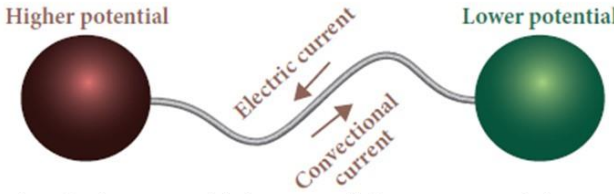
**a) Power point presentation**

Types of circutes were explained by using PPT with coloured visual slides.

## Electric Circuits

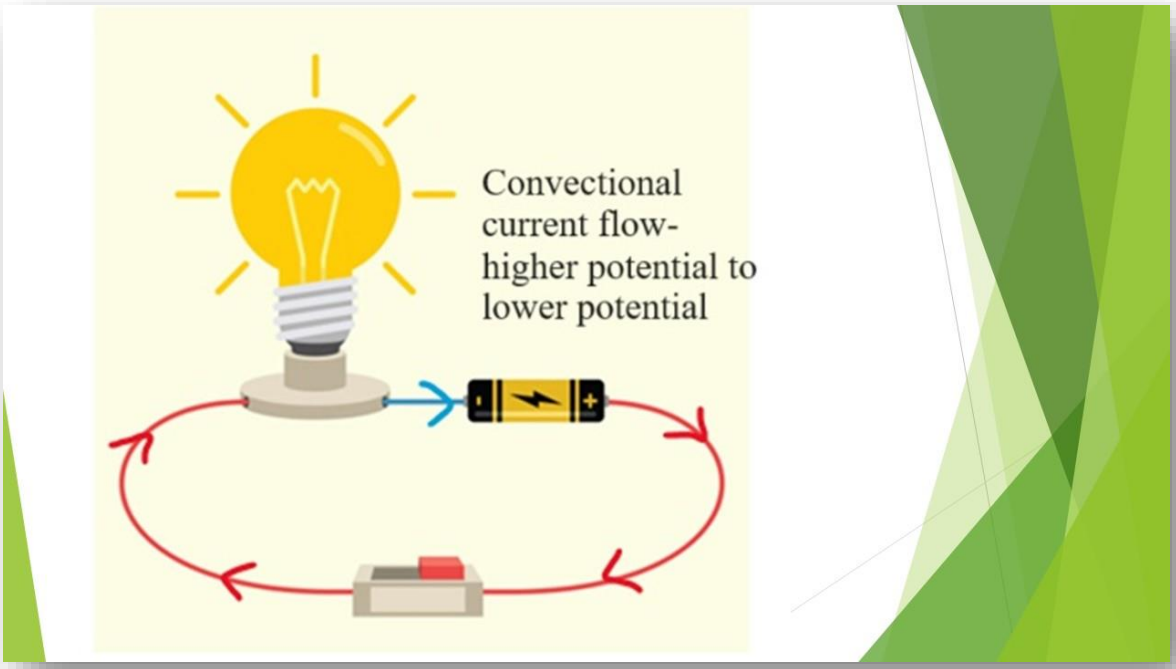


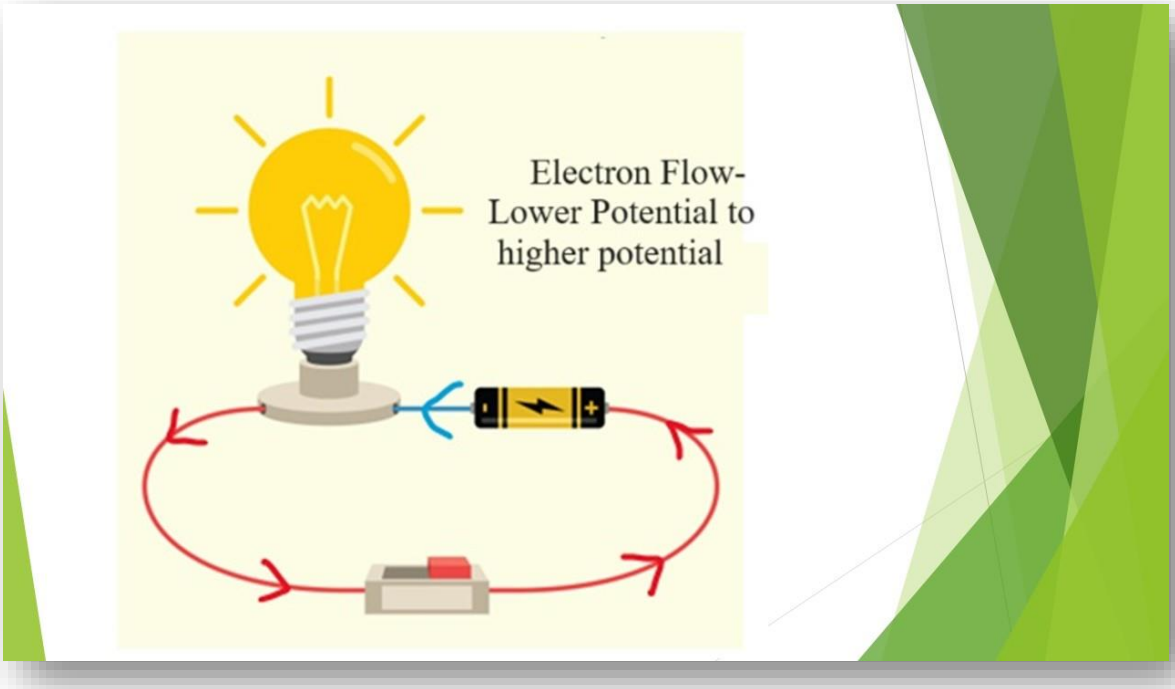

❖ when two oppositely charged spheres are connected by a metal wire, electrons flow from the sphere which is at lower potential to the sphere at higher potential




❖ If two terminals of a battery which are at different potential are connected by a metallic wire, electrons will flow from negative terminal to positive terminal.

❖ Electric circuit -electrons flow from one terminal to another terminal of the source.


Convectional
current flow-
higher potential to
lower potential


Electron Flow-
Lower Potential to
higher potential

## Four elements of simple circuit

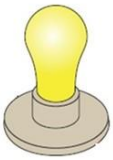
1. Battery

(source of electricity)

3.wire

a path or conductor through which electricity flows

2. Electrical resistor (lamp)

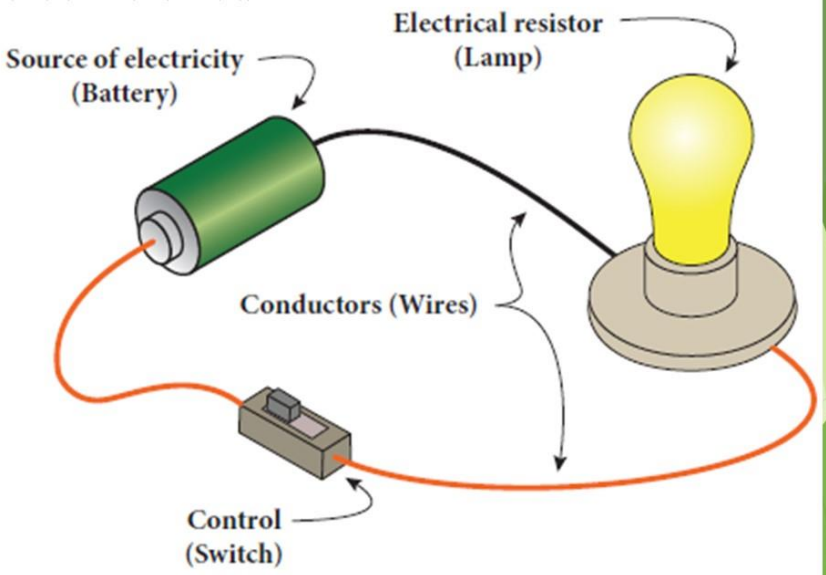


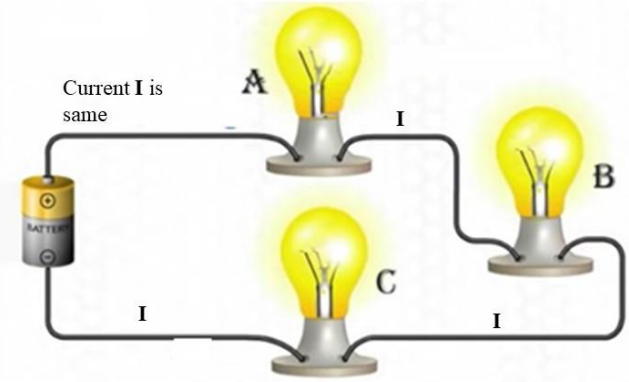
(device that requires electricity to operate)

4.Switch

(to start, stop and regulate the electric current)

## Simple electric circuit

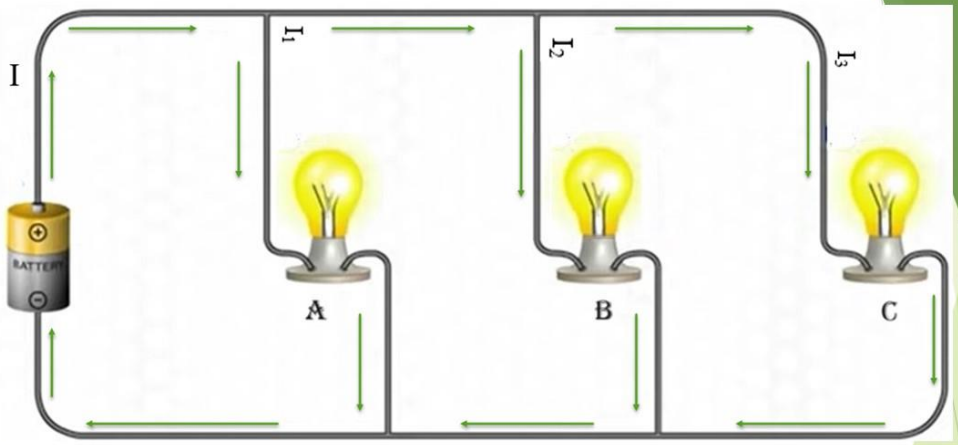





A series circuit is one that has more than one resistor (bulb) but only one path through which the electrons can travel

## Series circuit

- A series circuit is one that has more than one resistor (bulb) but only one path through which the electrons can travel.
- All the components in a series circuit are connected end to end.
- Current through the circuit remains same throughout the circuit. But, the voltage gets divided across the bulbs in the circuit
- In this series circuit, charges (electrons) from the battery have only one path to travel.
- If one bulb in the circuit is unscrewed, the current flow to another bulb would be interrupted
- If the lights are in a series circuit, one burned out bulb will keep all the lights off. If the number of bulbs in a circuit with a battery increases, the light will be dimmer because many resistors are acting on the same power from the battery.




- In a parallel circuit, there is more than one resistor (bulb) and they are arranged on many paths.
- This means charges (electrons) can travel from one end of the cell through many branches to the other end of the cell.

## parallel circuit

- Across the resistors (bulbs) remains the same but the current flowing through the circuit gets divided across each resistor.
- Even when one resistor (bulb) burns out, the other bulbs will work because the electricity is not flowing through only one path.
- All the light bulbs in our homes are connected in parallel circuit.
- The bulbs in a parallel circuit do not dim out as in series circuits
- Let us consider three bulbs connected in series. Let V be the voltage across the bulbs and $I_1$, $I_2$, $I_3$ be the current across each bulb.
- The current I from the battery is the total of the individual current flowing through the resistances (bulbs).

$$I = I_1 + I_2 + I_3$$

Let us consider three bulbs connected in series. Let I be the current through the circuit and $V_1$ is 3 volts $V_2$ is 2 volts $V_3$ is 2 volts be the voltage across each bulb. The supply voltage V is the total of the individual voltage drops across the resistances (bulbs). $V = V_1 + V_2 + V_3$

❖ Total voltage V = 3+2+2
= 7 volts

Let us consider three bulbs connected in parallel. Let V be the voltage across the bulbs and $I_1$ is 1 Ampere, $I_2$ is 2 Ampere, $I_3$ is 3 Ampere be the current through each bulb. Find out the current I from the battery.

I = 1+2+3
= 6 Ampere

**b) Videos made by the investigator**

Video was edited by the investigator and was played in the classroom.

**c) Model Making**

The four electric elements are given to each student.

I. 9v battery =1
II. Bulp with holder =7
III. Switch =5
IV. Wire =1 pack
V. Board=3

By using the above electric elements, students were making simple electric circute, series circute with 3 bulbs, and parallel circute with 3 bulbs. A demo classes was made by the investigator how to make circutes. The science teacher and also the investigator assist to help the students for making the models. By using their individual model, the investigator taught the difference between series and parallel circutes.


**Post-test.** After conducting all these activities i.e., the power point, video, model making for science concept, a post test was conducted to assess the nature of rectification of problem faced by the upper primary students (STD -VIII) while teaching Electric circute and its type.

## 9. DATA COLLECTION AND DATA ANALYSIS

The collected data were processed and analysed with the help of percentage and graphical representation in order to find out the meaningful interpretation of the raw scores. Pre-test and Post –test was conducted using the tool designed by the researcher. Fourteen students appeared. The two test scores were tabulated and used for analysis.

**Table-1**. ***Pre-test and Post test scores***

| S.No | Name | Gender | Pre-test Score (100) | Post-test Score (100) |
|---|---|---|---|---|
| 1. | Saravanan.G | Male | 55 | 90 |
| 2 | Manikandan.M | Male | 60 | 100 |
| 3 | Hari Nithish.M | Male | 50 | 100 |
| 4 | Nambirajan.J | Male | 20 | 35 |
| 5. | Jeffreen Paul Kingston.C | Male | 20 | 50 |
| 6. | Muhammad Navabal.N | Male | 25 | 55 |
| 7. | Arulrubies.B | Male | 60 | 100 |
| 8. | Ashwini.S | Female | 35 | 50 |
| 9. | Gopika.M | Female | 50 | 90 |
| 10 | Muthu Nethra.R | Female | 30 | 60 |
| 11. | Thasleema Srin.A | Female | 40 | 100 |
| 12. | Priya Dharshini.R | Female | 10 | 40 |
| 13. | Sathya Sri.G | Female | 20 | 60 |
| 14 | Reshma kayathri.M | Female | 20 | 70 |

*Table-1 pre-test and post test score in percentage*

| Test | Total Sample | Low | | Average | | High | |
|---|---|---|---|---|---|---|---|
| | | NO | % | NO | % | NO | % |
| Pre-Test | 14 | 8 | 57 | 4 | 29 | 2 | 14 |
| Post-Test | 14 | 1 | 7 | 4 | 29 | 9 | 64 |

*Figure-1*

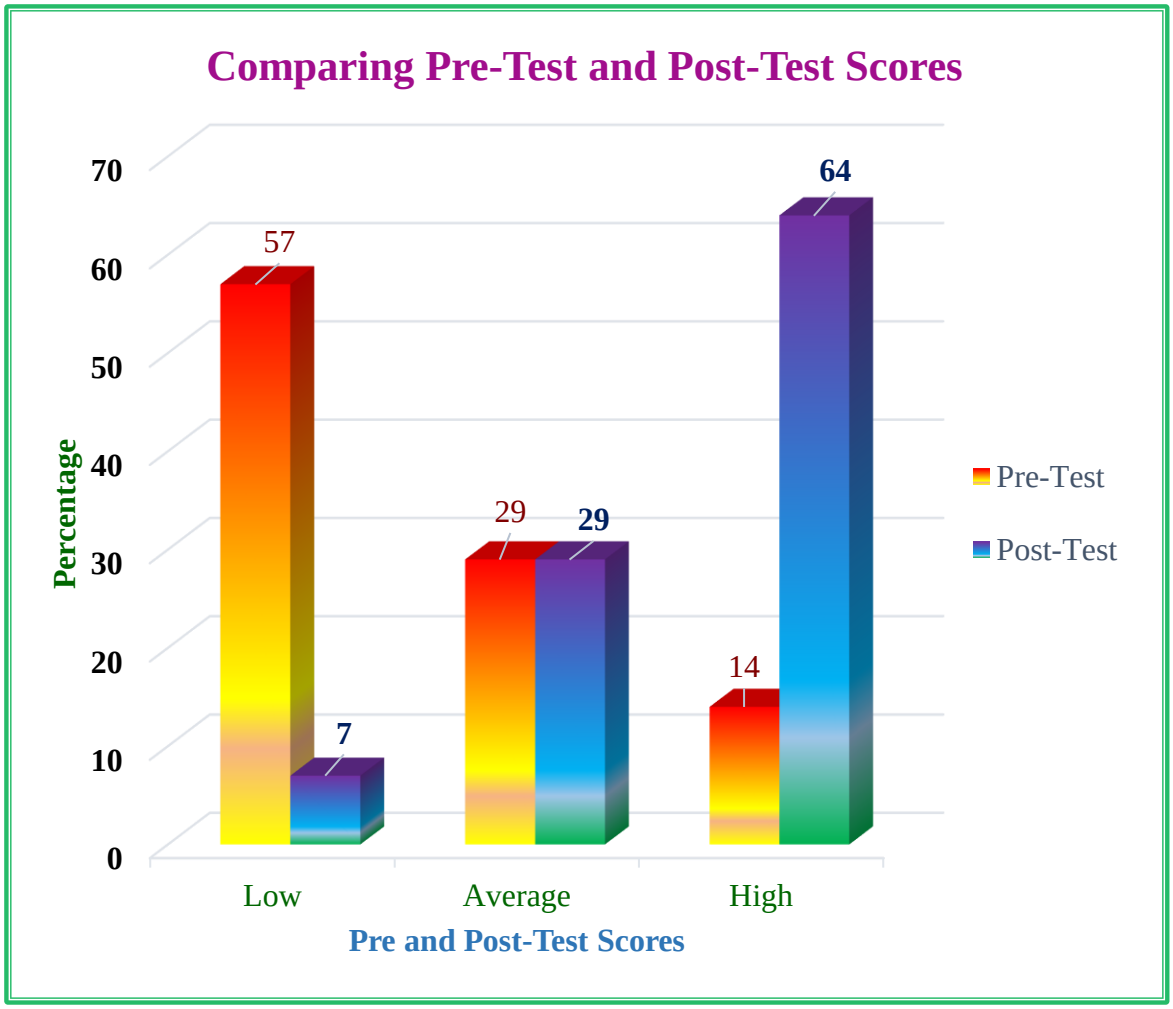
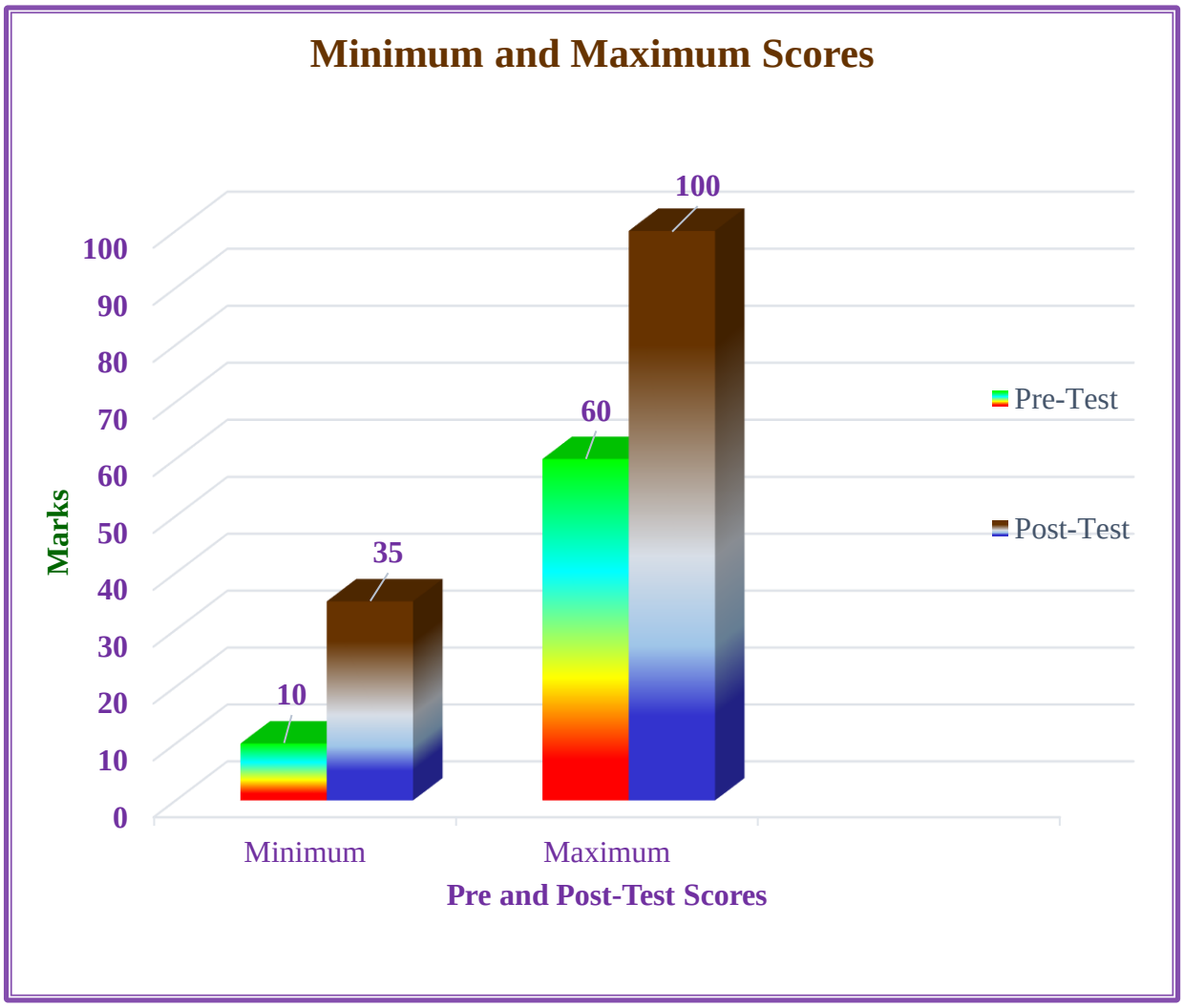


***Table-2 Minimum and maximum Score of pre-test and post-test***

| Test | Minimum scores | Maximum Scores |
|---|---|---|
| Pre-Test | 10 | 60 |
| Post-Test | 35 | 100 |

***Figure-2***



## 10. DECISION MAKING AND REFLECTION

The action research deals with the issues of using Web resources and self -made videos in the learning process. It represents basic information about the possibility to create comfortable environments for learning processes by creating information and communication learning environments. The tasks that inspired genuine collaborative learning were characterized by a certain complexity in terms of multimodality and technology, or professional knowledge combining academic and practical experience. The investigator stresses the main advantages of use of Web resources and self -made videos in the learning process. In general, self-made videos have increased the propensity of teachers to think about classroom-based science teaching and learning over an extended period of time.

Studies have shown that the use of short video clips allows for more efficient processing and memory recall. The visual and auditory nature of videos appeals to a wide audience and allows each user to process information in a way that's natural to them. In a nutshell, videos are good teachers, the inventions have brought about improvement to a maximum level. As the researcher has replanned, the interventions have gradually yielded the expected outcome among the target group. Everything went on well as expected. Their achievement level of developing the skill has almost tripled. Hence the researcher has decided to end the action research and not to proceed further to the next spiral.

## 11. TERMINATION

1. Pre-test findings show that 57 percent of the students are under low level, 29 percent of the students are under average level, 14 percent of the students are under high level. In post test scores 7 percent of the students are under low level, 29 percent of the students are under average level, 64 percent of the students are under high level. This shows that all students are improved in better level.
2. The minimum score in pre-test is 10, and the minimum score in post-test is 35. The maximum score in pre-test is 60, and the maximum score in post-test is 100.Thus it is clear that using different activities (ppt, Model making method, ppt, self-made video) enhance the understanding of science concept clearly.

## 12. NET GAINS OF PRESENT EFFORT

This study helps the teachers to know, activity-based learning (handson making models) is more effective in teaching the electric circute and make the learning process easier. The teachers could realize ppt and model making method might increase students' engagement, which in turn helps boost achievement. If students are interested in making models using given material, they will process and remember it better. They offer the flexibility to have class discussions or review particular areas.

Student can predict the behavior of the circuit, at least in terms of electrical properties, from the circute model. The Science teacher was also motivated to use teaching methods other than the lecture method. Students are also found that self model making increase knowledge retention, since they can be stopped and replayed as many times as needed. They can also be reviewed long after the initial lesson was taught.

When there are ppt and self-made models, students have the opportunity to apply them during the learning process. Overall, researchers are able to prove the effectiveness of using the ppt, self-made models to improve the performance of the student while teaching the topic Electric circute. Making models for physics topics must help the students to understand the concept clearly and thoroughly. Model making method ultimately consist in providing ways to create and use material and pictorial forms of visualization of objects and events.

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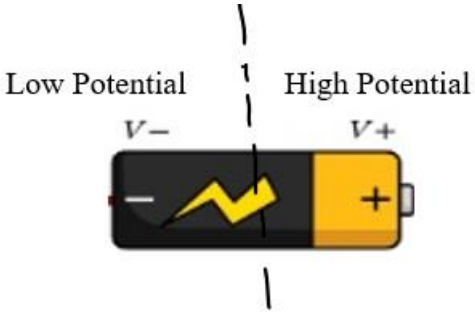
# APPENDIX

## PRE-TEST AND POST-TEST QUESTIONNAIRE

### THE TYPES OF CIRCUIT

### STANDARED-VIII

**I Choose the best Answer** **Marks:10*2=20**

1. 

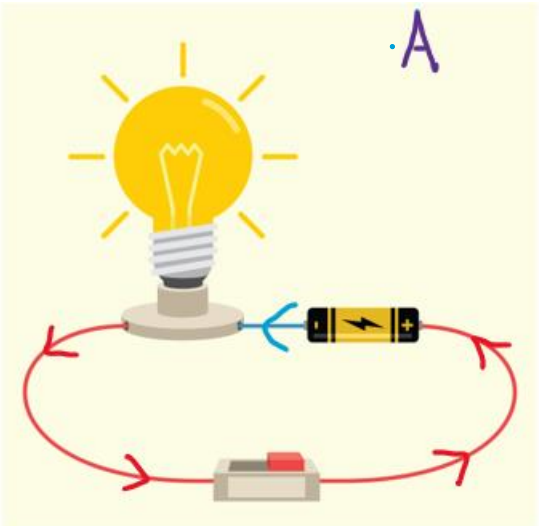

Which Statements are Correct according to the battery

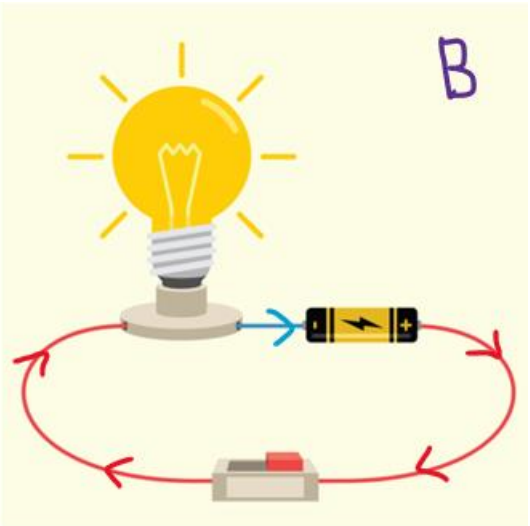
- Battery has two Potential end,higher and lower potential end
- Lower Potential end has more electrons
- Higher potential end has more electrons

A. Statement i and iii
B. Statement i and ii
C. Statement i,ii,iii

2. A) when two oppositely charged spheres are connected by a metal wire, Electrons flow from the sphere which is at lower potential to the sphere at higher potential.

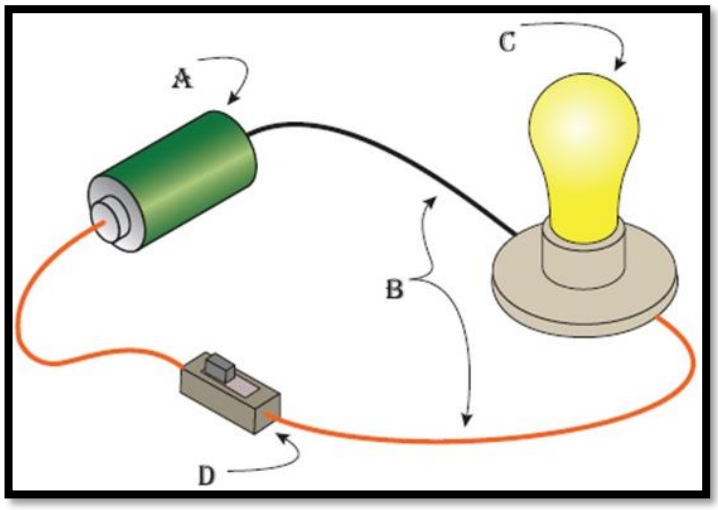
Which diagram is correct A or B according to the Electon flow?




i. Diagram A is Correct
ii. Diagram B is Correct

3.




The four main elements found in a simple electric circuit are marked as A, B, C, D in the figure. Which of the following letters represents electrical resistor?

i. A
ii. B
iii. C
iv. D

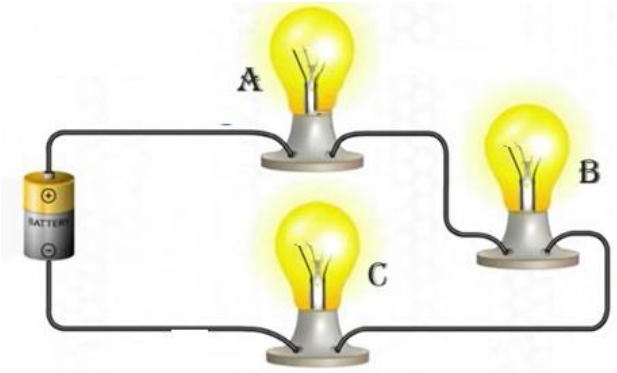
4. Which electric elements are used to start, stop and regulate the electric current in an electric circuit

i. electrical resistor
ii. switch
iii. electric wire
iv. battery

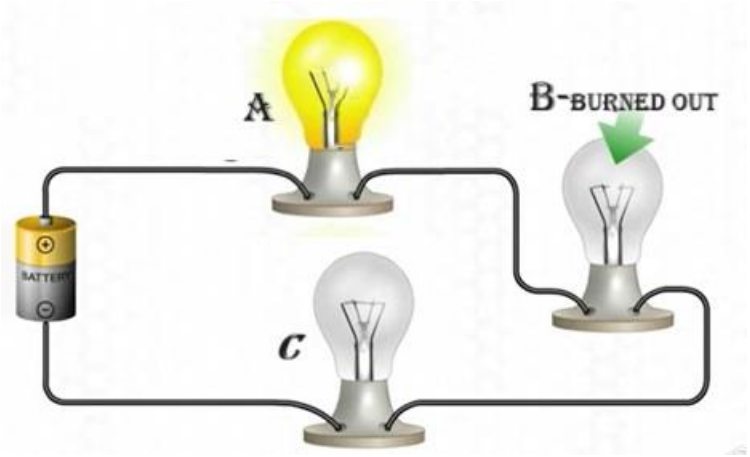
5. A) A series circuit is one that has more than one resistor (bulb) but only one path through which the electrons can travel.

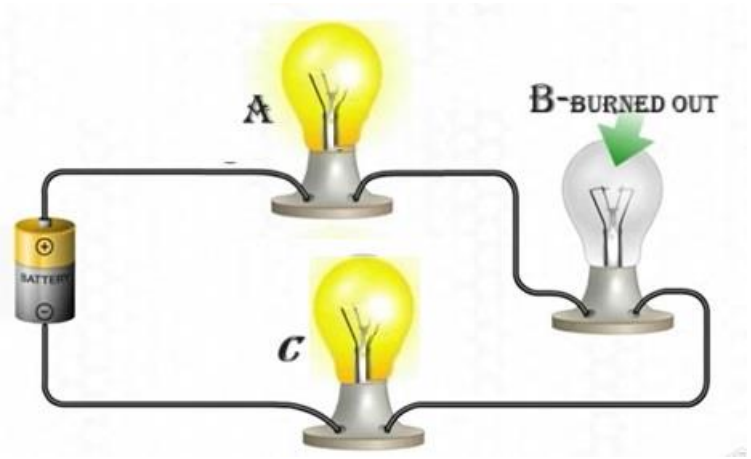
B) We saw that in series circuit, current will be different across each resistance

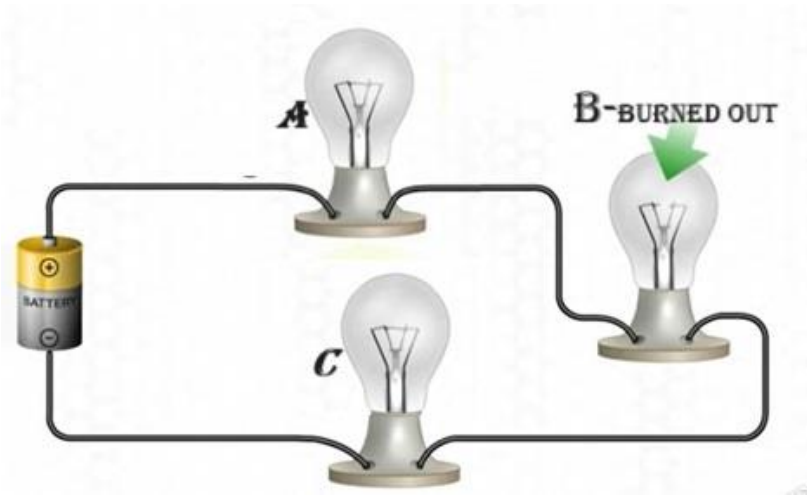
i. A-True, B-False
ii. Both A and B -True
iii. Both A and B -False
iv. A- False, B- True

6. 

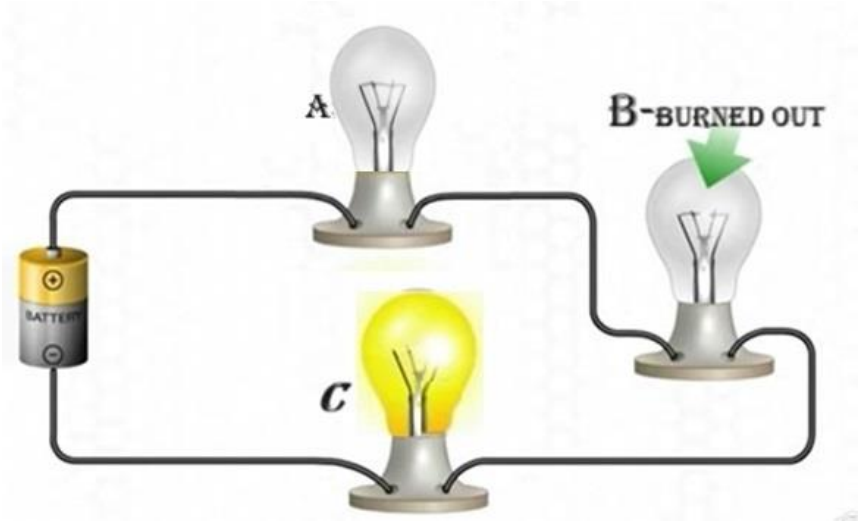

A, B, C are lighted bulbs in a series circute. Which diagram represents the lighting position of bulbs A and C due to a burned-out bulb B?

i. 

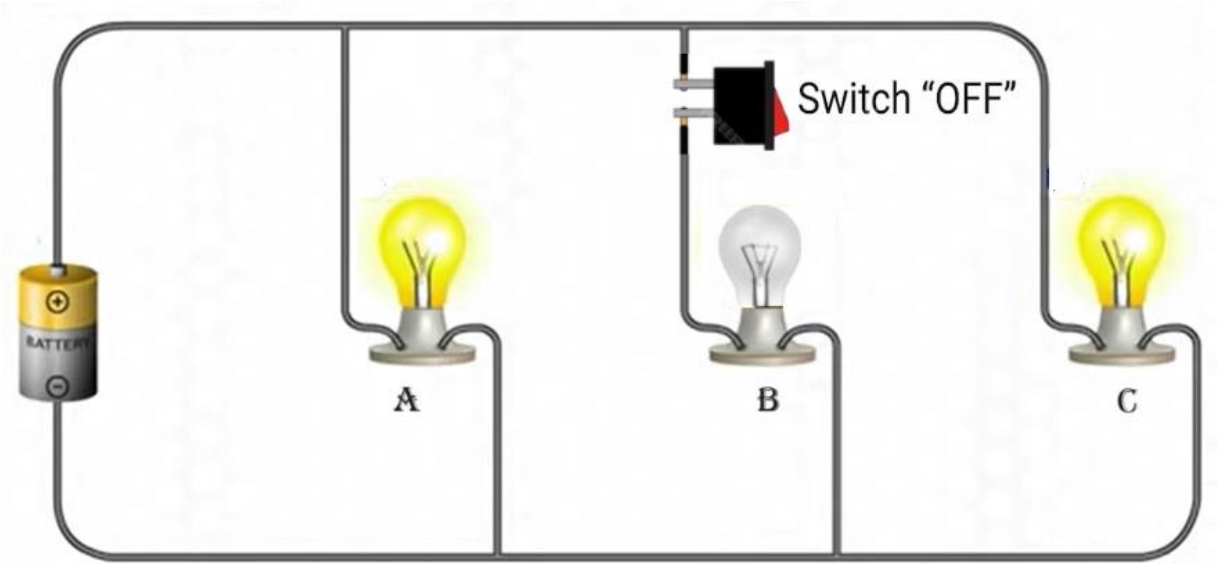

ii. 


iii. 

iv.




7.




A) In a parallel circuit, there is more than one resistor (bulb-A, B, C) and they are arranged on many paths. From the diagram we will notice that even when one resistor (bulb-B) switched out, the other bulbs A & C will work.

B) Because the electricity is not flowing through only one path. This means charges (electrons) can travel from one end of the cell through many branches to the other end of the cell.

Select the appropriate answer from the options given below for the above statements.

i. Statement A is Correct, B is not the correct reason for A

ii. Statement A and B is wrong

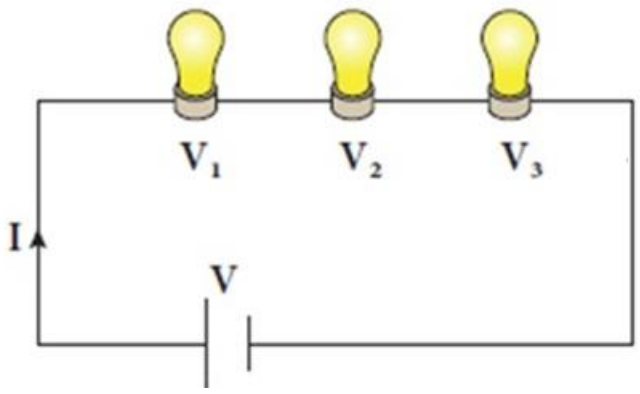
iii. Statement A is Correct, B is the correct reason for A

8. In series Connection bulbs in series dim out due to the changing voltage difference between each bulb in the circuit.

i. Statement is correct

ii. Statement is wrong

9.




$V_1 = 2$ volts,
$V_2 = 2$ volts,
$V_3 = 2$ volts

Let us consider three bulbs connected in series. Let I be the current through the circuit and $V_1$ is 2 volts, $V_2$ is 2 volts, $V_3$ is 2 voltsbe the voltage across each bulb. Find out the supply voltage V from the battery ?

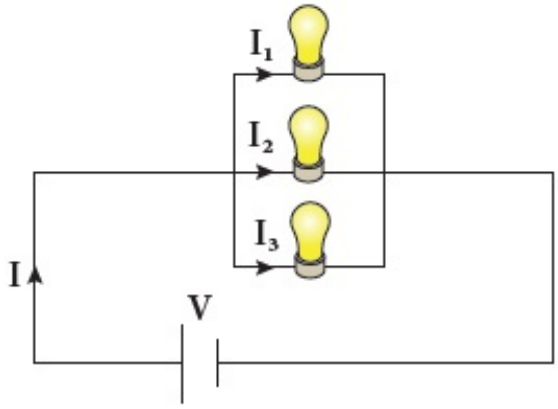
i. 4

ii. 2

iii. 6

iv. 8

10.




$I_1 = 1$ Ampere

$I_2 = 2$ Ampere

$I_3 = 3$ Ampere

Let us consider three bulbs connected in parallel. Let V be the voltage across the bulbs and $I_1$ is 1 Ampere, $I_2$ is 2 Ampere, $I_3$ is 3 Ampere be the current through each bulb. Find out the current I from the battery.

i. 4

ii. 6

iii. 3

iv. 5

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**Photo Gallary:**


Grapes

# ACTION RESEARCH ABSTRACT-APRIL 2024

**Title of the Action research:** **Solving the Problem faced by VIII Standared students in understanding the types of Circuit using Model Making Method**

**Name of the Investigator :** S.Sahayaponmalar
Lecturer
DIET,Munanjipatti

**Subject** Science

**Abstract**

***Target group*:** Fourteen upper primary students studying VIII standared (7 boys and 7 girls) in Panchayat Union Middle school, Radhapuram block, Tirunelveli district constitute the target group for the present study.

***Tool:*** Questionnaire with ten multiple choices was prepared from Tamil Nadu Text Book. Pre-test and post-test were administered to the sample before and after interventions.

***Methodology***: Pre-test and post-test, single group Experimental Design was adopted.

***Intervention:*** The interventions planned to adopt in this study are,

a) Power point presentation

b) Self-made Video made by the investigator

c) Materials are given to each target group and gave guidelines for making models of Simple circute, Sereis circute and parallel circute.

**Findings**

1. Pre-test findings show that 57 percent of the students are under low level, 29 percent of the students are under average level, 14 percent of the students are under high level. In post test scores 7 percent of the students are under low level, 29 percent of the students are under average level, 64 percent of the students are under high level. This shows that all students are improved in better level.

2. The minimum score in pre-test is 10, and the minimum score in post-test is 35. The maximum score in pre-test is 60, and the maximum score in post-test is 100.Thus it is clear that using different activities (ppt, Model making method, ppt, self-made video) enhance the understanding of science concept clearly.

**Conclusion:**

This study helps the students to know, how to prepare models in science concept. It also helps the students to analyse, the hands-on model making may create a more engaging sensory experience than using print materials alone. The students also found that self invovement in making models in electric circute using necessary elements might increase knowledge retention, through idea about the science concept basically. since they can be stopped and replayed as many times as needed. The teachers could realize videos increase student engagement, which in turn helps boost achievement. If students are interested in the material, they will process and remember it better. Student can predict the behavior of the circuit, at least in terms of electrical properties, from the circute model. Students are also found that

self model making increase knowledge retention, since they can be stopped and replayed as many times as needed. They can also be reviewed long after the initial lesson was taught.

When there are ppt and self-made model, students have the opportunity to apply them during the learning process. Overall, researchers are able to prove the effectiveness of using the ppt, self-made models to improve the performance of the student while teaching the topic Electric circute. Making models for physics topics must help the students to understand the concept clearly and thoroughly. Model making method ultimately consist in providing ways to create and use material and pictorial forms of visualization of objects and events.