



J6 STEAM PROJECT - SOLAR ENERGY CONVERSION EFFICIENCY BY SOLAR PANELS

STEWARDS POOI KEI PRIMARY SCHOOL

HEAT ENERGY AND LIGHT ENERGY ARE TWO FORMS OF SOLAR ENERGY.

LIGHT ENERGY OF SOLAR ENERGY IS CONVERTED INTO ELECTRICAL ENERGY BY SOLAR PANELS.



HEAT ENERGY AND **LIGHT** ENERGY ARE TWO FORMS OF SOLAR ENERGY.

LIGHT ENERGY OF SOLAR ENERGY IS CONVERTED INTO **ELECTRICAL** ENERGY BY SOLAR PANELS.



ADVANTAGES

1. CLEAN AND RENEWABLE ENERGY SOURCE
2. REDUCES ELECTRICITY BILLS
3. LOW LEVEL OF POLLUTION
4. LOW MAINTENANCE COSTS



DISADVANTAGES

1. HIGH COST OF INSTALLATION

2. WEATHER DEPENDENT

3. USES A LOT OF SPACE

4. LOW ENERGY CONVERSION EFFICIENCY



FACTORS AFFECTED THE ENERGY CONVERSION EFFICIENCY BY SOLAR PANELS

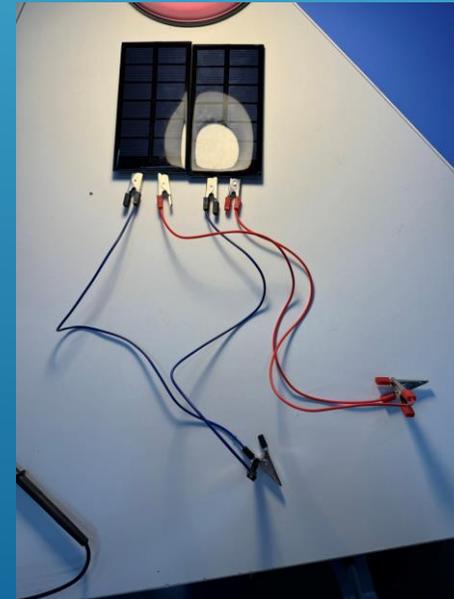
1. TYPES
2. LIFETIME
3. CLEANING
4. AREA OR NUMBER OF PANELS
5. ORIENTATION
6. DISTANCES BETWEEN PANELS AND LIGHT SOURCES
7. WEATHER CONDITION
8. TEMPERATURE



MEASUREMENT OF ELECTRICAL ENERGY GENERATED BY SOLAR PANELS

Using voltmeter to measure voltages connected with
the solar panels under the light sources

We will use a lamp instead of the Sun as the light source



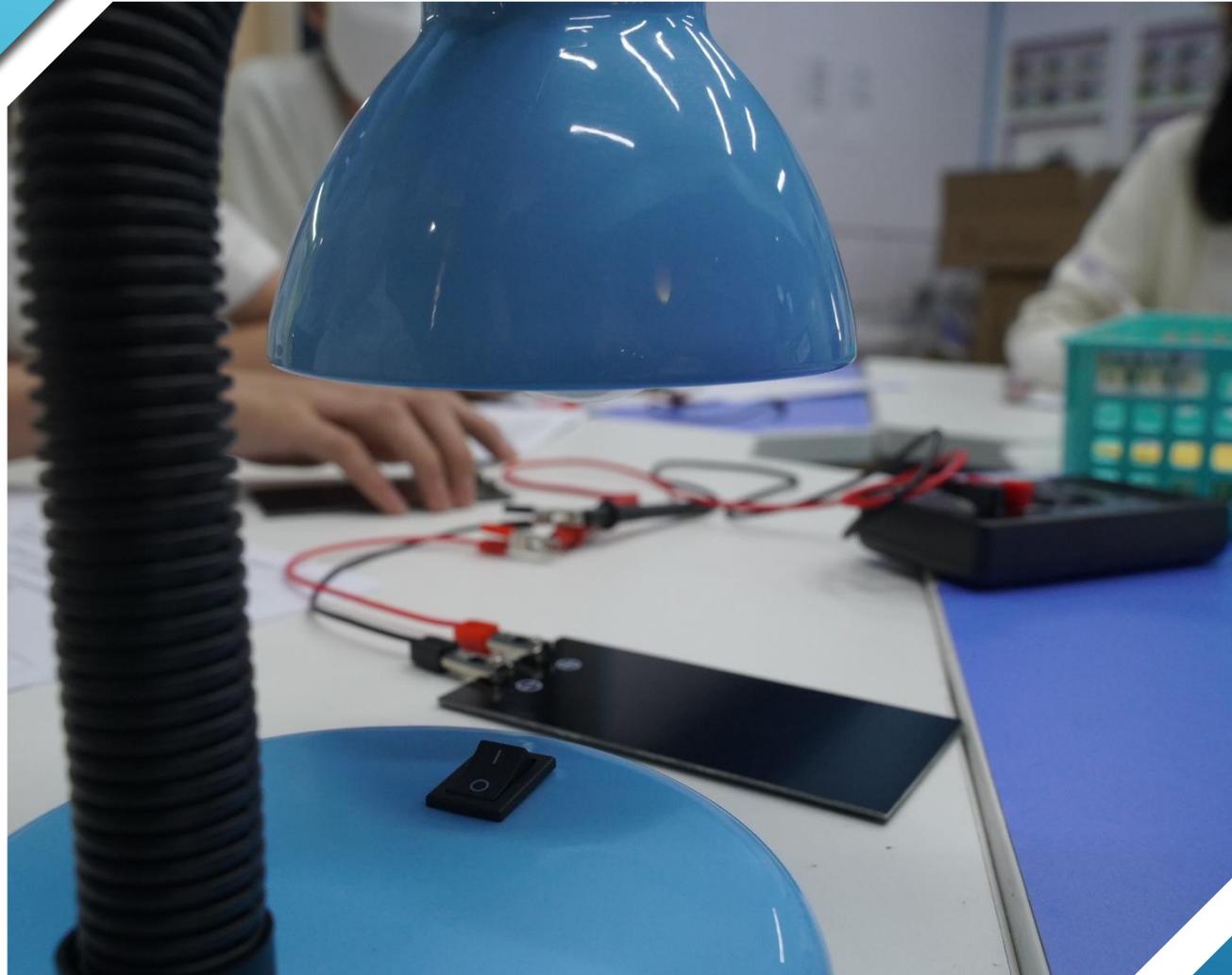
IDENTIFYING VARIABLES OF A FAIR TEST

Independent variables – Unique factor to be changed

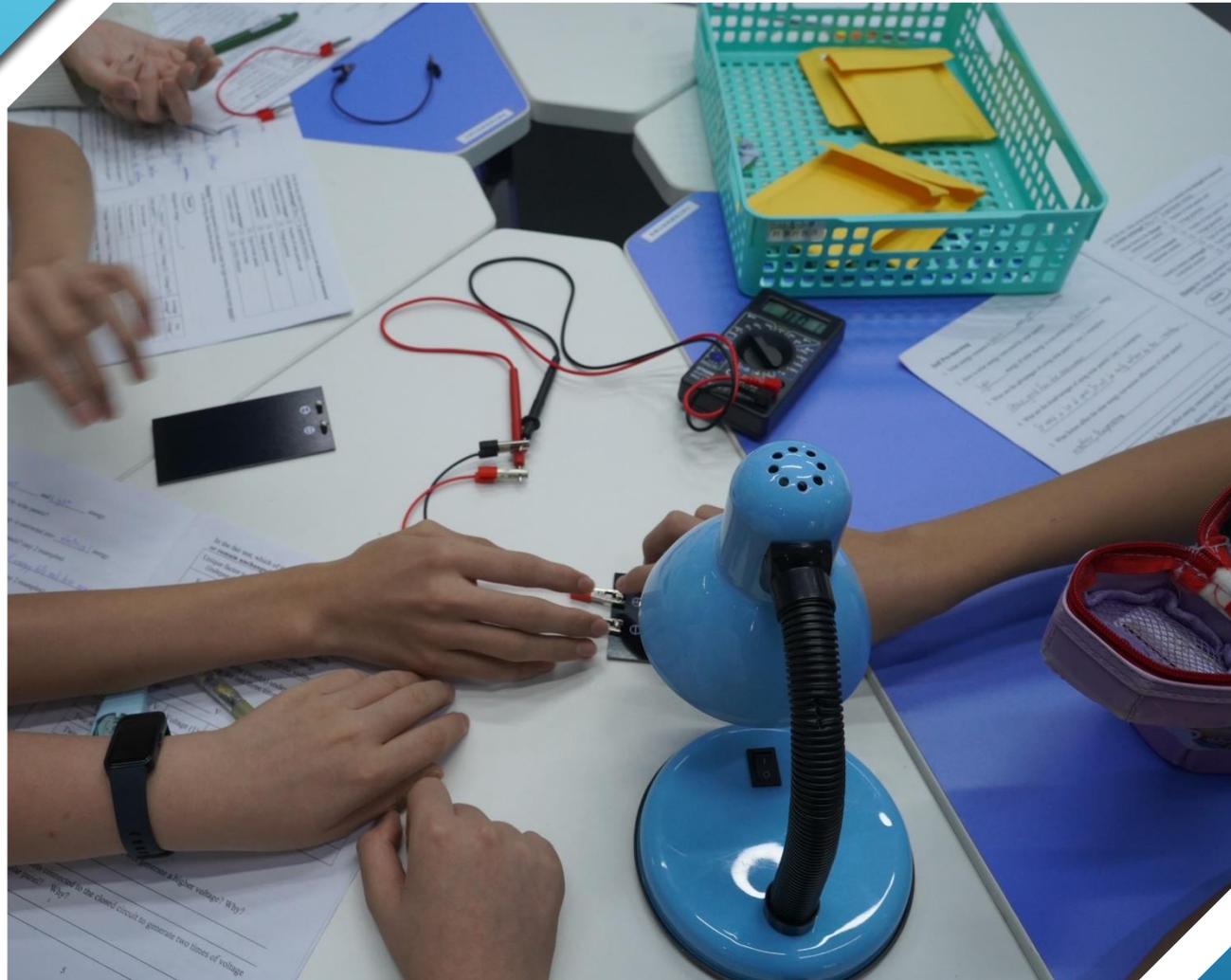
(orientation, distance, temperature...etc)

Dependent variables – Factor to be measured
(voltage)

Control variables - Factor(s) remain unchanged
(solar panels, voltmeter, wires, lamp...etc)



▶ They measured the background voltage before the fair test.



▶ They measure the voltage generated by **one** solar panel. Repeat to take the reading three times.



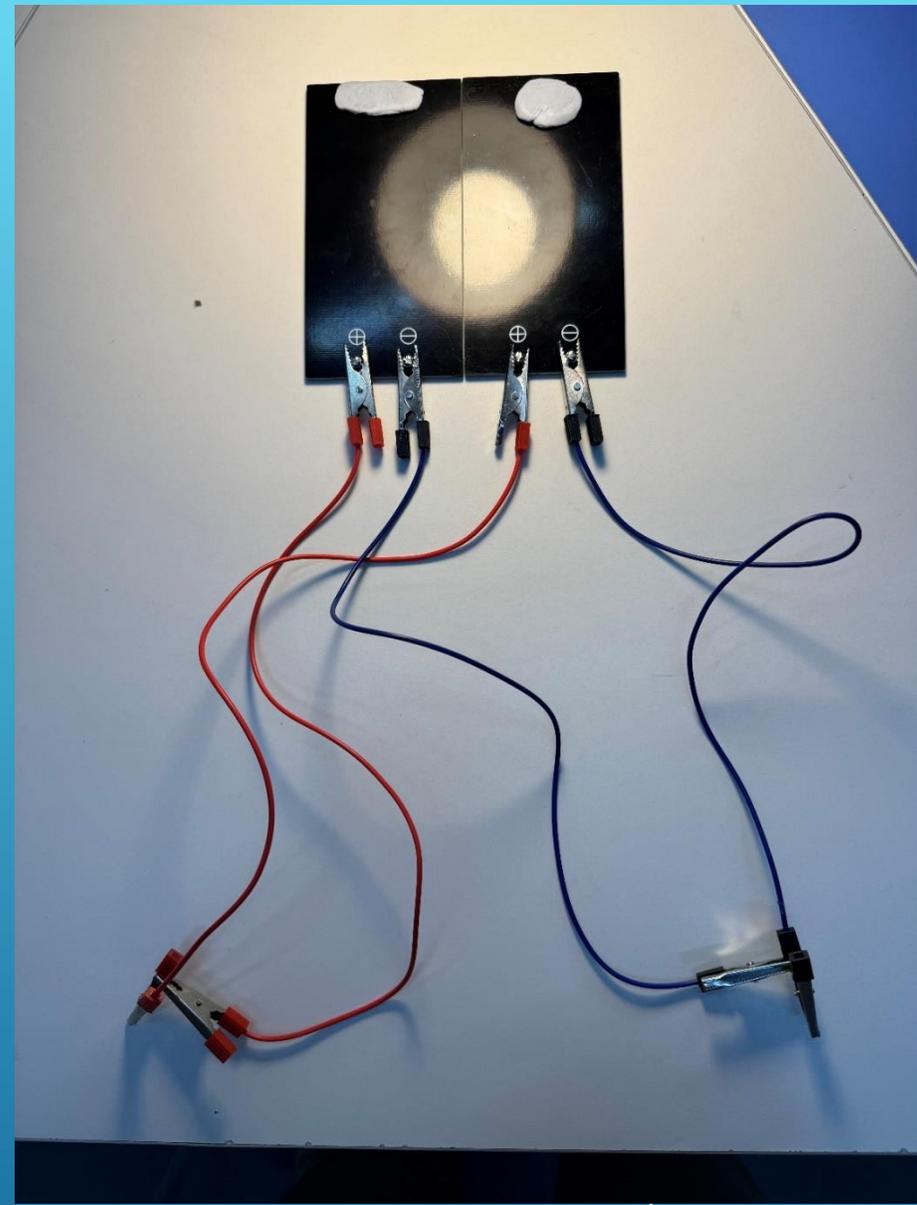
► They measure the voltage generated by one solar panel. Repeat to take the reading three times.



▶ They measure the voltage generated by two solar panels with two types of connection. Repeat to take the reading three times.



Connection 1



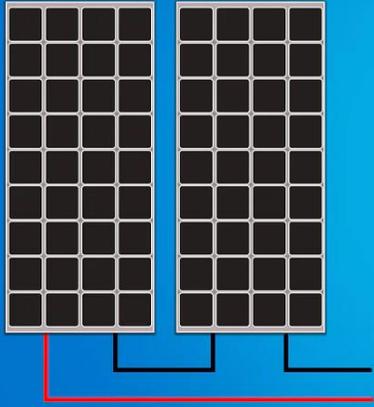
Connection 2

Volt(s) / V Solar panel(s)	Voltage (1)	Voltage (2)	Voltage (3)	Average voltage*	Net voltage ^
One solar panel	3.14	3.13	3.14	3.14	3.13
Two solar panels (1)	6.16	6.15	6.15	6.15	6.14
Two solar panels (2)	3.09	3.08	3.08	3.08	3.07

* Average voltage = (Voltage (1) + Voltage (2) + Voltage (3)) ÷ 3

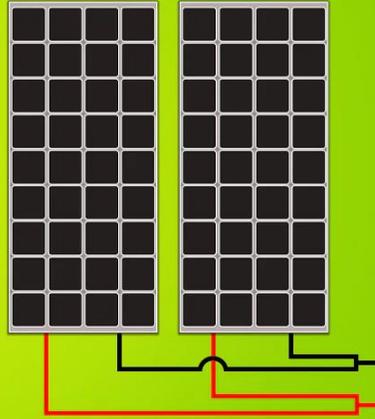
^ Net voltage = Average voltage – Background voltage

SERIES



VS

PARALLEL

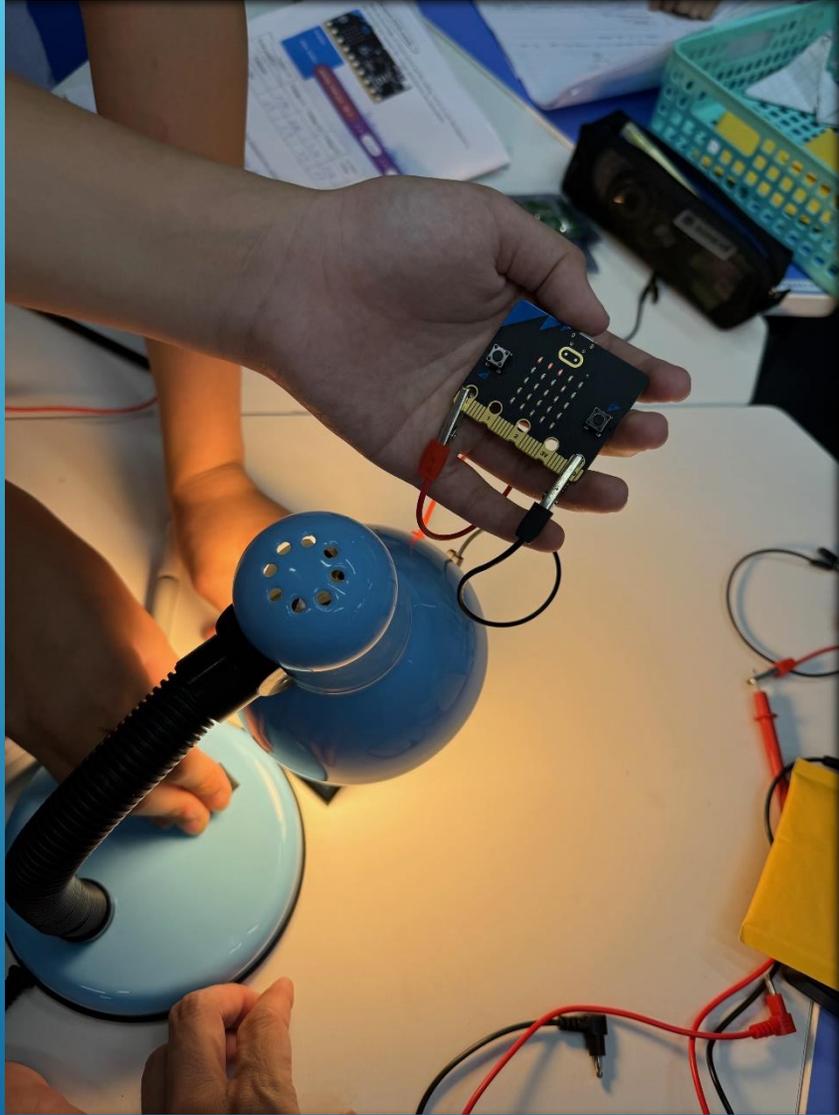


The difference between wiring solar panels in series or parallel is the output voltage. When you wire two panels in series, their output voltages add together. Conversely, when you wire two solar panels in parallel, their output voltages stay as the same as generated by one solar panel.



► What are the other factors affecting energy conversion efficiency of solar panels?

	Voltage (V)	Voltage (V)	Voltage (V)
Weather	Sunny	Rainy (Transparent plastic)	Cloudy (White A4 Paper)
	2.96	2.60	2.60
Temperature	0-4°C	25°C	33°C
	3.35	3.15	3.05
Orientation	0°	45°	90°
	2.92	3.04	3.12
Distance	25 cm	50 cm	75 cm
	2.78	2.54	2.19



► With the knowledge of closed circuit and the coding, we try to code the program to the micro:bit and measure the voltage generated by the solar panels.