



PLK Laws Foundation College  
S.1 Integrated Science  
**S1 Integrated Science STEM Project I**

**THEME:** How building materials relate to the indoor temperature?

**PEDAGOGIES:** Peer-learning (Group work), Inquiry-based Learning, Self-directed learning, Scientific Investigative Experiment, E-learning (Optional)

**SCIENTIFIC ELEMENTS:** STEM, Nature of Science, Scientific Investigation, Fair Tests

**STEM:**

- **Science:** Energy transmission by light rays of different wavelengths, Energy absorption
- **Technology:** Use of various tools and apparatuses for measurement
- **Engineering:** Design the experimental set-up by making proper scaled paper building models
- **Mathematics:** Measurement and Calculation of Changes in Temperature inside paper building models

**MODEL:** BSCS 5E Model

**STAGE I: Engage**

- Engage students by providing photos of buildings made up of different materials and ask them:
  - (i) why the external sides of buildings have different colour?
  - (ii) why the windows of buildings have different colour?



**STAGE II: Explore**

- Ask students the possible way(s) to test with limited materials and apparatuses in school laboratory
- Challenge students the importance and limitations of using models for testing (Nature of Science)
- Instruct students to design the experiment for tests
- Instruct students to make proper scaled paper models for tests
- Students work in groups to carry out their own investigation and interact with other groups



**STAGE III: Explain**

- Based on the experimental results collected, students are required to search for information to formulate scientific explanation for their results



**STAGE IV: Elaborate**

- Elaborate by interesting students about the simple scientific working principle of low-e glass or other relevant examples commonly found in daily life



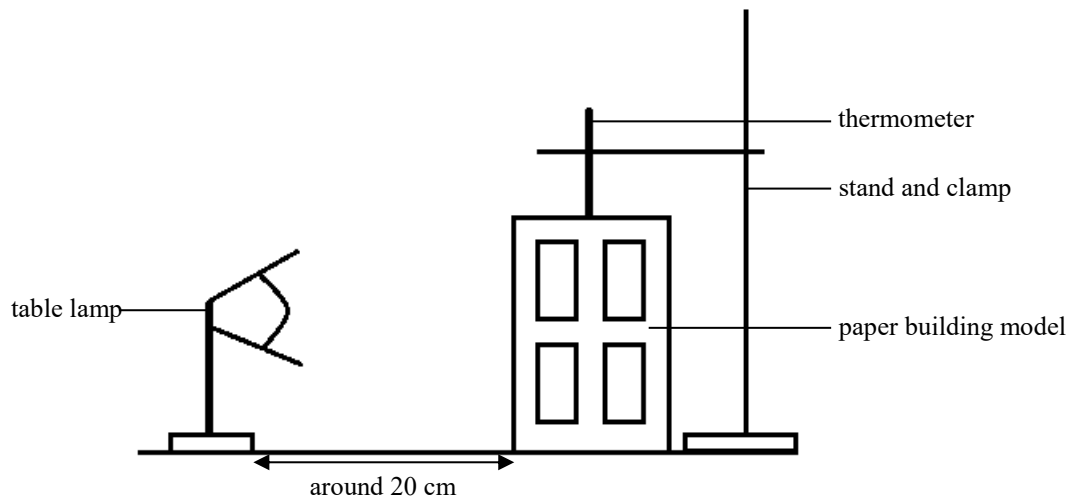
**STAGE V: Evaluate**

- Encourage students to reflect on (i) systematic and (ii) random experimental error and further improvement in the design of the experiment

**LOGISTICS ARRANGEMENT:**

- Divides into groups of three/four. Each group should choose one/more than one factor to be studied. Each group should have at least one control set-up and one testing set-up for the factor to be studied. Different groups study different factors to give diversified results so that students learn from other groups' results.

**PLAUSIBLE EXPERIMENTAL SET-UP:**



**FACTORS TO BE STUDIED:**

- (i) different colour of the external sides of the building model  
(e.g. paper with different colour, paper with shiny surface or dull surface)
- (ii) different colour of the windows of the building model  
(e.g. cellophane paper with different colour)
- (iii) sizes/numbers/distribution of windows  
(e.g. paper building models with different windows made)

**VARIABLES (\*Subject to be changed according to the factor to be studied):**

Independent	Dependent	Controlled
different colour of the external sides/ different colour of the windows/ sizes/numbers/distribution of windows	temperature measured in the center of the model	size of the model, distance between the table lamp and the model, duration of experiment, *material/colour of the paper used, *material/colour of the cellophane paper used, *sizes/numbers/distribution of windows

**E-LEARNING (OPTIONAL):**

- Real-time data collection and analysis can be done by incorporating quantitative measurement of temperature at regular intervals and recorded through Google spreadsheet
- Google spreadsheet for data entry and graph automatically plotted should be prepared in advance
- Google spreadsheet for data entry should be preloaded in tablets
- Wifi connection and several tablets would be required