

Design Thinking: Classroom Windows and Shades

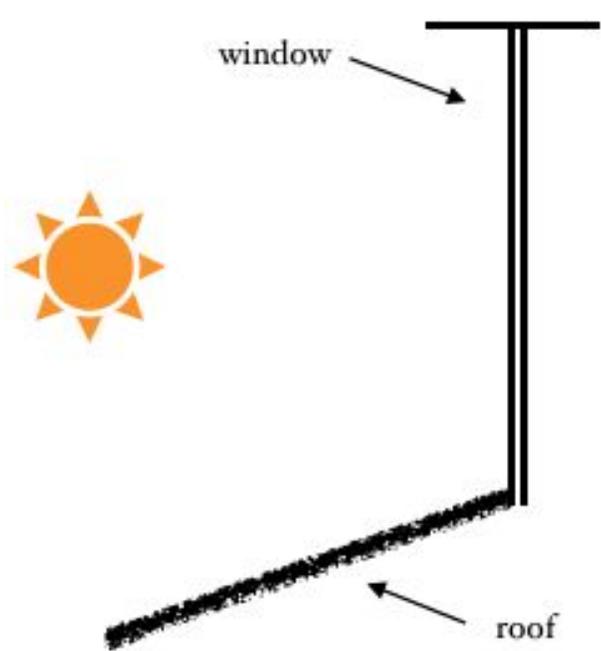
Design Challenge: Redesign to windows and shades in the classroom to improve the learning environment.

Take some time to think about the windows and shades in our classroom. It is so nice to have south facing windows where we are able to get lots of natural light and fresh air. As we have seen this year, though, this can create problems in the learning environment.

1. Discuss and Write - discuss at your table group
 - a. How do we use the windows and shades?
 - b. When and why do we have to open windows or put the shades up or down?

After you have discussed the ideas, use the box to write down ideas from your discussion.

We use them when...
We have to...



2. Electromagnetic Waves - On the diagram, draw colored waves to show what you think is happening with:

- infrared (red)
- ultraviolet (purple/violet)
- visible light (green)

Don't forget to include what is happening when light hits the roof outside of the window.

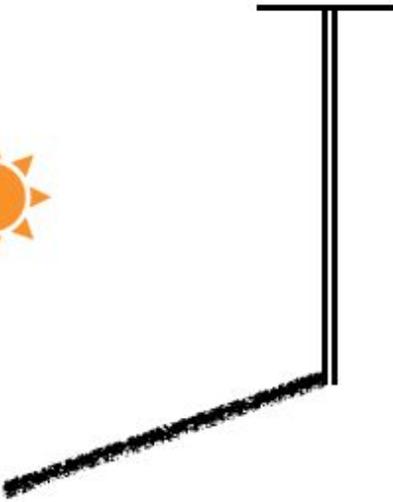
(Thinking Question) What other information could we collect to know more about the properties of this system?

3. **Empathy - Discuss and Write:** Why should we care about the windows and shades in our classroom? Who is it effecting? What is the outcome of improving the situation?

We should care because...
 _____ are affected by the ...
 Improving the windows and shades would...

4. **Define the problems - What are the problems with the windows and shades?**
 We need to consider a number of things for the new design of our windows and shades. Discuss in your table groups and state the problems below. Remember that we experience 3 of earth's seasons during the school year. This means that conditions change throughout the year.

Topic	Problems
Temperature (infrared) -	
Ultraviolet	
Visible Light	
Shade usage	
Fresh air (how the windows open, etc.)	



5. **Ideate Solutions -**

A. Your design should include new windows. Use the diagram on the left to indicate what you would want the light waves to do once they interact with the window and roof (think transmission, absorption, reflection). Use colors like in # 3.

- infrared (red)
- ultraviolet (purple/violet)
- visible light (green).

B. Explain your choices for infrared, ultraviolet and visible light in the boxes below.

Topic	Ideas
Temperature (Infrared) - What about heat that comes in the open windows?	
Ultraviolet	
Visible light	
Shades - How should these work?	
Fresh air - How will the windows open to allow in fresh air?	

6. **Prototype** - Sketch a model of the new window/shade set-up.

For Highly Proficient, you must make a 3-dimensional model out of materials of your choice. I will have some materials available in the classroom.

Sketch what your solution will look like. Label necessary parts.

Waves: create and use models to describe that waves are absorbed, transmitted and reflected through various materials

4 Highly Proficient	3 Proficient	2 Close to Proficient	1 Developing
<ul style="list-style-type: none"> <input type="checkbox"/> Project includes a 3-dimensional model of the window/shade solution. <input type="checkbox"/> Answers show detail and advanced knowledge of the behavior of waves. 	<ul style="list-style-type: none"> <input type="checkbox"/> Shows strong knowledge of the behavior of waves. <input type="checkbox"/> Can identify how EM waves are interacting with the classroom windows. <input type="checkbox"/> Solution shows how EM waves will interact with the classroom. <input type="checkbox"/> The project is complete. 	<ul style="list-style-type: none"> <input type="checkbox"/> Most of the lab is complete. <input type="checkbox"/> Answers need more detail. <input type="checkbox"/> Some of the information may be <u>incorrect</u>. <input type="checkbox"/> Work is <u>incomplete</u>. <input type="checkbox"/> Model does not effectively show design. 	<ul style="list-style-type: none"> <input type="checkbox"/> Not attempted or mostly incomplete.

Science and Engineering Practices: finding a Solution

4 Highly Proficient	3 Proficient	Close to Proficient (2)	Developing (1)
<ul style="list-style-type: none"> <input type="checkbox"/> Solution is presented in a 3-D model. <input type="checkbox"/> Model shows all aspects of the design. 	<ul style="list-style-type: none"> <input type="checkbox"/> Solutions are given to help improve the learning environment of room 8 <input type="checkbox"/> A labeled sketch is included <input type="checkbox"/> All parts of the project are complete. 	<ul style="list-style-type: none"> <input type="checkbox"/> Work is incomplete <input type="checkbox"/> Solution is not given or doesn't solve the problem. <input type="checkbox"/> Work lacks detail and thought <input type="checkbox"/> Sketch is missing <input type="checkbox"/> Model does not effectively show design 	<ul style="list-style-type: none"> <input type="checkbox"/> Not attempted or mostly incomplete.