

Understanding by Design (UbD) Unit Plan

Title: Dark side of the Light **Subject/Course:** Science w/ Engineering & Theatre

Topic: Light Waves **Grade:** 8th **Designers:** J.S. Peterson

Stage 1 – Desired Results (PLAN)

Established Goals: (What do students need to learn and be able to do?)

Science with Engineering Education Standard 8.2.5

Develop and use a model to describe the structure of waves and how they are reflected, absorbed, or transmitted through various materials. Emphasize both light and mechanical waves. Examples could include drawings, simulations, or written descriptions of light waves through a prism; mechanical waves through gas vs. liquids vs. solids; or sound waves through different mediums. (PS4.A, PS4.B)

Technical Theatre Standard L1.T.P.7:

Understand and apply technical elements to enhance activities and dramatizations.

Understandings:

Students will understand that light waves affects how we view pigment

Essential Question/Big Idea:

How can we use knowledge of electromagnetic waves in considering theatrical design elements?

How can

Students will know....

Students will know that light has many different wave lengths and each length effects the color of the light

Students will be able to....

Students will be able to apply lighting in real life applications and know the effects it has on multiple physical pigment colors

Be sure to include both language and content objectives.

Stage 2 – Assessment Evidence (STUDY)

Performance Task (How will we know if they learned it?)

Summary in GRASPS form

Here is where you will develop a scenario for the activity/project.

This section is for you to develop a guide for the students on what to do.

Goal(s):

Understand light as wave forms and how those waves affect various materials

Role:

Students

Audience:

Teacher

Situation:

Partaking in multiple activities that expand on the understanding of visible light waves

Performance:

Discuss, Participate, reflect

Standards:

Practical application

Key Criteria: to reflect Performance Tasks: *Examples: Rubric, Checklist, etc.*

Students will participate in the recreation of light waves through a prism with long and short waves using colored yarn in which they develop and use a model to describe the structure of waves

Students will then visualize how light interacts with several physical media in order to describe the structure of waves and how they are reflected, absorbed, or transmitted through various materials and Understand and apply technical elements to enhance activities and dramatizations.

Other Evidence (How will we know if they learned it?)

Summarized (tests, essays, work sample(s), etc.

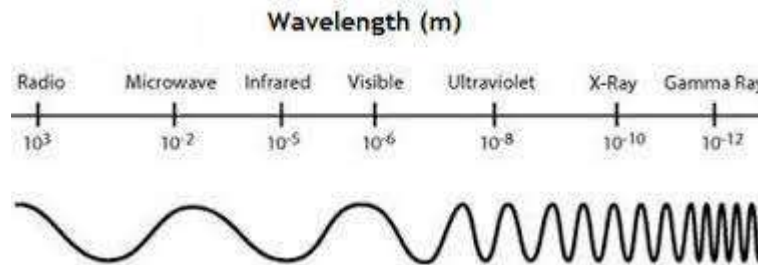
Students will create a list of educated guesses on how lighting will interact with different clothing

Stage 3 – Learning Plan (DO)

Learning Activities (How will students learn it?)

Hook: (5 min)

1. Flip off the classroom lights (ensure any window blinds are closed) once the lesson starts.
2. Have the students pull out and turn on their phone flashlights
 - a. Alternately handout small cheap lights as they enter class
3. Ask the class,
 - a. Does anyone know how the flashlight is creating the white light?
 - b. What is light made of?
 - c. How does the lighting we have created with our phones changed the atmosphere of the room?
 - d. Turn on the lights
4. Draw on the board the range of electromagnetic waves and explain that the length of the wave effects the energy and thus the effecting what the wave does



Epic Yarn (5 min)

1. Pull out 7 Pieces of yarn that are about 5 feet each
 - a. A white, Red, orange, yellow, green, blue, purple
2. Have the students volunteer to hold the yarn creating a light scattering spectrum
 - a. Start with the white yarn being held at both ends
 - b. Then add in the red, orange, yellow, green, blue, purple in that order splintering out from the point where the white yarn ends
 - c. Explain that is the spectrum of visible light and that white light is a combination of all the colors together and that when split with a prism it scatters to its base parts
3. Explain to the students that the colors come from the length of the waves
4. Red being the longest and least energized and blue being almost the shortest and most energized with purple sneaking in the range of ultraviolet light
 - a. Use the physical yarn to show these wavelengths
 - b. Make sure to ask questions and for examples to assess understanding
 - c. Collect the yarn

Magic fabric Ride (10 min)

5. Pull out 3 pieces of fabric that is a solid primary or secondary colors
 - a. Have each student pull out a piece of paper and create 3 columns (Fabric color, Light color, Result)
 - b. Turn off the lights once again
 - c. Hang/hold up one color of fabric and shine a color of light on it in this order
 - i. Blue
 - ii. Yellow
 - iii. Red
 - d. Repeat this for each color of fabric having the students write their observations within the columns
 - e. Discuss the results with the class and how it can attribute to technical design on the stage

Reflection

6. How can we use the knowledge of color and with lengths when creating design choices (Lighting, Paint, Costume)

Resources

- A white, Red, orange, yellow, green, blue, purple yarn about 5 feet each
- 3 pieces of clothes that are primary colors (plain tshirts work great)
- Color Changing LED light

Were the lessons successful? How do you know? What would you do differently next time?

Intervention (What will we do if students don't learn it?)

Use real life examples of pigment affected by light, drawing on other scientific knowledge like photosynthesis reflecting green light from the chloroplast.

Enrichment (What will we do if students do learn it?)

Ramp up the experimentation with different types of pigments introducing colored gels and how these lighting colors effect not just materials but also skin tones