



Light It Up! STEAM Country

LESSON OBJECTIVES

Students will be able to:

- **engage** in hands-on exploration by creating a lightning design to support a piece of country music
- **discover** how lighting creates or enhances the mood of a performance
- **apply** knowledge obtained about country music performance lighting and the effect it has on the overall concert experience

GRADE RANGE

3–8

DURATION

One class session (approximately 45–60 minutes)

LESSON OVERVIEW

How does a Lighting Director use the properties of light to enhance a concert experience? In this lesson, students will get a backstage pass to “The Ultimate Country Music Experience”—[CMA Fest](#). CMA Fest is the longest-running country music festival in the world, including more than 80,000 fans from all 50 states and fans from 39 different countries! Using their backstage pass, students will have the opportunity to step into the role of a Lighting Designer for a musical performance. They will create a prototype to enhance a piece of music and build on the mood, using their knowledge of the properties of light. Students will use a video featuring Alec Takahashi from the CMA Video Topic Series: *This is STEAM Country*. This video showcases how Alec uses lighting effects to enhance the country music experience for all audience members. Students will also discover what it takes to become a Lighting Director and Lighting Designer, as well as the skills needed in order to be successful within this role. Alec is responsible for designing and executing on the full visual spectacle that live performances offer for Thomas Rhett who performed at CMA Fest and is also featured in the Topic Series Video.

KEY STUDENT QUESTIONS

- What is “light,” and how is it produced and synchronized at a live performance?
- Why does light play a vital role in making a live musical performance such a powerful emotional experience?

NATIONAL CONTENT STANDARDS

Next Generation Science Standards

Engineering Design

1-PS4-2

Students who demonstrate understanding can: make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.

1-PS4-3

Students who demonstrate understanding can: Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.

1-PS4-4

Students who demonstrate understanding can: Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

National Literacy Standards

- Identify and explain how illustrations and words contribute to and clarify a text.
- Use information gained from illustrations and the words in a text to demonstrate understanding of a text.
- Prepare for and participate effectively in a range of conversations and collaborations with varied partners, building on others' ideas and expressing one's own ideas clearly and persuasively.
- Integrate and evaluate information presented in diverse media formats, such as visual, quantitative, and oral formats.

MATERIALS

- [Light It Up!](#)—video
- Educator device connected to the internet, with projector
- Student devices with internet access, one per group
- CMA Topic Series Video: *This is STEAM Country* featuring Alec Takahashi
- STEAM Challenge Rubric, one per group
- Copy of [Jamboard](#), [Padlet](#), or a blank poster and markers (1 per group)
- Copy of Google Slide: [Vocabulary Carousel](#)
- Posted copy of *Stage Lighting Reference* sheet
- *Light it Up!: Planning* Capture Sheet
- *Stage* Capture Sheet or CAD/Drawing software
- 5–6 Country Music Songs **screen beforehand to ensure songs are age appropriate*
- Various lighting sources and light apps **optional*

BACKGROUND INFORMATION

Light energy is made of electro-magnetic radiation and travels in waves. Light is only one type of electromagnetic wave. There are also radio waves, microwaves, x-rays, and gamma rays. All electromagnetic radiation travels in waves, but different types have different wavelengths. Scientists can detect and measure different radiation with special tools. Light with longer wavelengths, like radio waves, has less energy. Light with shorter wavelengths, like gamma rays, has more energy.

Light (visible) is a form of energy which the human eye can detect. Natural sources of light create light energy without the help of humans. The sun is a natural form of light that gives off energy in the forms of light and heat. Visible light produced from the sun is often referred to as white light. Although it appears to be white, this light actually contains all the colors of the rainbow (red, orange, yellow, green, blue, indigo, and violet).

Some forms of light are created by humans, also known as “man-made!” Man-made light is often referred to as artificial light. Light bulbs create the most common form of artificial light. Light bulbs convert electrical energy into heat and light energy. When a switch is flipped, electricity starts flowing. Electricity is the flow of electrons. This electricity is stopped by the filament of the bulb. The filament is usually made of tungsten, as it has a high melting point. The filament causes hindrance to the electrons as well as friction. Friction produces heat and causes the light bulb to start glowing, producing light energy.

When light travels to objects, sometimes the light is reflected, refracted, or absorbed. When light hits a rough surface, only part of the light is absorbed and the other light is scattered; this is called absorption. When light hits smooth shiny surfaces such as metal or water, light is bounced off and it is called reflection. An example of reflection is how the moon does not create its own light; instead, it reflects the light from the sun off its surface. Refracted light is bent as it passes from one substance into another. For example, light travels faster through air than it does through water, which often will create the illusion that water in a pool appears to be less deep than it actually is.

Transparent objects are clear or see-through and allow light to travel through them. Translucent objects allow some light to pass through but distort images on the other side. Translucent objects reflect and absorb light. Opaque objects absorb light and do not allow light to pass through.

SESSION FLOW

ENGAGE | LISTENING PARTY

Probing questions

- What type of mood does light produce?
- What are the characteristics of the light?
- How are lights moved, placed, or used during a musical performance?
- Begin the lesson by asking students the probing questions. Explain to students that they will now watch a live concert to try to answer those questions.
- Project a 2–3-minute video segment of a live country music concert, chosen prior to the start of class.
- After viewing the video, divide students into groups and ask them to capture their ideas on a Jamboard, Padlet, or a poster and markers to describe the mood, characteristics, and physical elements of the lights. As a whole group, discuss the answers that students recorded.

Teacher Note: *To create a true concert-going experience (especially for students who have never experienced a live musical performance) consider creating a concert scene within your classroom using lighting, seating, sound, and more. Identify a live country music performance to use as an example, prior to beginning the lesson. [CMA's YouTube channel](#) is a great place to find examples to share with students. Please view all videos prior to sharing with your students to ensure that they are appropriate for younger audiences. Consider collaborating with your music teacher on this lesson!*

LEARN | INVESTIGATE/VIEW: EXPLORING THE LIGHTS OF COUNTRY MUSIC

Inquiry Questions

- How does lighting enhance a musical performance?
- How does lighting affect the mood of the audience during a show?

What is Light?

- Explain to students that the goal of this lesson is to research and discover how theater and stage materials absorb, reflect, and refract light.
 - Divide students into small groups and assign them one of the following vocabulary words to define: transparency, opaque, illumination, translucent, reflection, refraction, and light absorption.
 - Students will use Google Slides to create a [Vocabulary Carousel](#) to share the meaning of their assigned vocabulary word and obtain a greater understanding of the properties of light. A non-digital alternative is to use the *Vocabulary Graphic Organizer*.
 - Allow student groups the opportunity to share and present their slide or graphic organizer.

The effects of lighting and music on mood

- Let students know that they will now discover how lighting affects mood. They will explore the relationship between light, sound, and mood. Instruct students to head out on a [Gallery Walk](#) to view photos of Alec Takahashi's work as a Lighting Director.

Teacher note: *Print images in color and post them throughout the classroom. Another alternative is to have images featured on devices throughout the classroom or projected.*

- Ask students to take one minute to view each picture and, in their journals, to describe what they see or know, and ask them to write a one sentence description about the photo.
- Remind students to use vocabulary that they learned from the vocabulary carousel.

Lighting Moods

- Choose 5–6 age-appropriate country music songs in order to allow students to determine the mood of each song (consider choosing collaborations with other genres that illustrate various moods and tempos like “Meant to Be” by Bebe Rexa and Florida Georgia Line or “Where We Started” by Thomas Rhett and Katy Perry).
- Explain to students that after listening to each soundbite, they will record how the song makes them feel using one word and a scale of 0 to 5 (0=very angry ,1=angry, 2=sad, 3=neutral, 4=somewhat happy, and 5=very happy).
- Play a short sound bite from each song you have chosen.
- Use the participation protocol [Whip Around](#) to have students share their results after each song (another option is to create a [Google Form](#), spreadsheet, [Survey Monkey](#), or similar software to collect student data).
- Introduce the Emotional Frequency Chart Resource (EFC) to students by projecting it so that it is visible for all students. Explain to students that different colors are associated with different moods.
- Ask students how the EFC could be used as a reference when designing the lighting that enhances a musical performance.

CAREER CONNECTION—ALEC TAKAHASHI, LIGHTING DIRECTOR

Inquiry Questions

- What does a Lighting Director and Lighting Designer do?
- How do you think lights come together to create music?
- What are the that steps Alec takes to design the lighting for a show in collaboration with Thomas Rhett?
- What are the skills needed to be a successful Lighting Director? What determines success?
- Introduce students to Alec Takahashi using the CMA Topic Series Video: *This is STEAM country*.
- Read the following excerpt below prior to viewing the video:
Approximately six months before audiences see a performance, Alec's work begins! Alec collaborates with Thomas Rhett and learns about the songs he wants to feature, the themes he wants to express, and the stories he wants to share with his audiences. Alec then works with his own team to put together the entire look and feel of the performance, relying on a computer animated design (CAD) artist to help visualize in three dimensions what the stage will look like to fans, working with designers to build the actual set, and working with the Production Manager (the person in charge of the

entire production process: all aspects of tour/performance planning, timeline, budget, and more) to help ensure the crew is staffed in every location. Alec's concerns are not just about creating a great musical experience, but also about designing a set that is safe, quickly set-up and torn down, mobile, and within the specified budget.

- View the video with students, taking the time to pause and have discussions in order to address or discuss inquiry questions.
- Ask students to consider how Alec uses the properties of light to inform the work he does and how they could use this information in planning their own prototype.

APPLY | LIGHT IT UP!

- Divide students into pairs or small groups. Tell students that they will now apply what they have learned about light to develop a light show for a Country Music selection of their choice.
- Allow students to select a Country Music song by any artist (remind students that the song must be age-appropriate for the classroom). They will use the *Light it Up! Planning Capture Sheet* to research and begin recording their thoughts.
- Ask students to pay close attention to the words and melody to determine the mood of the song.
- Have students begin brainstorming using the *Stage Capture Sheet* to plan the light show. Students will sketch a prototype of their design and determine the color, frequency, and amount of lights that they will use.
- Remind students to consider the science of lighting that they learned today as they prototype.

Teacher Note: Consider giving students the option to use a free CAD software or drawing software (like [Google Drawings](#)) to create their prototype for their stage design. Students may also refer to the *Stage Lighting Reference sheet* to determine the type of lights they will use.

CHALLENGE | LIGHT IT UP! IN ACTION

- Have students share their stage design with their classmates through a [gallery walk](#). As students view other projects, ask them to leave two comments about what they love about the design and one way they would improve upon the prototype.
- Allow students time to consider two or more suggestions given by their peers to improve their prototype.
- Now ask students how they could creatively reproduce their show for the class using materials they have at home or in the classroom (students will need to be especially creative if materials are limited).
- If time permits, allow students to create their light show utilizing smartphones or devices (lighting apps), holiday lights, or other available lighting.

Teacher Note: Prior to beginning the challenge, distribute the *STEAM Challenge Rubric*. Also consider reaching out to a music or theater teacher to help students produce their light show.

REFLECT

- Students will go back to the Jamboard, Padlet, or poster and post an answer for the following prompt:

I used to think _____, but now I think _____.

Teacher Note: Consider sending students home with the Family Activity: Backyard Lightshow, to allow students to continue their learning at home.

FORMATIVE ASSESSMENTS SUGGESTIONS (OPTIONAL)

- Inquiry Questions
- Traveling Waves Drawing
- Team Collaboration Rubric
- Jigsaw
- Graphic Organizer
- Data Analysis of Lights
- Journal Reflections
- Peer Review

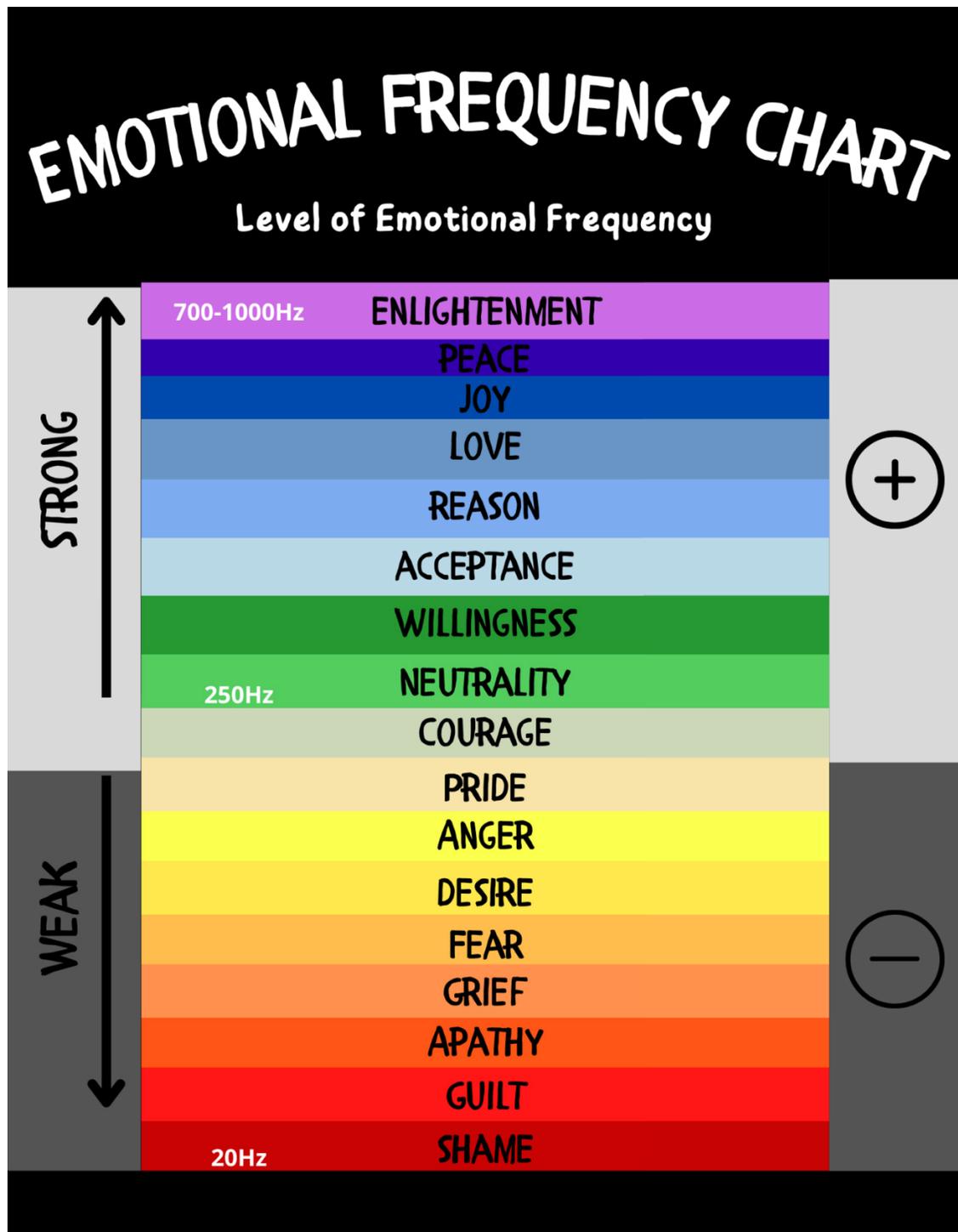
STEAM Challenge Rubric

Score Value	Completes the Challenge	Follows the Challenge Rules	Collects Accurate Data	Provides Explanation of Creation	Attempts Multiple Ideas and Adjustments	Collaborates with team
4	The completed challenge is done on time and is successful.	All of the rules of the challenges are followed.	Data is collected for the challenge and is 100% accurate.	Completed challenge is completed in full detail.	The team attempts more than three ideas and makes adjustments as needed.	The team works together and communicates throughout the entire challenge.
3	The completed challenge is done after the time limit and is successful.	Most of the rules of the challenge are followed.	Data is collected, but some of it may not be 100% accurate.	Completed challenge is explained in basic terms.	The team attempts more than two ideas and makes a few adjustments.	The team works together but may have some issues with communication.
2	The completed challenge is done but it is not successful.	Some of the rules of the challenge are followed.	Data is collected for parts of the challenge but it is not complete.	Completed challenge is not adequately explained.	The team attempts at least one idea but does not make any adjustments.	The team struggles to communicate and work together.
1	The challenge is not finished and is not successful.	Few of the rules of the challenge are followed.	No data is collected for the challenge.	Challenge is not explained.	The team attempts only one idea and is unable to make any adjustments.	The team does not communicate or work together.

Images (from Alec's Tour) for Gallery Walk



Images (from Alec's Tour) for Gallery Walk



Images (from Alec's Tour) for Gallery Walk

STAGE LIGHTING



FLOODLIGHT

A floodlight is a very simple type of light. It has no lens and cannot be focused. Floodlights are often used during low light activities, like outdoor events.



PROFILE SPOT

The profile spotlight is a light with a strong, well defined beam, and is very versatile. This light is used to produce intense illumination in a well-defined area in stage, film, television, ballet, and opera production.



FOLLOW SPOT

A Followspot is a powerful theater light used to 'follow' actors and singers around the stage. They are operated by a human followspot operator.



FRESNEL SPOT

Fresnel lights, also known in theatre as the "Fresnel lantern", is a soft spotlight that allows the user to adjust or zoom the angle of the light. The fresnel includes four barn doors to adjust the shape of the light.



PAR CAN

The par Can Light is a lamp strong beam of light in one direction. This light is often used for illuminating a single person or event at concerts and productions around the world.

Light it Up! Planning Capture Sheet

Imagine that you are the Lighting Director for a country music group. Your job is to help the artist convey the intended mood of their songs through the usage of lighting. This capture sheet will help you design your show. Select the artist(s) and song in order to get started! Listen carefully to the pace and tone of your song in order to complete this planning document. Consider what you have learned about light energy to ensure that your plan is successful.

Artist or Group Name:

Song Title:

Song Tempo (Fast, Medium, Slow):

Keywords used in song:

How would you describe the overall mood of the song? Provide evidence and details.

How many lights will you need? How did you determine this?

What colors will you use? Why?

Will you fade or dim lights throughout the song? Why or why not?

Light it Up! Concert Design Capture Sheet

STUDENT CAPTURE SHEET

Light it Up! Concert Design

STUDENT CAPTURE SHEET



STUDENT CAPTURE SHEET

Name _____ Date _____

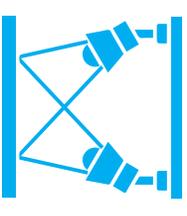
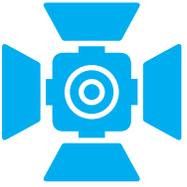
Definition:

Visuals / Illustrations:

Term:

Examples:

Non-Examples:



Light it up! STEAM Country Family Activity

Dear Parent / Guardian / Family Member,

Your student has been learning about concert lighting and how lighting enhances the mood of a song. During this lesson, students learned about properties of light: transparent, opaque, translucent, reflection, refraction, and light absorption. They also discovered what a Lighting Designer does and why properties of light are important within this career field.

Continue your student's learning, at home, by joining in and participating in the **CMA Family Activity: *Backyard Light Show***. This activity can be found at: _____ . We encourage you to have fun and play as a family in order to reinforce learning and encourage your child to continue their curiosity at home.

For more family activities that support your student's learning, visit: *

We hope you continue learning together about the power of STEAM and the diverse careers available within the countrymusic industry.

Have fun learning together!

