Arts, A/V Technology & Communications

TEXAS CTE LESSON PLAN

Section 1: Lesson Identification and TEKS Addressed	
Career Cluster	Arts, A/V Technology & Communications
Course Name	Printing and Imaging Technology I
Lesson/Unit Title	History of Printing and Imaging
CTE TEKS Student Expectations	**§130.94. Knowledge and Skills** (12) The student researches the history of the printing and imaging field. The student is expected to analyze and summarize the evolution of the printing and imaging field and its historical impact on society.
Science TEKS Student Expectations	**§112.39. Knowledge and Skills** (8) Science concepts. The student knows simple examples of atomic, nuclear, and quantum phenomena. The student is expected to: (A) describe the photoelectric effect and the dual nature of light **§112.35 Knowledge and Skills** (8) Science concepts. The student can quantify the changes that occur during chemical reactions. The student is expected to: (F) differentiate among double replacement reactions, including acid-base reactions and precipitation reactions, and oxidation-reduction reactions such as synthesis, decomposition, single replacement, and combustion reactions (9) Science concepts. The student understands the energy changes that occur in chemical reactions. The student is expected to: (C) classify reactions as exothermic or endothermic and represent energy changes that occur in chemical reactions using thermochemical equations or graphical analysis.
Section 2: Lesson Plan	
Instructional Objectives	The student will be able to • describe different printing and imaging processes used in photography, • explain the effects of light on various light-sensitive materials, • identify chemicals and processes used in modern darkrooms to process photographic prints, and • compare and contrast modern photographic processes and their results to past processes used throughout the history of photography.
Rationale	Provide an understanding of the impact of science on the development of photography and photographic printing.
Academic/ Technical Vocabulary	Light-sensitive materials Chemical reactions Silver nitrate Silver iodide

	Mercury vapors Light waves Reflection
Duration of Lesson	One 45-minute lesson.
Materials/ Specialized Equipment Needed	**Materials:** • Paper • Scissors • Sources of light (strong flashlight, desk lamps, different light bulbs) • Large dark paper (to cover windows) **Specialized Equipment:** • Light-sensitive chemicals and paper • Protective eyewear • Gloves
Teacher Notes: • Yellow bubbles refer to one of the six essential elements of science-enhanced CTE lessons. • Orange bubbles refer to one of the core principles of integrating science into CTE. • Blue bubbles refer to a scientific practice as outlined in the TEKS.	

E1: ENGAGEMENT
Six Essential Elements: Introduce the CTE lesson to engage the students
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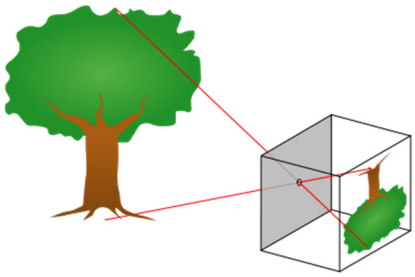
Core Principle: Begin with the CTE and not the science
	Prepare the classroom by blocking out the windows with dark paper. On one of the pieces of paper, cut out a small circle to create a pinhole camera. Make sure this hole is opposite a blank wall or hang a large white sheet on the wall as a screen.
	
	Turn out the lights so the pinhole camera image projects on the wall. Ask the students:
	• What do you notice about the image you are seeing?
	  ○ Answers may include: it is upside down, it is projecting what is outside the window, it is in color
	• By show of hands, how many of you have heard of a camera obscura or pinhole camera? (Point out that this is a pinhole camera.)
	• Again, by show of hands, who thinks they could explain how this works and why the image is upside down?
	• What do you think this hole represents in a more modern camera?
	  ○ Answers may include: the lens, the aperture
	• If we wanted to preserve or save this image, how would we do that? What might we need?
	Before I turn the lights on in this dark room, by show of hands, who has processed photos in a darkroom?

E2: EXPLORATION	1. Pinhole Camera Obscura • Display an illustration of how light enters and exits the pinhole camera (similar to the one shown below).

Six Essential Elements:
Teach the CTE content and the embedded science within

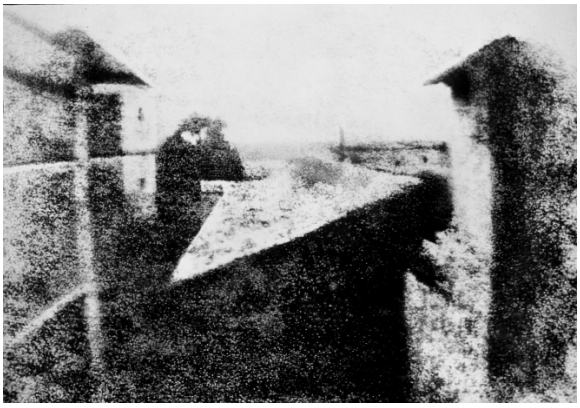
Core Principle:
Recognize CTE teachers as teachers of science-in-CTE, not science teachers

Core Principle:
Maximize the science in CTE



- Discuss how early cameras operated in this manner with a single opening.
- Teach the basic physics behind the concept of the pinhole camera: how light waves enter the hole and are reflected onto the wall.
- Lenses replaced pinholes

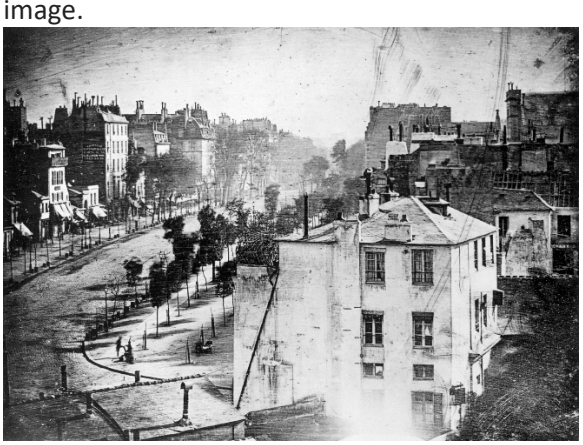
2. Light sensitive chemicals and plates
   - Display the oldest known photograph, View from the Window at Le Gras by Nicéphore Niépce and discuss how this was captured on a coated metal plate in 1826 or 1827 and is a heliograph. Niépce coated metal with Bitumen of Judea which is a light-sensitive material which hardened when exposed to light. He then washed it with oil of lavender to remove the areas that were not hardened.



From https://upload.wikimedia.org/wikipedia/commons/thumb/5/5c/View_from_the_Window_at_Le_Gras%2C_Joseph_Nic%C3%A9phore_Ni%C3%A9pce.jpg/1280px-View_from_the_Window_at_Le_Gras%2C_Joseph_Nic%C3%A9phore_Ni%C3%A9pce.jpg

   - Display the first known photograph of a live person, view of the Boulevard du Temple in Paris by Louis Daguerre taken in 1838. Discuss how this was a very busy street, but due to the long exposure time, the only people captured were a man getting his shoes shined and the shoe shiner. This image was also captured on a metal plate and is known as a Daguerreotype. Daguerre used highly polished silver-coated copper plates. He used iodide vapors which reacted with the silver to become a light-sensitive

material. After exposed, the plate was treated with vapors of mercury to complete the process of developing and setting the image.



From: https://upload.wikimedia.org/wikipedia/commons/d/d3/Boulevard_du_Temple_by_Daguerre.jpg

- Discuss the contributions and experiments in photography made by Henry Fox Talbot, John Hershel, and Frederick Scott Archer. Show video A Brief History of Photography: Innovations in Chemistry by Bytesize Science (https://www.youtube.com/watch?time_continue=38&v=Mh42xZQL6-k) (runtime 4:46).
- If available, pass around examples of these early types of prints for students to examine up close and observe the differences between these plates and modern photographic prints.

3. Film replaced plates
   - Discuss how George Eastman developed a dry gel on paper (film) in 1884. This eliminated the need for large boxes and dangerous chemicals. In 1901, Eastman's Kodak company began to produce the Brownie camera, making photography accessible to the masses.
4. Activity:
   - Students will work in small groups to perform a comparative experiment.
   - Select a light-sensitive material (provide options of silver nitrate, sun-sensitive paper, liquid crystal sheets, Polaroid film, or other similar options).
   - Decide the variables to be tested. For example, cut out a design (stencil) to place between the light-sensitive material and light source to keep some areas from being exposed to the light source and use time as a variable. Or the variable could be materials or lotions with different SPFs. Students could also choose to make their variable different light sources such as lights with different wattage, colors, or different types of bulbs

Six Essential Elements: Create activities with authentic application of CTE using inquiry

Scientific Practice: Design and implement a comparative investigation

Scientific Practice: Collect and Record Data **Scientific Practice:** Construct Tables & Graphs to Organize Date **Scientific Practice:** Analyze Data and Communicate Conclusions	such as fluorescent, halogen, or incandescent. Provide some suggestions for the students, but allow them to design the experiment. • Expose the material to the light source. • Using a digital camera, photograph or video the light-sensitive material's reaction. • Record observations and organize the images in a creative manner of the students' choice to make additional observations. • Analyze and communicate findings to the class by displaying images and discussing observations. Students can choose their method of presentation such as a PowerPoint, time-lapse video, or a poster.
E3: EXPLANATION **Six Essential Elements:** Provide opportunities for the students to demonstrate their understanding of the explicit science in this lesson	Lead students in group discussion on the differences between the substances and papers tested in the activity. Start to make connections to modern photographic technology and processes. Ask the students: • Why do they think a red light is used in a darkroom? • What do they think would have happened if they used a red light in a darkened room instead of exposing the substances to the existing light in the classroom? • Can they name the chemicals used in modern darkrooms? Discuss the different chemicals and processes used in modern darkrooms to process photographic prints. Compare these processes and their results to past processes used throughout the history of photography.
E4: ELABORATION **Six Essential Elements:** Provide opportunities for the students to demonstrate their understanding of the explicit science in this lesson **Core Principle:** Approach the science as an essential workplace skill	Ask the students: • How does the shutter and shutter speed of a camera affect the image? How does this relate to what they saw in their experiments? • How is this relevant to photography and art today? Show Dan Carrillo video on making Daguerreotypes (https://vimeo.com/63639523) (runtime: 4:05) or on wet plates (https://vimeo.com/20011942) (runtime: 4:02). Lead students in a discussion about why a modern artist would choose to use these older techniques. Ask them what they would like to experiment with. Discuss how knowledge and understanding of the science behind these concepts is essential to working with photographic prints and in the overall field of printing.

E5: EVALUATION **Six Essential Elements:** Evaluate through formal assessments of CTE and science knowledge & skills	Ask students to write a $2 summary about what they've learned regarding the history of printing and imaging. Each word in their summary is valued at $0.10, and the total summary must be worth $2.00 – i.e. they can only use 20 words total. **Teacher Note**: Rather than tell the students they can only use 20 words, simply provide them the value of each word, and the amount they must "spend".
Section 3: Lesson Notes	
Resources/ Teacher Notes	• **A Brief History of Photography: Innovations in Chemistry** https://www.youtube.com/watch?time_continue=38&v=Mh42xZQL6-k • **Making Daguerreotypes** https://vimeo.com/63639523 • **Wet plates** https://vimeo.com/20011942