Augmentation Lesson Plan
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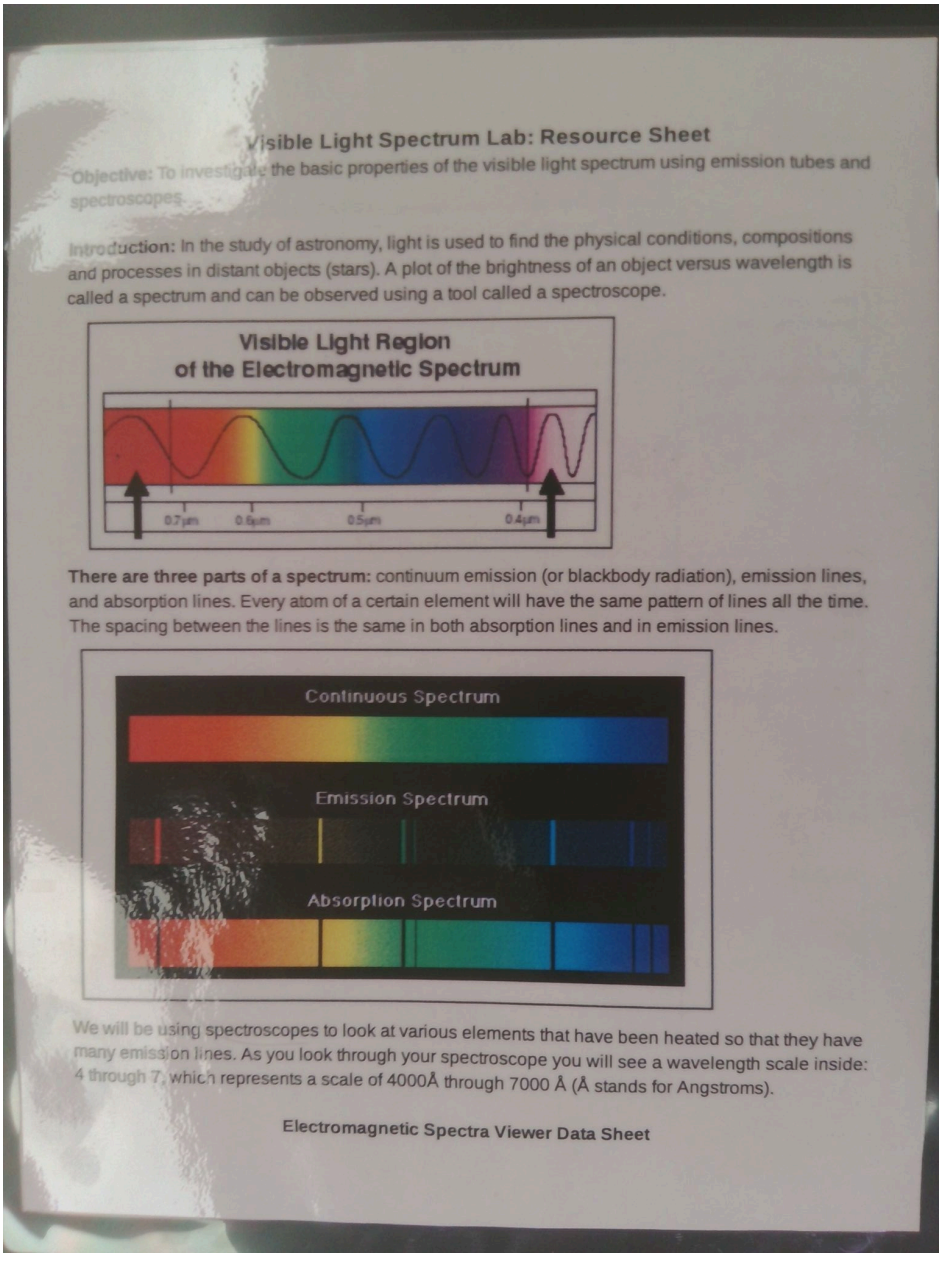
Spectrum Fingerprints of Gases

A+ Anticipatory Set	Using a static sphere machine as a demonstration item. Turn the machine on and pose the question "What does lightning travel through?" Many of the students should respond with the air. "Do you think there is air in this globe?" (Yes/No response isn't right or wrong you just want them to respond.) "It isn't air. In your journals, predict a gas that is in the globe from the list on the wall."
Objective	Students will observe and record spectrums of different gas emission tubes. Students will use their observations to find the gas inside the static sphere machine.
Procedures	Supplies 1 1000 line diffraction grating slide per student 1 guide sheet per student Students will be using the cameras on their 1:1 iPads to take pictures of the emission spectrum using the diffraction gratings. Have a single light bulb lamp on at the front of the room for them to practice finding the spectrum with the camera. A little bit of masking tape is useful to attach the slide to the iPad (don't touch the middle). Once they have mastered the grating, number the students off 1 to 9 for the nine stations. Have them travel to the station that matches their number. Take a picture of the label for the station, then turn on the emission tube (you only get 20 seconds to take the picture before the tube has to cool off). Progress 1 station higher with each signal to rotate. Once you have been to all stations create a google slide show for all the gasses and their spectrums. Retake pictures as needed and return the diffraction when finished. *Teacher note: if you are using 7th grade's mini sphere swap out Bromine for Xenon*
Summary	The static sphere is station 10. The students will take a picture of the spectrum of the sphere then compare it to the gasses they have observed. On the exit slip they are updating their predictions for the gas in the sphere. (8th grade's static sphere is Argon, 7th grade's mini sphere is Xenon).

- Instructions on using the technology being integrated.
    - Students will be using their device's camera.
- Additional supporting information or handouts needed.
    - The resource sheet below is useful for students to know what they are looking for during the lab.
    - 

Visible Light Spectrum Lab: Resource Sheet

Objective: To investigate the basic properties of the visible light spectrum using emission tubes and spectroscopes.

Introduction: In the study of astronomy, light is used to find the physical conditions, compositions and processes in distant objects (stars). A plot of the brightness of an object versus wavelength is called a spectrum and can be observed using a tool called a spectroscope.

There are three parts of a spectrum: continuum emission (or blackbody radiation), emission lines, and absorption lines. Every atom of a certain element will have the same pattern of lines all the time. The spacing between the lines is the same in both absorption lines and in emission lines.

We will be using spectroscopes to look at various elements that have been heated so that they have many emission lines. As you look through your spectroscope you will see a wavelength scale inside: 4 through 7, which represents a scale of 4000Å through 7000 Å (Å stands for Angstroms).

Electromagnetic Spectra Viewer Data Sheet

- A statement on why the technology was chosen, how it provides a tangible purpose, and how you addressed the "Perceived Usefulness" and "Perceived Ease of Use" for your instructor to help with the adoption of your recommended technology.
    - Going from a traditional drawn on worksheet to a digital guide that is student created gives them ownership in the lab. The perceived usefulness for the

teachers is adding the digital camera to the diffraction grating makes it easier to record data in a shorter class period. It is also useful when working with students who have color blindness as they can't see the colors of the pattern but they are able to match the light and dark portions of the spectrum "fingerprints."

- The ease of use comes from the number of previous experiences the students have using the technology. The biggest teachable moment is making sure the students have turned off the flash on their camera. On the assessment side, the digital guide book is easier for the students to show their knowledge instead of the color lines drawn in the dark. The mastery success is when the students are able to identify the gas in the static sphere.