Spectroscope Design Project

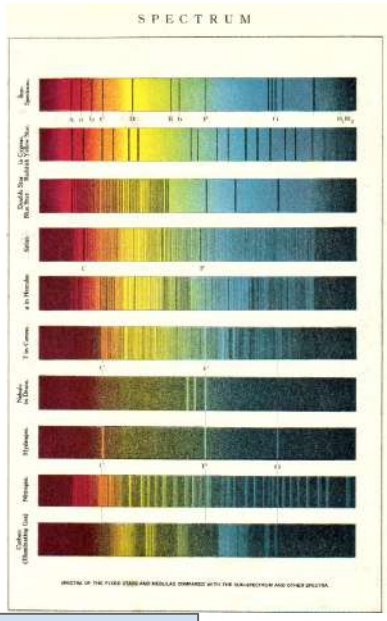
How do we study astronomy?

Essential question: How do we study space?

Learning target: I can design and build a functioning spectroscope and use it to analyze chemical composition of light.

Related vocabulary: electromagnetic radiation, visible light spectrum, spectroscope

Introduction



Our sun is approximately 70% hydrogen and 28% helium...ever wonder how we know that? If you remember back to chemistry, you studied **atomic spectra**, or the wavelength of light given off by a specific element. Each element gives off a different atomic spectra, just like each human has a different fingerprint. Scientists can measure these spectra, or **visible light waves**, coming from the sun, using a tool called a **spectroscope**. Your task is to research a spectroscope design, improve the design, and build a functioning model. You may work with one partner and should record all work in a shared Google doc. Follow the design process outlined below and document each step of the process[1]. Your documentation should include written explanations, sketches/drawings, photographs, and references. References should be included as footnotes that includes a full citation in the format of your choice (MLA, APA, etc). Your final product will be (1) a functioning spectroscope that we will use to identify spectra and (2) a Google doc report to be shared with Ms. Vogel. You will be graded on identifying atomic spectra using YOUR spectroscope!

Timeline

Day 1-2
Research & Design

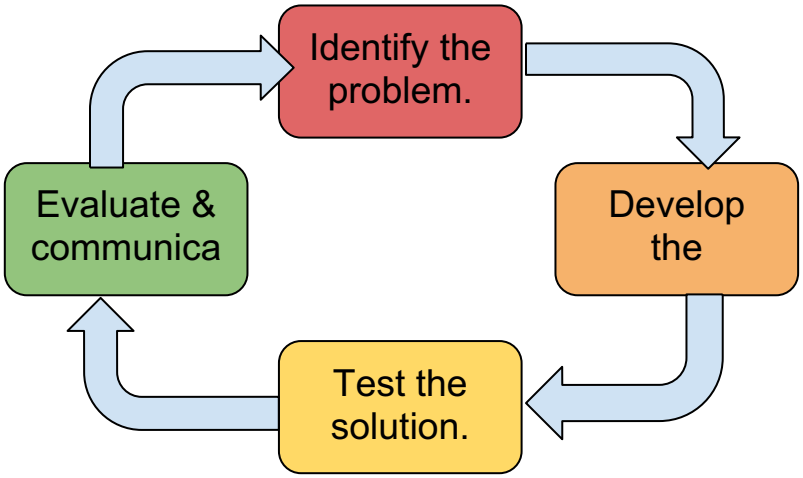
→

Day 2-3
Build your model

→

Day 4
Test spectroscope
Finish & submit

Design Process



Make a copy of the APA Report Template (honors / college prep) and share

[1] Wright, R. Thomas. (2012). *Technology & Engineering.* 6th ed. The Goodheart-Willcox Company, Inc., Tinley Park, Illinois, 189-199.

it with your partner. Add a title for the project, your names, and headings for each part of the design process. You will have four total. Complete each step below and record your work in your report under the appropriate heading.

Identify the problem.

1. **Define the problem.** *This should be written and include what you are building and why (what is the purpose of this object?).*
2. **Identify at least 6 constraints.** *You will want to think about these constraints and other ways in how you may be limited (i.e. space, time, money, tools, equipment). You may use the following two as part of your six to get you started:*
    a. *Must fit inside classroom.*
    b. *Must be made to view light in the visible spectrum.*
    c.

Develop the solution.

3. **Gather information.** *Research spectroscopes using Google's Explore tool and summarize your findings. You should include the purpose of spectroscopes in astronomy, potential designs for homemade spectroscopes, & the following vocabulary: spectroscope, electromagnetic spectrum, visible light spectrum, atomic spectra*
    a. *Also use the Explore tool to add citations as footnotes throughout your document. For a demo on how to do this, watch* ***Quickly and easily cite your source with Explore in Google Docs****.*
4. **Pick a design.** *Narrow your solutions down to a design that you want to recreate. Include a sketch with labels for the materials using Google drawing. To do this, go to Insert > Drawing > New.*
5. **Rationalize your choice***. Explain why you selected this model. Be specific. One to two sentences is not enough here.*
6. **Present the solution for approval.** *Show Ms. Vogel your Report so far. She will review it for headings, footnote citations.*

Test the solution.

7. **Model your solution.** *This is the building part of the process so you will need to have your materials available to complete this. Document the building process using visuals. Ms. Vogel can provide masking tape, box cutters, black construction paper, tape, diffraction grating film, poster board, a light source. This should include photos of your spectroscope during the building process and upon completion. 3-6 photos*
8. **Test your solution.** *Ms. Vogel will provide instructions for how we will do this next class.*

Evaluate & communicate the solution.

9. **Interpret the solution.** *Reflect on your model. Did it function as it should? Is there anything you would change and if so, how?*

Assessment Rubric (adapted from Design Challenge Rubric)[2]

Criteria	Expectations	**5 points = Meets expectations** *(required criteria is present)* **0-4 points = Partially meets expectations**
Identify the problem	___ Problem is clearly defined ___ 6 constraints are listed and make sense	
Develop the solution	___ Evidence of good research, evidence that student has acquired new knowledge of problem and what others have done to solve similar problems ___ References are cited appropriately using footnotes ___ A solution that addresses the problem is clearly chosen ___ Reason clearly stated for selecting final design ___ High quality sketch is present with attention to aesthetics, materials, and assembly	
Test the solution	___ Design completed with attention to detail ___ Evidence of thorough work appropriate to time allotted. ___ Correctly identify spectra using model	
Evaluate & communicate the solution	___Self-reflection including self-criticism where appropriate ___ Detailed reasons for the success of the project OR details given of the modifications or alterations which would ensure a successful conclusion ___ Each part of the design process is well-documented with both visuals and text via Google doc that is shared with teacher	
Work Ethic	___Time Management- Student utilized class time wisely to complete requirements to the best of their ability ___Worked well with others (if applicable) ___Both partners contributed a fair share to the project (equal contributions in Google Doc) ___All instructions were followed (i.e. on the correctly labeled Google Doc with sections labeled) ___Grammar and spelling conventions followed ___Paragraphs in paper are at least 3-5 sentences (no bullet points or lists)	

Final Grade: /25

[2] Randt, K. *Design Challenge Rubric*. Technology Education at Neshaminy High School. Retrieved Sept. 21, 2015.