

Redshift-Blueshift Lesson Plan

SIOP Lesson Plan Template

Class & Lesson Information

Date: Day 4 - Monday	Grade/Class/Subject: Astronomy - mostly 11 and 12				
Class setting (# of students & MLs, WIDA level if applicable, lesson duration, etc.): 18 Students total 3 MLs - average composite score is about 4 - Given the language skills of my students I feel comfortable giving them the same materials as my native speakers, but they will need more frequent check-ins and supports than other students might not need. 57 minutes per class period					
Grouping explanation: This lesson I would like them to work in small groups again; in small groups they can talk to each other about what they are doing and get some speaking and listening practice in. Additionally, in small groups they can help each other and support each other's understanding. My ML students are skilled enough this year that social supports like working with others is typically enough to help them be successful, but I also constantly rotate around to support my struggling students as well.					
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Unit/Theme: Modern Tools of Astronomy - Light / Spectra	Standards: NA				
Content Objective(s): Explore the direct connection between moving objects and the redshift / blueshift of the waves they produce.					
Language Objective(s): Read data to make sense of the motions of stars and galaxies.					

Key Vocabulary: Redshift Blueshift Motion Wavelength Expansion Exoplanet Emission Spectra Black Body Radiation Star Galaxy Distance Speed Doppler Effect	Materials (supplementary & adapted): Intro Slides Redshift - Blueshift HO Stations Handouts with Data
Higher-order questions/tasks:	

Lesson Sequence (Pre-/Opening activities):

Time allotted	Activities (Teacher talk, action, etc.)	Other notes
~5 min	Bellwork Students will take part in a warm up think-pair-share that will then extend to volunteers sharing to the whole class. This time I want them to think about the Doppler Effect, which they should have learned about in Earth Science and Physics I. So I am going to pick a scenario that shows it, and hopefully connects to their outside school experiences and past learning. I am going to play this video: https://youtu.be/a3RfULw7aAY?si=RI2RJdA3rCyMNmli And ask: <i>Tell your groupmates in what way does the car horn sound different as the car gets closer versus when the car is moving away. Explain Why the car horn sounds different when getting closer and away.</i> My goal is for them to talk about Doppler effect, sound waves changing sizes, or changing pitches. As a warm into talking about light waves doing the same kind of size changes.	Students learned about Redshift, Blueshift. and the Doppler Effect in Earth Science. So the main idea for today should be familiar, but I am likely asking them to think about it more deeply than before and in new ways. So at the beginning of hour I am using the bellwork and intro slides to help review / introduce those concepts. Make the vocab words for the day clear and provide examples. As well as set students up with all the background they need to be independently successful today, so that their groups won't immediately need my help as they travel the stations. I'll be there to help, but I cannot help everyone at once, so I try to set things up so that they rarely need me.
~3 min	Review the Daily Objectives As a class we will review the objectives, and my goal when doing so is to show how motion is a key aspect all throughout today, and that we will be using different types of data today as well.	

Lesson Sequence (Main activities):

Time allotted	Activities (Teacher talk, action, etc.)	Other notes
~15 min	Redshift / Blueshift Intro Slides - As a whole class we will walk through these slides lecture style. My goal is to provide visuals and review of key concepts that we have briefly covered in this class or substantially covered in previous courses. These concepts are the focus for today, and I want to make sure their background knowledge as at the assumed level to be able to fully participate and appreciate the small tasks they will complete at their stations today. I really want them to be comfortable with what redshift and blueshift are, and their general cause with motion and wave stretching.	
~30 min	Redshift - Blueshift Stations Students will travel in small groups to different stations and use different types of data to talk about how the motion of stars or galaxies are reflected in their spectra as redshift / blueshift. I won't be picky about the order they complete the stations, but I do want them to travel in a small group and work on them together. So the stations are designed to have them talk to each other to reason through what they are seeing. The different scenarios / data they are exploring include: • A short article about historic galaxy data showing redshift of galaxies and their measured speeds • Star Spectra data showing an example of a star moving closer and farther from Earth as part of it's orbit • A data set that students will use to measure the speed of example galaxies as they redshift / blueshift. • A data set that students will use to measure the distance to different galaxies using the universe's expansion rate.	

Lesson Sequence (Post-activities):

Time allotted	Activities (Teacher talk, action, etc.)	Other notes

~5 min	Review Objectives and Exit Ticket As a class we will review the daily objectives and then students will complete an exit ticket to get them to think about redshift / blueshift one last time. This time it will be individually completed though, so I should get some feedback about how well students understand the core concept for the day. For the exit ticket, they will be given a spectrum of a star and then a blank spectrum. The scenario they will draw is either a spectrum showing the star moving closer to Earth or farther from Earth. To do this, the student will either redraw the star's spectrum shifted to the right or left side of the spectrum depending on which direction the star is moving in space.	
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