

Spectra Lesson

SIOP Lesson Plan Template

Class & Lesson Information

Date: Day 1: Tuesday	Grade/Class/Subject: Astronomy - mostly 11 and 12 Students have already finished Earth Science and studied many of these concepts last year, so today's lesson should be mostly review. This gives me some liberty to introduce more complexity in terms of vocabulary and science content in this course. I would slow things down if students were new to these concepts or if I had lower WIDA skill levels.		
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: For this lesson, I am switching up the grouping depending on a couple of factors: - Complexity of the task: I want my students to have someone to lean on for the more difficult tasks. - Communication activity: MLs need communication tasks to create genuine opportunities to practice their language skills, and some tasks make good opportunities for students to NEED to work together and thus engage in genuine communication about science content. - I don't necessarily try to do all four different grouping types each day, but it is good to have diversity throughout a week. Especially with MLs because they are more likely to feel comfortable speaking in small groups, and small groups also often afford them the chance for think-time in order to formulate how to say what they are thinking.			
whole class Choral Reading - While the concepts should be familiar there is some genuinely challenging vocabulary that I think is best tackled by working together as a class.	small group Bellwork and Exit Ticket - Both are small tasks related to today's content, while the bellwork is a think-pair share, the exit ticket is a small group task that will require them to work together to complete it and thus communicate about spectra.	partners Define Spectra Types - Students will work in pairs, one reader and one writer to describe the three types of spectra which are also one of the main vocabulary goals for the day. The two roles encourage communication	independent Identifying Spectra - I want to make sure that each student gets a chance to identify the different elements and see them for themselves. The complexity is also low enough that I don't feel like my ML students will need any support or buddies to complete it on their own.

Unit/Theme: Modern Tools of Astronomy - Light / Spectra	Standards: NA
Content Objective(s): Students will compare and contrast different unique elemental spectra to identify which elements are being depicted.	
Language Objective(s): Students will discuss in small groups how different spectra are created and how they look different from each other.	

Key Vocabulary: Students <i>should</i> know all these words already, but the big five for today are: Spectra Absorption Spectra Continuous Spectra Emission Spectra Wavelength Lesser vocabulary they should already know: Light wave band / line	Materials (supplementary & adapted): • “Using Light to Study Planets” Article • White boards, markers, and erasers • Identifying Spectra Handout • Gas Bulbs, Powersources, Example Spectra Handouts (laminated) • Exit ticket - Spectra Paper Strips, and Continuous Spectrum for them to draw on
Higher-order questions/tasks: Most of this lesson should be review from Earth Science, so while some of the tasks are somewhat higher order I’m hoping they are easy since they should be mostly waking old memories and ideas from last year.	

Lesson Sequence (Pre-/Opening activities):

Time allotted	Activities (Teacher talk, action, etc.)	Other notes
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~5 min	Bellwork We'll do a bellwork question which is a think-pair-share warm up where students first think, then share in their small groups, before having about three volunteers share out to the whole class. I am looking to pick a question that relates to today's topic but also helps connect to their background or wakes their past learning. It is important to start from something they are familiar with, both in terms of language and content, and then build from there. This time I'm thinking something like: "What type of information from space probes and telescopes do you think astronomers use to identify or learn about objects?" I am choosing a vague question to invite them to think about what they know and to collect as much input from them as possible.	Opening Sequence for a lesson is an important time to think about two things: 1. What new science vocabulary do I want to introduce, model, and explain for my students because I know they will encounter them today? If you have a bunch of new vocabulary or words with complex or abstract meanings then it is often helpful to spend time defining and explaining these words well. A good way to do this is to have a slide show or handout prepared with definitions, example uses, and images / diagrams to help explain the word. I am intentionally using the choral reading today to do that heavy lifting for the different types of spectra. 2. Am I speaking in a way to make myself more comprehensible to my non-native speakers? Ideally, your speed should be deliberate, your speech clear, your word choice intentional. You should use words that your students are familiar with, but make sure to use the important vocab for today and define / explain them as you do. Last, are you using gestures, images, or diagrams to help show what you are saying? All this helps make you more accessible to your own students.
~2 min	Review Learning Objectives (<i>Listed Above</i>) Next we'll review the learning objectives for the day. The goal here is to give a preview of what we are going to do, but I like to also make clear when reading them what the take-away goal for the day is. "By the end of class you should be able to...." -or- "you should have...." This helps students understand the broad goal to shoot for even if they are struggling with small details.	
~15 min	Choral Reading As a class we will take turns reading and decoding the meaning of the "Using Light to Study Planets Article". I always make sure to stop at the pictures and help students find their meaning and relevance within the context of the text. These kinds of reading tasks are a good time to help make explicit different reading and meta-cognitive strategies to help them be successful readers. Part of my goal with this reading is to introduce some of the general themes of the unit, but also to introduce, describe, and show examples of the key vocabulary for the day.	

Lesson Sequence (Main activities):

Time allotted	Activities (Teacher talk, action, etc.)	Other notes
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~10 min	Define and Describe Spectra Types (These include the key vocab) Students will work in reader and writer pairs using white boards to describe (through words and/or pictures) what the different spectra look like. They will also work to describe how the different spectra are created. I like the idea of them working in pairs where each has a unique job or tool to bring to the task. This forces them to communicate with each other in the talk <i>Task (see right)</i>, and also gives them each a defined role to contribute. I will tell them that one student should have their laptop out to read or show pictures, while the other is in charge of writing on the whiteboard. I will probably ask each pair to share one if not all of their spectra descriptions. I am worried about having enough time, so I will probably only ask each group to share about one spectra and get three share-outs per spectra type.	<i>Tasks</i> are a type of activity in Task Based Language Teaching where students are given a problem, activity, or task to complete that requires them to use their content and language skills in a setting. This forces them to use their language skills in a content specific authentic way. Working together to define important science concepts is not the most textbook task, but it gets them talking about science to reach a shared goal.
~15 min	Identifying Element Based on Spectra We have some elemental gas bulbs that when powered glow with the pure spectra for that element. These kinds of spectra are compared to complex spectra to decipher which elements are combined to make the complex composite object; for instance which elements make up the outer layers of a star, or a planet's atmosphere. Students will visit different gas bulb stations and use the example spectra images to compare and contrast to try and decide what each bulb is made of. This is a task they should have done in Earth Science, so conceptually it should not be new, but is a good refresher of previous concepts and directly relates to the activity for tomorrow. NOTE: Students should not touch the bulbs; their finger oil makes them age faster and the bulbs can get hot enough to be dangerous to touch. Also, in order to preserve the bulb's lifetime, I make my students only turn them on for a short duration and then turn the power off to let them cool back down. Last, students will need the lights off and the room as dark as possible for best results. Students will record their findings on a handout that we will go over at the end. I have some candy that I will probably give a piece to students who get a certain percentage correct.	When starting both these activities it is important to model how to do these tasks and explain the goal. This helps students start, but with the partner task it helps make clear how to interact and what their role is in their pair. For the identifying spectra activity, even though they are working alone you need to show how to safely complete the task because there are some minimal safety concerns and ways students can damage the equipment.

Lesson Sequence (Post-activities):

Time allotted	Activities (Teacher talk, action, etc.)	Other notes
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~5 min	Combining Spectra Exit ticket This exit ticket asks students to work together to produce a combined version of a spectra with multiple elements put together. Students will each be given a pure elemental spectra and work together in triplet to create a combined spectra using a blank spectra. Both their elemental and blank spectra will have a scale that makes it easier to compare. ...Or maybe I should give them each an elemental spectrum and ask them to work in triplet to add the missing two onto their own so each group member is forced to explain what to add, and each is forced to listen in order to complete their own. I like this idea more because it necessitates them communicating more. It is to re-enforce the idea that elemental spectra are often combined in real samples, and to get them used to the idea that spectra are not pure samples. Tomorrow they will be working almost exclusively with mixed sample spectra so I want them to already understand that that happens.	
~3 min	Review Learning Objectives At the end of the hour, we'll review the learning objectives for the day and ask students to quickly show if they feel like they completed them and are ready for tomorrow. Something quick and informal like a thumbs up or down, or show a number of fingers out of five, is a good way to do this because a teacher can get some quick feedback about why is feeling unconfident, but it is fast and simple enough that students are less likely to feel like they will stand out if they show they didn't understand today. It is important to help ML (and all students really) students feel comfortable in the classroom. It is really easy for them to feel like they are different or bad learners and then try to find ways to hide instead of engaging and participating.	