

Refraction

5E Lesson

The 5E model is a scientifically proven method to improve student engagement and learning in your classroom

- ✓ Engagement
- ✓ Exploration
- ✓ Explanation
- ✓ Elaborate
- ✓ Evaluate



Complete Teacher Instructions

Refraction 5E Lesson

Grades 7-10	Refraction	Ongoing Les
Lesson Objective: Students will learn about: • Refraction • Illusions/optical phenomena • Speed of light • Angle of refraction • Rules of refraction • Apparent depth • Partial reflection and refraction • Index of refraction • Total internal reflection • Fiber optics • Rainbows • Snell's Law		
Possible Student Misconceptions: • Light can only be reflected from shiny surfaces • An object cannot both absorb and reflect light • Only sunlight can be reflected • Light always moves straight through transparent objects without changing direction • Different wavelengths of light have different energy and therefore different colors • Light needs air to travel • Light is not reflected or refracted predictably • When an object is viewed through a transparent material, it is seen exactly as it is • White light is pure and colorless • Sunlight is red, yellow, or orange • Color is not a property of light • A prism adds color to light when it passes through		
Materials: • 1 device (smartphone, Chromebook, laptop, tablet, or computer) per student • A means of projecting a PowerPoint presentation • Internet access • General classroom objects • Prisms		
Teacher Notes: ➢ All videos can be accessed directly from the PowerPoint. To retrieve them, click on the video icon while in slideshow mode and it will automatically open for you. If they don't open, right-click the image and click Edit Hyperlink or something similar. ➢ I've created a video walkthrough if needed. It can be accessed here - https://youtu.be/oCIKIP9SaDQ ➢ I don't believe in long lessons. If you feel your students are losing their focus, stop the PowerPoint and give them a 5-minute break. If you'd like to see more of my video collection here - http://www.teachwithferdy.com are tons of brain-break videos to choose from all grouped by category.		

Refraction – 5E Lesson

Engagement Phase Your students will watch the video 'How Do Rainbows Form?' and complete the questions found in the file – Engagement – How Do Rainbows Form Video .	D T le ur ☐ ☐ ☐ ☐
Teacher Notes: - The video is about three minutes long - You may need to show the video more than once or pause when an answer is given to one of the questions.	
Exploration Phase Exploration – Lab Station Activity • In groups of 2-3, have your students complete Exploration – Lab Station Activity. Once they're done, they will submit their passport to you.	D T le ur ☐ ☐ ☐
Teacher Notes: • The complete instructions for my Lab Station activity can be found in the START HERE – Instructions file.	
Explanation Phase PowerPoint Lessons • The lessons are found in the folder – Explanation – Lessons • These lessons are designed to be completed over two days • There are multiple embedded videos and plenty of opportunity to engage, interact and check for your students' understanding throughout the lesson	D T cc m pr ☐ ☐ ☐
• Lesson 1 covers the following topics: ➢ Refraction introduction ➢ Illusions through refraction ➢ Changing the speed light moves	

➢ Angle of refraction ➢ Rules of refraction ➢ Apparent depth ➢ Partial reflection and refraction • Lesson 2 covers the following topics: ➢ Speed of light ➢ Index of refraction ➢ Calculating the index of refraction ➢ Calculating the speed of light ➢ Total internal reflection	Goals ☐ Students develop understanding of the content ☐ Observations and experiences are discussed and critiqued ☐ Students develop vocabulary ☐ Students are able to connect the content presented to previous experiences
Teacher Notes: • All videos can be accessed directly from the PowerPoint. To retrieve them, click on the video icon while in slideshow mode and it will automatically open for you. If they don't open, right-click the image and select Edit Hyperlink or something similar. • I've created a video walkthrough if needed. It can be accessed here - https://youtu.be/oCIKIP9SaDQ • I have also enclosed a .PDF version of both the teacher and student versions.	
Elaborate Phase Elaborate – Scavenger Hunt Your students will complete – Elaborate – Scavenger Hunt . This activity will require your students to move beyond what was covered directly in the lesson and allow them to further develop their understanding.	Duration: 1 hour Teacher Role – Facilitate learning and keep students focused
Teacher Notes: - Students will work individually or in small groups - Students will need one device per group.	Goal ☐ Students use their newly obtained knowledge to propose solutions and extend their learning to new situations
Evaluate Phase Quiz Have your students complete - Evaluate – Refraction Quiz	Duration: 30 min Teacher Role – Distribute and collect evaluation
Teacher Notes: ➢ It's sometimes best to have the students peer evaluate ➢ Placing students in small groups and having them exchange papers to mark will accomplish two things 1) Provide immediate feedback on the questions they just completed 2) Significantly reduce your marking time ➢ Peer evaluation is not needed, only suggested when appropriate	Goal ☐ Students are given the opportunity to demonstrate their understanding and evaluate their own progress

Each phase is clearly described

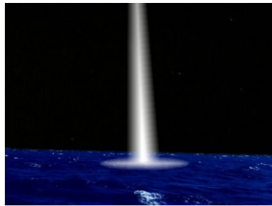
Two Complete Lessons

Refraction

- Refraction is when speed up or slow down due to travelling in different medium. medium is something that waves will travel through.

Speed of Light

- The speed of light is different in various media, but it is always less than that of the speed of light in a vacuum.



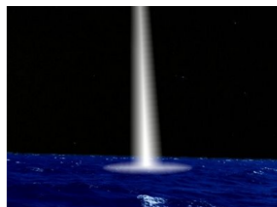
Refraction

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A medium is something that waves will travel through.

Speed of Light

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Make sure your students are on track

Student copies with blanks
Videos embedded right into your slideshow

Illusions through refraction

Index of Refraction



Total Internal Reflection Demonstration



Interactive and Engaging Activities

Device-Based Scavenger Hunt Refraction



Includes

- 5 Unique Locations
- Online form submission
- Answer Key

Works on all smartphones, tablets, Chromebooks, and laptops

- **100% Digital**

- Simulations
- Quizzes
- Videos
- Games
- Word Scramble
- and more



Refraction Lab Station Activity



7 Lab Station Activities to get your kids out of their seats and engaged in their learning

Get away from tired practices and unengaged students



Provide a Scientifically-Proven means of instruction



Incorporate Technology and Increase Collaboration

