

CosmoVerse Adventures:
Expansion of the universe: Hubble-Lemaître law
Lesson Plan

Grade/ Grade Band:	Topic: Expansion of the universe: Hubble-Lemaître law	Lesson # _____ in a series of _____ lessons
Brief Lesson Description: This lesson aims to teach students about the Hubble-Lemaître Law and the expanding universe. Through storytelling and a hands-on experiment, students will grasp these complex concepts in an engaging and meaningful manner.		
Specific Learning Outcomes: By the end of the lesson, students will be able to: <ol style="list-style-type: none"> (1) Understand the Hubble-Lemaître Law and its significance. (2) Recognize the concept of the universe's expansion. (3) Realize that Earth is not the center of the universe. (4) Grasp the scale of the universe and their cosmic address. 		
Narrative / Background Information		
Prior Student Knowledge: Students should have a basic understanding of: <ul style="list-style-type: none"> • Students should have a basic understanding of galaxies and the concept of the universe. • The Big Bang theory and the idea that the universe is expanding. 		
Materials needed: <ul style="list-style-type: none"> • Rubber bands of different lengths. • Metal washers of different sizes. • Pins. • Board or thick card. • Small colored stickers. • Ruler or measuring tape. • Graph paper. • Pencils.) 		
LESSON PLAN – 5-E Model		
ENGAGE: Set the stage for the lesson and pique the students' interest <u>Activity:</u> Show the Hubble Ultra Deep Field photo. <u>Discussion:</u> <ol style="list-style-type: none"> (1) Ask students about their initial impressions and ideas about the universe's structure and expansion. (2) How do you envision the universe based on the description of the scale of the universe? (3) Why do you think scientists are so interested in understanding the universe's expansion? 		
EXPLORE: Dive into the main content with the students through the story with Hubble and Lemaître. <u>Activity:</u> Share/Read out the conversation with Hubble and Lemaître. <u>Discussion:</u> <ol style="list-style-type: none"> (1) How did Edwin Hubble contribute in our understanding of the universe? (2) What is the Hubble-Lemaître Law and its significance? 		
EXPLAIN: Introduce hands-on learning with the Action Lab. <u>Activity:</u> Conduct the "Elastic band model—a one-dimensional model" experiment <u>Discussion:</u> <ol style="list-style-type: none"> (1) How does stretching the rubber band correlate with the concept of the universe expanding? (2) Based on the experiment, what can you infer about the distances between galaxies? 		
ELABORATE: Reinforce and deepen understanding. <u>Activity:</u> Have the students plot their data from the experiment, comparing the Milky Way washer and the "Other" galaxy washer. <u>Discussion:</u> <ol style="list-style-type: none"> (1) Why do you think the data from the Milky Way washer and the "Other" galaxy washer fell on the same line? (2) How does this experiment support or challenge your previous beliefs about our position in the universe? 		
EVALUATE: Check for understanding. <u>Questions:</u> <ol style="list-style-type: none"> (1) What key takeaway did you get from Edwin Hubble's discoveries? (2) Based on today's lesson, how would you describe our place in the universe? (3) Why do all galaxies feel like they are at the center of the universe? 		
Homework/Extension: For those eager to dive deeper into this vast expanse, recommend the "Cosmic Library" section (as mentioned in the script) for further reading and exploration. Have students explore more about galaxies that are exceptions to the Hubble-Lemaître Law, like those not receding from the Milky Way due to gravitational attraction. Ask students to research and find out more about the ongoing debate on the precise value of the Hubble constant.		