How It All Began

Rich Task 3 Activity 2

Introduction:

This activity provides an opportunity for students to investigate the Origins of the Universe. This activity is full of movement and modelling for students to take an active role in learning. The aim is for students to have an understanding of the evidence pointing to the Big Bang as the beginning of the Universe. The students will also formulate their own opinions of the end of the Universe a topic scientists know very little about and are uncertain of. All of this can be discussed as a class. This activity scaffolds the next (Rich Task 3 Activity 3), which looks at human made satellites and Earth's natural satellite, The Moon.

Preparation Required:

- Printing
- Open space for movement
- Balloons and markers

Downloadable Materials:

- Worksheet 3.2
- Expected Student Responses Worksheet 3.2
- Prompt images

Relevant Junior Cycle Learning Outcomes:

Students should be able to….

NOS 1: Appreciate how scientists work and how scientific ideas are modified over time

NOS 2: Recognise questions that are appropriate for scientific investigation, pose testable hypotheses, and evaluate and compare strategies for investigating hypotheses.

E & S 1: Describe the relationships between various celestial objects including moons, asteroids, comets, planets, stars, solar systems, galaxies and space.

E & S 2: Explore a scientific model to illustrate the origin of the universe.

PW 2: Identify and measure/calculate length, mass, time, temperature, area, volume, density, speed, acceleration, force, potential difference, current, resistance, electrical power.

Teacher Resource

Learning Intentions:

Students will be able to…

- Give evidence as to why the Universe is expanding
- Estimate how the speed of the Universe is calculated
- Consider the evidence for the Big Bang

Prior Knowledge/Horizon Content Knowledge:

- Solar system
- Noticing patterns
- Speed, distance, time
- Origin of the Universe

Differentiation and Accessibility Suggestions:

This activity is accessible and does not require prior knowledge of the specific topic. Students can decide the depth of discussion.

Prompt images are given to help students understand the electromagnetic spectrum on a very basic level as deeper understanding is not necessary.

If moving about is not an option this activity can also be done with music and sounds rather than movement. Redshift and blueshift can be explained with ambulance and train horns, as they move away they sound lower as the wavelength is longer (redshift). Use the wavelength of music notes to show this.

Activity Outline:

Activity Name	How it all began…
Alignment to ISLE investigation	Experimenting to investigate hypothesis
Rationale	To allow students to investigate the origin of the universe and hypothesise its ending
Activity Description	(*please see downloadable materials for the resources for this activity)* (Q1. *worksheet 3.2)* Students physically model a star (the source) sending out light and how that changes depending on if the star is moving closer or further away. Further explanation in a video example is given here. The students can be shown the electromagnetic spectrum to have an idea of the types of

	light beyond visible light. (Q2. *worksheet 3.2)* BEFORE ANSWERING QUESTION: Students (A) should model the solar system moving while other students (B) are dotted around the classroom. One of the students (B) is chosen to hum/make a small noise, without students (A) knowing. Students (A) should be able to identify the source of the sound. WHEN ANSWERING QUESTION: These two scientists discovered cosmic microwave background. The leftover radiation/noise that never changed as we moved through the Universe meaning it came from the Universe itself when it first began. Further explanation video here (Q3. *worksheet 3.2)* Students can model the expanding Universe where the balloon represents the Universe and students mark 'stars' on the balloon that move away from each other (redshift). Students then draw an image of their stars at the beginning and end, and estimate how you would calculate the speed at which the balloon is expanding. (Q4. *worksheet 3.2)* Students develop this idea and explore how you might calculate the speed at which the Universe expands and thus find out how old it is. (Q5. *worksheet 3.2)* Students explore possible endings of the Universe and identify which description matches which line in the graph. (Q6. *worksheet 3.2)* Students can consider which ending they think is most likely.
Link to other activities	Scaffold for Rich Task 3 Activities 3 and 4
Link to current research in DIAS Dunsink Observatory	The Solar and Space Weather group at DIAS Dunsink consists of PhD students, postdocs and professors who study different aspects of the Sun and Space Weather. Through their research, scientists can get

	daily updates on the activity of the Sun (https://solarmonitor.org) and advise on precautions that can be taken to protect Ireland's power grid from potential solar storms. More information on specific projects can be found here: https://www.dias.ie/solarphysics