MISSION GRAVITY

90-120 MINUTES

PHYSICS/SPACE SCIENCES YRS 10-12

LESSON PLAN: MISSION GRAVITY

MATERIALS:

Pens, Data Lab Manual*, Mission Guide*, Mission Gravity Slides*, Lenovo Mirage Solo with remote**

Australian Essential Standards: Year 10 Examples

ACSSU188, ACSSU229, ACSHE191, ACSHE192, ACSIS199, ACSIS200, ACSIS203, ACSIS204, ACSIS208, ACMSP251, ACMSP252

Physical Sciences (Y 7-10)
Space Sciences (Y 7-10)
Science Inquiry Skills (Y 7-10)
Science as a Human Endeavour (Y 7-10)
VCE Physics Unit 1: What is matter and how is it formed?
VCE Physics Unit 2: What are stars?
VCE Physics Unit 3: How do things move without contact?

LESSON OBJECTIVES

- Framing the experimental question;
- Data Collection of stellar properties over time;
- Scientific Modeling of stellar evolution using observations;
- Synthesis of collected data into appropriate patterns
- Developing a broad model of stellar evolution;
- Understanding of major star features: mass, diameter, composition, temperature
- Calculation of major star features from observable parameters

DIFFERENTIATION STRATEGIES TO MEET DIVERSE LEARNER NEEDS:

Differentiation will be based on year level. Variations will come in how data is collected (direct vs indirect) and how students will present it. The required maths can be scaled according to grade levels. The data collection can be either conceptual or can require the use of transforming to a new parameter.

ENGAGEMENT

The purpose of these questions is to allow the students to share their understanding with their peers and leader and to subsequently think about what learning could be new to them.

- Why is it important to understand stars?
- Could other stars have planets and why should we care?
- What is the closest star to us? What do we know about it?
- What do you know about stars?
- What do you want to know about stars?

* These resources are available in digital form for download

** In lieu of VR, the Mission Gravity program can be access through a browser based version

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EXPLORATION

In this portion of the lesson, students will have the opportunity to make observations of stars at various ages and collect data on their physical properties.

- Discussion of what properties a star has, i.e. how can we describe a star?
- Discussion of how we could measure these, i.e. how can we find the size of a star?
- What barriers do we have to measuring stars?
- Show students how to travel to stars in the web interface and review how to make measurements
- Allow students directed time to use the virtual realm to collect their data. This time will require the teacher to provide cues for data collection. Each student / group should investigate different stars.

EXPLANATION

- Allow students to use their observations to make a mental model and develop some ideas about their star's lifetime and fate
- Teacher will ask questions about how they can best present their data and guide them to a clear format
- Student explanations should precede introduction of terms by the teacher.
- Did each of your measured values change? How can you visualize this data?
- Allow students to synthesize their data into multiple representations of understanding
- What happened at the end of the star's life? What features did this remnant have?
- What are the most important features that determine what happens to a star? Why
- You need to create a presentation that others can view and understand your star. What are the major features to include?

ELABORATION

- After developing models, groups will share their models with others and the teacher
- After this all students will see if they can agree on some consensus statements about star's lives based on what they saw, focusing on common themes throughout the different stars' models
- If time allows, add a discussion about how these measurement are actually made in real life
- The consensus statements will introduce key words: white dwarf, neutron star, black hole,
- This knowledge allows students to comprehend the difficulties associated with studying stars. Understanding them helps understand our sun. Also allows for progression of technology in society by development of technologies to support difficult detections.

EVALUATION

- Students will demonstrate knowledge by creating a map of stellar evolution using class consensus and then comparing with the actual models
- The engaged teacher will rotate around to student groups to ask questions about their work during the entire process.
- If time allows, a pre- and post-incursion set of content questions can be provided to evaluate content gains
- If time allows, a pre- and post-incursion set of attitude questions can be provided to evaluate attitude toward scientific process and experimentation