Susan Hellewell

Grade: 9-12

Discipline: Earth Science

Content :Space

Type of Class: Heterogeneous Multi grade

Purpose of Tiered Instruction

Earth Science is a freshmen/ sophomore "core" course that has recently been changed to have a heterogeneous mix of student abilities. In addition, for some reason this year I have an equal mix of lower and upper classmen, some of whom have taken higher level science courses, so it is a thorough mix of ages, prior experiences and abilities. The purpose of differentiated instruction is to meet the learning needs of all students by providing activities that challenge each at their particular level. Clearly an incoming freshmen "struggler" will need a different a different approach than a senior who has already had physical science and biology. (Or a brilliant freshmen and a "struggling" senior for that matter.)

Type of Management System

I had students fill out an interest/ previous background inventory two weeks before the start of the unit so I could get a feel for the territory and I will do a simple pretest at the start of the unit. Based on that, I will group students by ability and interest for group projects.
Throughout the unit there will be a mixture of whole group instruction, flexible groupings and independent work. We will also be watching some videos together.
For group activities I will make up task cards, perhaps combined with stations, depending on the activity. For independent work I will have different sets of handouts for each level. Initially I will decide which level a student needs to work at, but I think eventually I would like to arrange it so students can choose assignments worth different points.
I will keep track of student assignments by using a chart for each task that designates the level of task given to each student.

Scheduling Time

We are on an eighty minute block schedule. I like to divide the time up to include cognitive, affective and psychomotor activities. Differentiated tasks will be done in class by breaking into groups after a whole group lecture, lab. or demonstration. Some of the independent tasks may be done as homework assignments, or finished for homework.

Assessment Types and Procedures

There will be quizzes to check for understanding along the way and an end of unit test . Some of the larger differentiated tasks will be scored using a rubric and counted either as a quiz or test grade. Smaller tasks (definitions etc.) will be scored as a homework grade. All students will know how the task will be scored beforehand.

Topics and Subtopics

Instrumentation for Studying the Universe

- Electromagnetic Spectrum
- Spectroscopes Telescopes
- Rocketry, Space Probes, Space Shuttle

Dimensions of the Universe

- Time Scales
- Distances: Light Years, Parallax

Processes That Shape the Universe

- Big Bang Nuclear Fusion
- Gravitational Collapse

Structure of the Universe

- Galaxies, Stars, Solar Systems, Planets and Moons
- Asteroids and Comets
- Black Holes and Quasars

Patterrns

Allow for predictions

Change

Is inevitable

Order

Creates structure

Diversity

Is universal

Interdependence

MLR G1 G2 G3

Essential Questions

1) How do scientists gather information about the universe?

2) How do scientists believe the universe originated?

3) How can we appreciate the immensity of the universe, it's structure, component parts and processes?

4) How is our solar system structured and how are scientists' ideas about solar systems and planets changing?

5) How does distance from the sun determine a planet's characteristics?

Unit Questions

1) What kinds of instruments have scientists developed to access information from wavelengths of the electromagnetic spectrum that we cannot experience directly?

2) What is the Big Bang Theory and what is the scientific evidence that supports it?

3) What are the major features within the universe and how do scientists measure distances to them and between them?

4) What are the characteristics of stars?

5) What are the differences between the outer and inner planets and how do scientists account for these differences?

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Differentiated Tasks

Individual Product: Writing with pictures included.

1) Using several sentences **describe** what a spectroscope is and two ways scientists use information from spectroscopes to gain information about stars. Be sure to include information about the Doppler Effect. You may include pictures.

1b) In a paragraph or two, **apply** what you know about the Doppler Effect and Spectroscopes to **justify** the information scientists have gathered about stars. Please include two types of information. You may include pictures.

1c) In a paragraph or two, **discuss patterns** about stars that have been obtained using spectroscopes and how these **patterns allow for predictions** about the universe.

Individual Product : Any of the following formats: Written, Poster, Power Point

2) **State** the Big Bang Theory and the evidence for it. Be sure to include a description of the Doppler Effect, Red Shifts in Galaxies and Information brought back from the COBE space probe.

2b) **Describe how is change implicated** in the the Big Bang Theory and the evidence for it. Be sure to include a description of the Doppler Effect, Red Shifts in Galaxies and Information brought back from the COBE space probe.

2c) **Describe how change in the universe is inevitable** based on the Big Bang Theory and the evidence for it. Be sure to include a description of the Doppler Effect, Red Shifts in Galaxies and Information brought back from the COBE space probe as support for the Big Bang Theory.

Small Group Product: Poster

3) Make a poster to **demonstrate** how different telescopes use different wavelengths of the Electromagnetic Spectrum. Include Light Telescopes,Radio telescopes, X Ray telescopes, infrared telescopes. Give an example of each and what it has been used for. Also describe the Hubble telescope, what factor makes it unique and what it has been used for.

3b) Make a poster **comparing and contrasting** different types of telescopes and how they use different wavelengths of the electromagnetic spectrum. Include Light Telescopes,Radio telescopes, X Ray telescopes, infrared telescopes. Give an example of each and what it has been used for. Describe the Hubble telescope, what factor makes it unique and what it has been used for.

3c) Make a poster **summarizing** the developments of different types of telescopes and how they use different wavelengths of the electromagnetic spectrum. Include Light Telescopes,Radio telescopes, X Ray telescopes, infrared telescopes. Give an example of each and what it has been used for. Describe the Hubble telescope, what factor makes it unique and what it has been used for. **Predict what the next development for telescopes might be.**

Small Group Product: Brochure

4) **Create** a brochure to **describe** any three **space probes** used to study the planets, or other aspects of the Universe. Make the brochure read like a travel brochure with vivid and exciting language and pictures.

4b) **Create** a brochure to **relate information obtained from** any three **space probes** used to study the planets,or other aspects of the Universe. Make the brochure read like a travel brochure with vivid and exciting language and pictures.

4c) **Create** a brochure to combine Information obtained from any three space probes used

to study the planets,or other aspects of the Universe **to demonstrate that diversity is universal**. Make the brochure read like a travel brochure with vivid and exciting language and pictures.

Individual Product : Writing with pictures.

5a) **Explain** how parallax can be used to determine the distance between the earth and a star. Use words and pictures.

5b) **Apply** your understanding of parallax and how it is used to determine the distance between the earth and a star, to determine the distance between objects in the classroom. Use words and pictures to explain what you would do.

5c) **Design** an activity to **demonstrate** to seventh graders how parallax can be used to determine the distance between the earth and a star. Use words and pictures to explain what you would do.

Groups Product: Skit with informational posters.

6) **Demonstrate** how gravitational collapse and nuclear fusion determine the evolution of a star by acting out the life cycle of a **small main sequence star**. Use informational posters as props. (Group)

6b) **Demonstrate** the **interdependence** gravitational collapse and nuclear fusion in the evolution of a **main sequence star** by acting out it's life cycle, using informational posters as props to get your point across.

6c) Demonstrate how the **pattern** of cycling between gravitational collapse and nuclear fusion **helps us understand** the evolution , life cycle and fate of stars by acting out the life cycle of a **super giant**. Use informational posters as props to get your point across.

Individual Written answers (which may include diagrams) for product.

7) **Explain** the nebular theory of the origin of the solar system.

7b) Demonstrate how **order** is implicated in the nebular theory of the origin of the solar system.

7c) Discuss the nebular theory of the origin of the solar system in order to show how **order creates structure**.

Individual Written answers for product.

8) Charting the Planets (Handout) Looking for Patterns in the Data

a) Look at the silhouettes at the top of the page. **Identify** the most obvious pattern related to planet size.

b) Look at the Mean Distance from the Sun for each planet.

Do you **detect** any patterrns there?

8b) Charting the Planets Looking for Patterns in the Data

a) Look at the silhouettes at the top of the page. **Identify** the most obvious pattern related to planet size.

b) Look at the Mean Distance from the Sun for each planet.

Do you **detect** any patterrns there? **Compare** the distances and decide if there is a pattern you could **justify** mathematically. Identify any pattern breakers.

8c) Charting the Planets Looking for Patterns in the Data

a) Look at the silhouettes at the top of the page. **Identify** the most obvious pattern related to planet size.

b) Look at the Mean Distance from the Sun for each planet.

Do you **detect** any patterns there? **Compare** the distances and decide if there is a mathematical pattern you could justify. Locate any pattern breakers.

c) **Predict** how a scientist developing a theory about the planets' orbits would account for any breaks in the pattern.

Individual Written product.

9a) **Discuss** the impacts that comet Shoemaker Levy 9 made on Jupiter.

9b) How can we **relate** the information gained from the impacts of comet Shoemaker Levy 9 on Jupiter to Earth?

9c) After **observing** the effects of comet Shoemaker Levy 9 on Jupiter **should** scientists be concerned about the potential for comets or asteroids to collide with Earth? (Philosophical)

Individual Oral

10a) What are galaxies? (**Define**)

10b) **Distinguish** between different types of galaxies.

10c) **Apply** what you know about galaxies to **evaluate** different star populations within galaxies.