Lesson Title	Hierarchy of the Heavens
Length of Lesson	One (50 minute) class period
Created By	Calista Guthrie
Subject	Earth Science
Grade Level	8th grade
State Standards	8th: 1d, 1h (Inquiry); 4f (Earth Science)
DOK Level	DOK2, DOK3
DOK Application	Categorize, Organize, Construct, Modify, Interpret, Make Observations, Show, Classify, Compare
National Standards	5-8: A (Inquiry); D (Earth and Space Science); E (Science and Technology)
Graduate Research Element	We commonly think of gravity as the force that holds us on the ground however gravity is not only present on our planet. Gravity is what holds our moon in orbit around the Earth which causes the tides that have a global effect on coastal habitats. Gravity also holds the Earth-Moon system in orbit around our sun and it controls our solar-system's position in our galaxy and our galaxy's position in the Universe. Comparing Earth to the Universe is like comparing a microbe to the entire Earth.

Student Learning Goal:

MS 8th Grade:

1(d) Analyze evidence that is used to form explanations and draw conclusions. 1(h) Analyze different ideas and recognize the skepticism of others as part of the scientific process in considering alternative conclusions. 4(f) Describe the hierarchical structure of the universe.

National Science Education Standards of Content 5-8:

A: Inquiry: Develop descriptions, explanations, predictions, and models using evidence.
D: Earth and Space Science: Earth in the Solar System
E: Science and Technology: Understandings about science and technology.

Materials Needed (supplies, hand-outs, resources):

Handout (INSPIRE_Guthrie_UniverseWorksheet),
Worksheet key (INSPIRE_Guthrie_UniverseWorksheetKEY)
PowerPoint (INSPIRE_Guthrie_UniverseHierarchy)
Materials to build a model such as: fishing line, tape, scissors, beads, pom pom balls, popsicle sticks, pipe cleaners, straws, construction paper, etc.

Lesson Performance Task/Assessment:
The PowerPoint (INSPIRE_Guthrie_UniverseHierarchy) will be presented first, explaining different things that exist in the universe. As the PowerPoint is presented, students should listen to fill in the blanks on their handout (INSPIRE_Guthrie_UniverseWorksheet). Students will make models of the universe or some part of the universe. The teacher will use the last ten or fifteen minutes going to each pair of students and discussing what they have/are building a model of and have them explain its place in the universe. Any fundamental problems or misunderstandings with the model should be addressed at this point. After all students have presented their models, the teacher will close with a report of the models and to address any reoccurring misunderstandings among groups.

Lesson Relevance to Performance Task and Students:
The capture activity for this lesson is making models of the universe. Through the lecture students will learn about things in the universe and where they are found in the universe. The structure of the universe and scale at which these things occur should be emphasized. Students will then make models to reflect something they have learned about the universe.

Anticipatory Set/Capture Interest:
The initial capture of this lesson will be the NASA video (see Teacher Notes). The video will demonstrate the scale of the universe and help students understand how small we actually are when compared to the expanse of the universe.

Guided Practice:
Students will listen and interact throughout the lecture. The instructor should check regularly for understanding by involving the students as much as possible in explaining different parts of the universe. The lecture should be completed within 15 minutes, materials to build the model then passed out and students should have 12 to 15 minutes to make the model. Models will then be presented and discussed. Misrepresentations should be discussed with the students concerning scale and quantity particularly.

Independent Practice:
Students have 12 to 15 minutes to make a model of something they learned about the universe. During this time and the discussion following, they should fill in the chart at the bottom of their handout (attached).

Remediation and/or Enrichment:
Remediation – Have students make a flow chart showing the relationship between different components of the universe.

Enrichment- If the teacher would like to expand this into two class periods, they can use this lesson as an introduction to the universe and next period discuss ways things in the universe are observed through x-ray, red-shift, radio, etc.

Check(s) for Understanding:
Allow students to interject during lectures with questions and comments. The instructor should present questions throughout the lecture to check for understanding. The teacher will lead discussion about the models at the end of class by giving clues that will lead the students to recognizing misrepresentations and difficulties in modeling the universe.

Closure:
The teacher will report on the models and address any reoccurring misunderstandings among groups.

Possible Alternate Subject Integrations:
Social Studies (Astronomy as the oldest natural science)

Teacher Notes

Opening NASA Video- http://apod.nasa.gov/apod/ap100120.html