Jacky Byatt NASA Top Stars, 2010

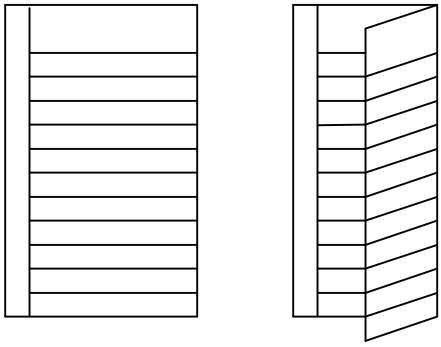
Twenty Years of Hubble

The Learner Will: Research Hubble and its discoveries over the past twenty years and create a time line of events using foldable* cards.
The Learner Will: Synthesize the information discovered and display in a creative manner
The Learner Will: Take three column notes** while watching and interacting with "Hubble: The First Decade" video.
The Learner Will: Discover and use new vocabulary in their research displays.
The Learner Will: Create a foldable* for new vocabulary.

*Foldables: Foldables are a fun, engaging and innovating way for students to display information. Rather than just make a list, write a report, construct a poster etc., students manipulate paper / card stock / construction paper in interesting and varied ways. Ideal f or your kinetic and visual learners - but be prepared to help those who have difficulties making the folds. 'Foldables' is a term created by Dinah Zike, M.Ed. of San Antonio, Texas who has published many books on the topic.

Materials (enough for your entire class/blocks):
Lined paper
12 inch by 4 inch cardstock
Pen, pencil, colored map pencils, colored markers, crayons etc
Yellow sticky notes
Glue sticks
Roll of cash register paper tape for timeline
Computer linked to a projector
Computer with internet access for every student
Color printer access

Vocabulary:
TLW: create a foldable* for new vocabulary.
Fold an 8 inch x 11 inch lined piece of paper hot dog style – so that the raw edge is about an inch and a half from the red line. Vocabulary word goes on the left, under the flap is the definition (students use their own words – paraphrase) and on top of the flap (when folded) is a drawing/symbol representing the word. Add words as needed – advise students that, "only you know what you know (or don't know)." Use only one side of the paper (photo attached).



*Foldables: rather than have your students write out words they do not understand and then use a dictionary to define them, use the above foldable. I have found that students are more engaged and connected to their work when they have the opportunity to be creative.

My Lesson plan is modeled on the 5E model.

Engage:

- Show images of Hubble photos using the projector connected to the internet via a computer – invite discussion as to what students are looking at. http://hubblesite.org/gallery/

- Show video, "Hubble: The First Decade.

http://hubblesite.org/hubble_discoveries/10th/video/video.shtml

The Learner Will: take three column notes:

**First column 1 ½ inches wide: students will write heading or topic subject
Second column 2 ½ inches wide: students will take notes using words, phrases, sentences
Third column 2 ½ inches wide: students will draw a picture or symbol to represent the topic (see photo)

- Discuss project with students – ensure complete understanding by questioning and restating answers. Students will research and create a time line on the history/facts regarding Hubble. Pre-create both foldables as a model for the students – build foldables together.

Explore: Students will explore the NASA Hubble web pages:
http://history.nasa.gov/hubble/index.html
http://hubblesite.org/the_telescope/hubble_essentials/
http://hubblesite.org/the_telescope/hubble_essentials/edwin_hubble.php
http://hubblesite.org/hubble_discoveries/
http://hubblesite.org/hubble_discoveries/10th/photos/slide04long.shtml
http://www.chron.com/news/space/
http://news.bbc.co.uk/2/hi/science/nature/638187.stm

To explore a virtual Hubble:
http://hubblesite.org/hubble_discoveries/hstexhibit/telescope/vrhubble.shtml

To aid students in finding the above web pages put them on a 'Power Point Slide' and post it to your class web page/common account (if you have one). Students will go to the class page and click on the links on the slide.

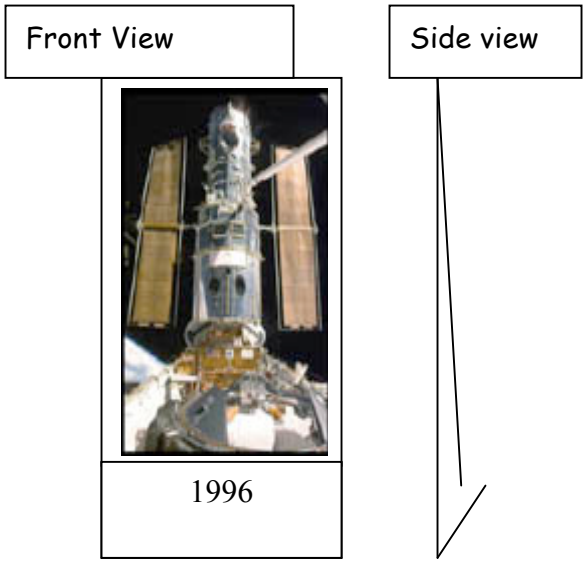
Creating the time line:

Staple one end of the cash register tape at eye level along the wall outside your classroom – draw lines down the tape every twelve inches. Let students determine the start and end years. When students find a relevant piece of information they will immediately place a 'sticky note' placeholder on the timeline stating topic/subject, title, relevant date plus their own name before moving on to researching their find. If a sticky already exits on the topic/subject they will move on to find something else – you do not want duplicates. Encourage students to check with you if in doubt – they may have another 'take' on the topic, or a different angle of approach. Let students know that they can move the sticky notes if necessary to place their own in correct time order.

Explain:

Once students have identified topic/subject they will create a foldable* to illustrate their findings.

*Foldable: See illustration below and check the photos attached. Students need one 12 inch by 4 inch piece of cardstock, fold up one of the short edges 1 ½ inches. Then fold the remaining 10 ½ inches in half and tuck the front flap inside the short fold. On the short fold flap, write the date. On the front larger folded flap paste a picture of the discovery – students will use the color printer to print a suitable/matching picture. On the inside of the foldable students will write their research, be sure to include: title, date of discovery, composition of discovery, what was discovered and if possible the names of scientists involved. No plagiarism: paraphrase what you have found and give credit to where you found the information – cut and paste the web address/s in the form of a short bibliography. Do not let students forget to write their own names.



Do not post the foldable to the time line yet. Wait until all the research has been completed and documented so that you know how many foldables you have. Remember each is four inches wide and should be posted in time order. If you have any that share the same time span and students can not determine which came first

you can hang them under each other. Before handing in as a finished project review using the supplied rubric and invite a peer edit to catch any spelling and/or grammar errors.

Extend:

- If you had control of the Hubble Telescope what would you do with it? Where would you look? Why? What would you like to find? What do you think you could find? Think of a creative way to post this information.
- Create a model of the telescope to display with the time line.
- Construct a scaled cross section model of the Hubble.
- Hubble has taken and sent back to Earth many amazing photographs of galactic phenomena - students can create a model of some of the nebula etc. out of a material of their choice – clay, yarn, straws, nets etc.

Evaluate: Completeness and creativity of information on the Hubble discoveries based on the rubric (attached – created using Rubistar). Also supplied is a rubric that can be used as a personal interview assessment between the teacher and each individual student to assess content learned and retained.

Note: This lesson has only just been developed. I intend to present it to my students after our state tests (April 27th and 28th 2010), as an end of year investigation. At present there are no products to show, hopefully there will be the first week of June.

Connection to National Standards

NS.5-8.1 Science as Inquiry
As a result of activities in grades 5-8, all students should develop:
Abilities necessary to do scientific inquiry
Understandings about scientific inquiry

NS.5-8.5 Science and Technology
As a result of activities in grades 5-8, all students should develop:
Abilities of technological design
Understandings about science and technology

NS.5-8.6 Personal and Social Perspectives
As a result of activities in grades 5-8, all students should develop understanding of:
Personal health, Populations, resources, and environments, Natural hazards, Risks and benefits,
Science and technology in society

Relevancy to project: My students bring a limited inner city perspective to the study of space and Hubble. As my students are our gifted and talented population they are the scientists and mathematicians of our future. Working and living in space is in their future – therefore, they need to relate personal health, populations and their needs/requirements, resources found and taken into space and the environments in which they may one day work and live i.e. Mars/Moon/Space stations, Space is an environment that needs to be understood by students. Natural hazards are different to those experienced here on Earth, there may not be hurricanes and tornadoes but there will be meteor showers, solar flares, extremes of cold and heat etc. They need to understand the constraints and benefits that living in space can bring. In our 6th Grade study of

'Environments' we extended into creating space environment models depicting needs that would sustain life: water, 'air', food, recycling, renewing etc. Therefore a study of Hubble would bring into question finding life or looking for life which could or would become a part of this timeline, if not now but in the future. I believe that this is a necessary and predictable projection of this project, creating a very open ended investigation.

NS.5-8.7 History and Nature of Science
As a result of activities in grades 5-8, all students should develop understanding of:
Science as a human endeavor
Nature of science
History of science