MAISA and the REMC Association of Michigan
Best Practices in Technology Integration
Plan

Title: Solar System Search

Subject(s): Language Arts, Math, and Technology

Intended Grade Level(s): 6th-7th grade

Description:

Middle school students will explore the solar system through an integrative approach involving science, language arts, math, and technology skills. Students will research space topics related to the planets and space exploration using the Internet. Students will work in small groups to construct scale models of the solar system. Students will explore the possibility of life on other planets. Using HyperStudio students will create a "travel brochure" for their favorite planet. Students will explore the fascinating night sky. Using *The Great Ocean Rescue*, an interactive laser disc program, students work together in cooperative learning groups to complete problem solving missions. They will use their observation skills to create a skywatch journal. They will also build a simple refractory telescope and have the opportunity to take part in a unique, interactive multimedia planetarium presentation.

Curriculum Benchmarks:

MI.SCI.V.4.MS.1. Compare the Earth to other planets in terms of supporting life.
MI.SCI.V.4.MS.2. Describe, compare, and explain the motions of the planets, moons, and comets in the solar system.
MI.SCI.V.4 .MS.3. Describe and explain common observations of the day and night skies.
MI.SCI.V.4.MS.4. Explain how the solar system was formed
MI.SCI.I.1.MS.6. Use sources of information to help solve problems.
MI.SCI.II.1.MS.3. Show how common themes of science, mathematics, and technology apply in selected real world contexts.
Determine topic, audience, purpose, format, and appropriate information.
Produce final draft.
MI.MAT.I. Patterns, Relationships, and Functions.
MI.MAT.II. Geometry and Measurement
MI MAT.III. Data Analysis and Statistics
MI.MAT.IV. Number Sense and Numeration
Technology Incorporate hardware and software telecommunication tools
Technology Design presentations and projects

Materials/Hardware/Software:

To complete this project, the teacher/students should have access to the following:

- Access to the Internet and the World Wide Web
- Access to *HyperStudio*
- Telescope kits from *Astronomical Society of the Pacific*
- *The Great Solar Rescue* from Tom Snyder Productions
- Field trip to local planetarium i.e. Delta College Planetarium, Bay City, MI

Activities/Procedures:

A. INTERNET RESEARCH

Throughout this unit, students will need to have ongoing access to Internet as a resource tool. Some key web sites for your students to explore are:

http://www.nasa.gov
http://quest.arc.nasa.gov/
http://spacelink.msfc.nasa.gov/
http://pao.gsfc.nasa.gov/gsfc.html
http://www.jpl.nasa.gov/
http://stellar.arc.nasa.gov/stellar/
http://www.earthsky.com/
http://athena.wednet.edu/
http://www.seds.org/
http://bang.lanl.gov/solarsys/
http://www.nasm.edu/
http://tommy.jsc.nasa.gov/~woodfill/SPACEED/SEHHTML
http://heasarc.gsfc.nasa.gov/docs/StarChild/StarChild.html
http://www.stsci.edu/EPA/Pictures.html
http://www.soest.hawaii.edu/SPACEGRANT/class_acts/
http://spacelink.msfc.nasa.gov/html./Instructional.Materials.html

B. SOLAR SYSTEM SCALE MODELS

1. Students will use the Internet to research information on the planets and our solar system. Using the information, students will construct a chart showing the relative distances of the planets from the Sun. The students will need to be taught how to calculate relative distances. They should begin with the distance of 1 AU(1 astronomical unit) representing the distance of Earth from the Sun. An example of the chart follows below but it is intended to be use for teacher background information only. Make sure students are given the opportunity to research information and construct a chart on their own. Further research will help the students discover the astronomical symbols astronomers use for each planet.

	Average Distance from Sun (Millions of km)	Astronomical Distance (Astronomical units)	Scale Model
Earth	150	1 au	1 cm
Mercury	58	0.39 au (58/150)	0.39cm
Venus	108	0.72 au (72/150)	0.72cm
Mars	228	1.5 au (228/150)	1.5 cm
Jupiter	778	5.2 au (778/150)	5.2 cm
Saturn	1427	9.5 au (1427/150)	9.5 cm
Uranus	2869	19.1au (2869/150)	19.1cm
Neptune	4486	29.9 au (4486/150)	29.9cm

Pluto	5890	39.2 au (5890/150)	39.2cm

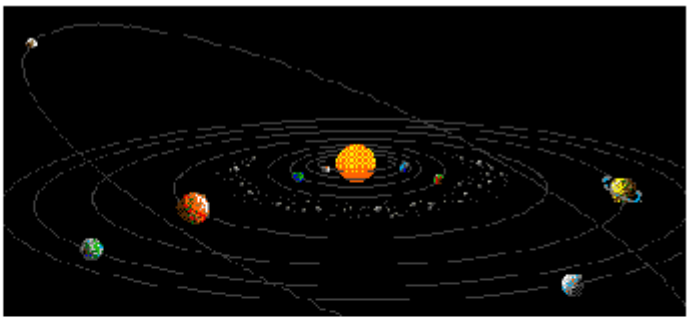
2. Once students have determined the relative distance of each planet, they can work together in groups to construct their own scale model of the solar system. Students must first decide what unit they will use to represent 1 AU in their scale model. This is a very crucial point because students must select a unit that gives them a workable model. The model must be carefully designed to give distances that show both visible inner planets while still keeping the outer planets viewable. Students should also be encouraged to use meaningful nonstandard units from their school environment such as 1 au =1 floor tile or 1 au =1 cement block.
3. The final step is to have the students actually create the physical layout of the scale model. An easy way to do this is to have them create planet signs using the astronomical symbols and planet names. An additional challenge is to have them construct their signs using their word processing & draw/paint program. They can then place each planet sign at the appropriate distances from their model sun. After completing their scale model, students will better understand the role distance played in both the formation and resulting characteristics of the inner and outer planets
4. Students can also use the same process to construct a scale model of the relative sizes of each planet. Again, repeat the process by setting 1.0 as the Earth's diameter. Students can then calculate the relative diameters of the other eight planets and record them on a chart. Care must be given again to assure that a workable model is created that displays both the tiny inner planets' diameters and the massive outer planets' diameters.
5. Students can use their word processing programs to create tables on their own highlighting the differences and similarities that exist between the different planets. As the students explore the different planets they will gain a better appreciation for the small "zone of life" that makes life on planet Earth possible.

TRAVEL BROCHURE

1. Students should quickly discover that travel to any other planets is currently out of the question. Inspire their minds by giving them a peek into the future. Imagine that modern technology has made interplanetary travel possible. After researching the solar system, the students need to decide which planet they want to visit first.
2. Using HyperStudio students will create a stack for their chosen planet. Students may use the following templates or create their own designs.
3. The following criteria should be included in each presentation.
    - Stack includes title card, bibliography card, and at least 5 other cards
    - Stack includes information about:
        - the planet's length of day and year
        - the planet's location in the solar system
        - the planet's climate
        - the special features & characteristics of the planet

HyperStudio Card 1

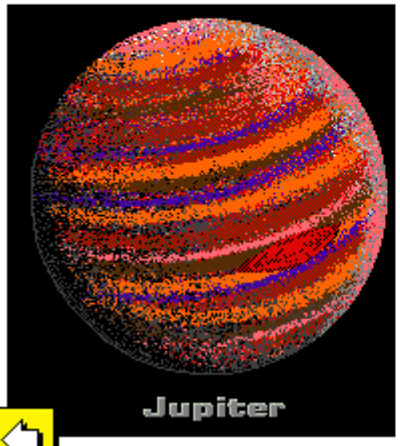
Write the title of your planet brochure here
Make sure you include your name and date



Clip and place a picture of your planet here

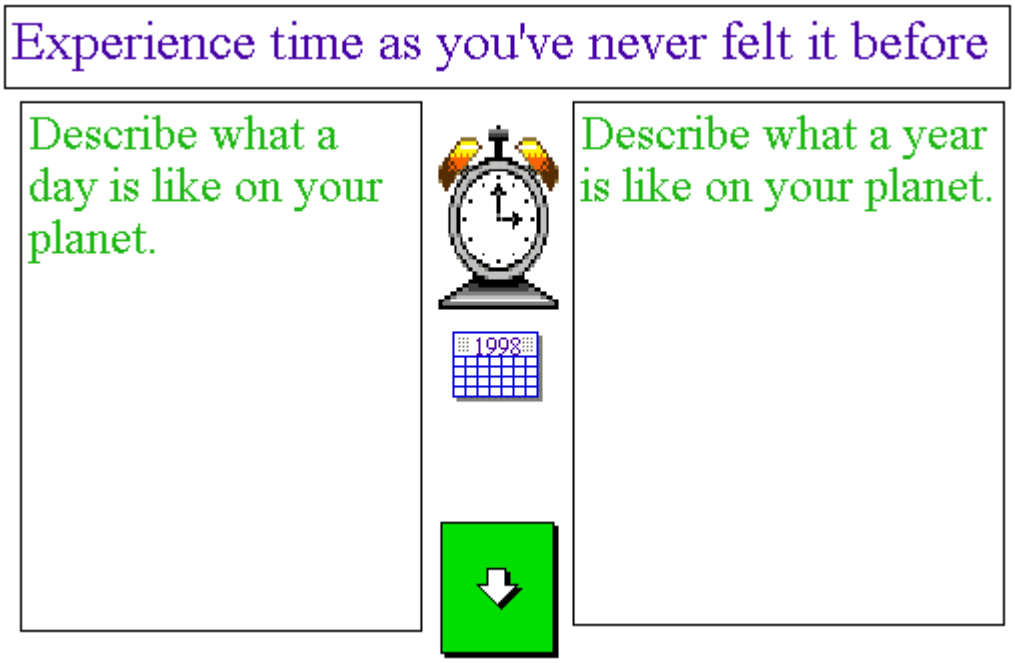
HyperStudio Card 2

Write an opening statement indentifying your planet.



List at least 3 reasons why your reader should could to visit your planet.

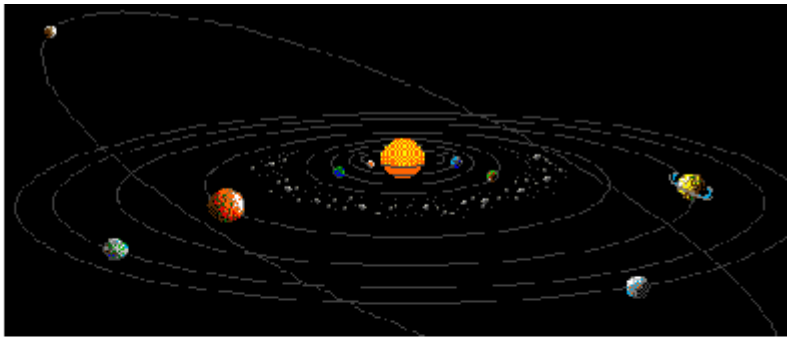
HyperStudio Card 3



HyperStudio Card 4

HyperStudio Card 5

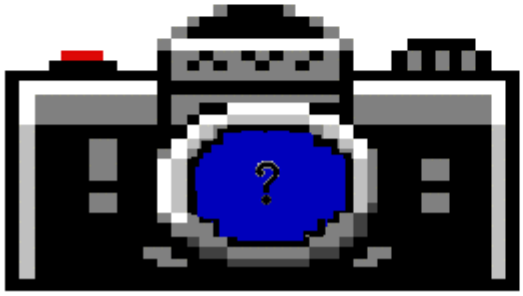
Getting there is half the fun



Write a description explaining where your planet is located and how far away it is from planet Earth.

HyperStudio Card 6

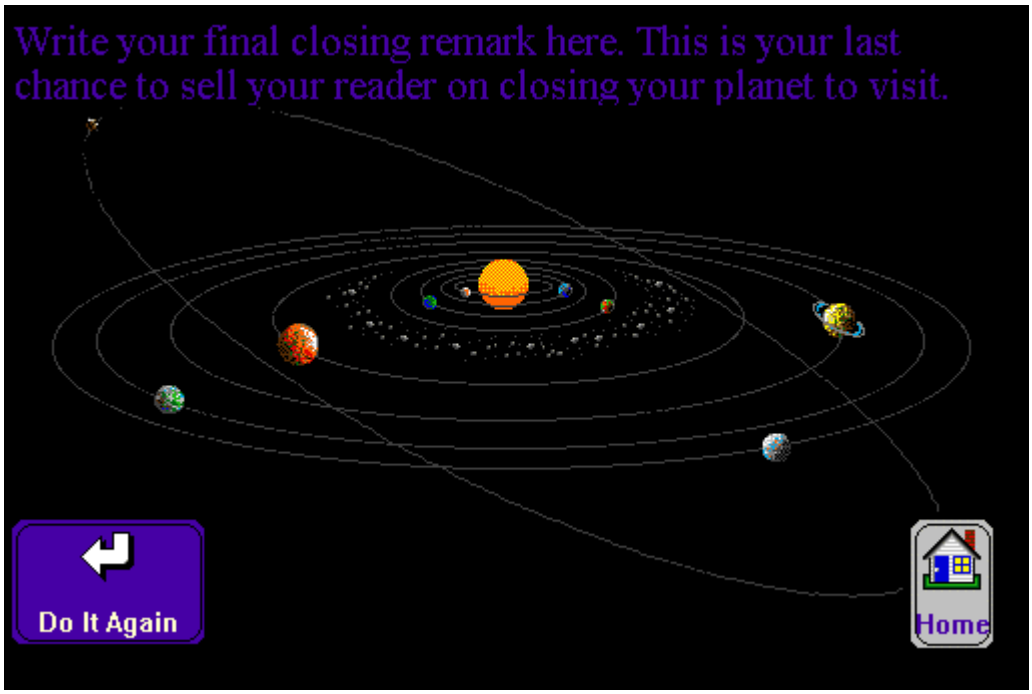
While on your stay on this planetary trip make sure you stop and see our scenic sites.



Make a special list of the special features you think your visitors will enjoy on their stop at your planet.

Make sure your descriptions

HyperStudio Card 7



C.*THE GREAT SOLAR RESCUE*

1. This interactive laser disc program is available through Tom Snyder Productions. Complete teaching instructions are included in the program. Basically the program begins by placing the students in groups of four. Each student is given the role and information pack of a specific scientist-astronomer, geologist, meteorologist, or historian.
2. Working together the groups must solve four problem-solving missions in an efficient and cost effect as possible. Since they each have only a small piece of the total picture they need to listen (not an easy task for middle schoolers) and work together to solve the problem.
3. There is also a software program that allows you to interface your computer to the laser disc. The advantage to this is that it allows easy movement throughout the program and accurately records every step the class makes as they worked through the missions.

D. NIGHTTIME SKY JOURNAL

1. It is amazing to discover that although your students have been observing the moon for several years they have little if any understanding of the lunar cycle. A meaningful learning experience is to have the students make an observation journal recording one complete lunar cycle. Observation journals play an important part in gaining scientific knowledge. An interesting challenge is to have your students to find examples of key historic journals from key scientists such as Galileo and

Leonardo daVinci. Your students will find the new moon phase as an easy starting point for their lunar journals.

2. Each night your students should record their observations. It is important that your students record both with illustrations and text. They should include a drawing of how the moon looked that night. They should record the date, time and place of their lunar observations. If possible students should include the correct phase name. Students should be encouraged to use their word processing and draw/paint programs to make an accurate, legible observation journal.
3. It is important that time is given daily to have students share their findings. On nights that clouds obscure their actual observations students can hypothesize what the moon's actual appearance would have been.

D. TELESCOPE KITS

1. Students can gain a better understanding of the scientific tools by constructing a telescope. Telescope kits are available from the Astronomical Society of the Pacific.

   Astronomical Society of the Pacific
   390 Ashton Avenue
   San Francisco, CA 94112
   1-800-962-3412

   Working together in small groups, students can build simple refractory telescopes. The image quality of these telescopes are rather crude but keep in mind the purpose of this lesson is to see how telescopes work.
2. After building their telescopes, students can research Galileo and discover how incredible his accomplishments really were given the crude tools he had to work with.

E. FIELD TRIP TO LOCAL PLANETARIUM

We are very fortunate to have an incredible local planetarium to visit. The Delta College Planetarium is a state-of the-art planetarium that incorporates a variety of multimedia technologies. If you haven't been to a modern planetarium you will be amazed. Consider a field trip to your closest planetarium to discover New Worlds with your students.

Assessment/Evaluation:

SAMPLE OF RUBRIC USED TO EVALUATE SCALE MODEL

Astronomical Unit Chart		3 x =
Need Total Assistance Completing Chart	Need Some Assistance Completing/Correcting Chart	Chart Completed Independently/Accurately
1	3	5

Planetary Markers		3 x =
4 or less Planets Correct Names/Symbols	Five Planets Correct Names/Symbols	Nine Planets Correct Names/Symbols
1	3	5

Accuracy of Model		8 x =
4 or less Planets Accurately Placed	Five Planets Accurately Placed	Nine Planets Accurately Placed

	1	3	5
Quality of Model			3 x =
	Difficult To Read Sloppy Display	Legibility OK Display OK	Easily Read Excellent Display
	1	3	5
Project Deadline			3 x =
	Project Completed Two Days Late	Project Completed One Day Late	Project Completed On Time or Early
	1	3	5

Follow-up Activities:

Check out a complete teaching unit filled with space education activities geared to meet current middle school MEAP objectives at the Regional Science/Math Center located at Saginaw Valley State University (517) 790-4114.

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