

Hey, I've Got a Question!

(An Interdisciplinary, Thematic Unit for Language Arts and Earth Science, Utilizing Technology and Inquiry-Based Research)

Ida Middle School
Linda Holladay

Note: The purpose of this unit is to practice the reading, writing, and research skills taught in Language Arts class and the word processing and presentation technology skills taught in Technology class with the learning of new content in the area of Earth Science. Last year the content explored was plate tectonics. This year the content is the solar system. Next year we will probably select another area. The format is the same. The sample lessons included in this application are the ones developed for the solar system unit.

Best Practices of Technology Integration

Title: Hey, I Have a Question!

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Subject Area(s): Language Arts, Earth Science, and Technology

Intended Grade Level: Seventh Grade, but the format of this thematic unit could probably be used for sixth, seventh, or eighth graders. Grades--whichever happens to have a focus on Earth Science

Description: This is a thematic, interdisciplinary unit that practices the reading, writing, and research skills learned in Language Arts with the introduction of new content from Earth Science. The focus of the research component is utilizing age-appropriate On-Line resources and developing a final presentation using the technology that is available to our students. Last year we used plate tectonics as our focus, this year we are using the Solar System as our focus. First students practice reading skills in exploring the content from our Earth Science book—we are using this as part of our MEAP preparation this year. Then students develop research questions that cannot be answered using the text book. Once students have their research questions approved, they use inquiry-based research skills (the emphasis here is the use of On-Line resources) to find the answers to their questions. Once they find those answers, they carefully write up their findings and develop a presentation to share the information they have learned with the rest of the class.

Narrative: Last year this thematic unit was very successful. Students were involved. Each student had something to present--some were terrific, some weren't so great, but everybody was involved. Students selected from a multitude of ways to make their presentations. With this project, a student cannot simply copy a chunk of an encyclopedia and expect it to work. This unit involves a lot of conversation between partners or small groups, and lots of clarifying conversations with the teacher. Every day before research began, we opened class with a brief status check to make sure that each student knew what they needed to accomplish during the class period. Students would sign up if they needed a teacher conference. Students seemed more willing to work when they had designed their own questions.

Students had to go beyond their textbooks, and the information in their answers had to be current. They were fascinated with On-Line research. They had designed their questions, and they were responsible for finding the answers. This seemed pretty "real world" to me, and students seemed much more ready to work on this project than just the general "library book" research.

Technology made this type of unit possible. Our school is small, and our library is limited in both quantity and quality of books, but we do have On-Line sources available to us. Because we had On-Line resources, we had up-to-the-minute information. Students are provided with a list of appropriate web sites as a starting point. Students were encouraged to work with web sites that were either university sources or government agency sources. The USGS and several universities were terrific for plate tectonics, and NASA and major universities are terrific sources for the study of the Solar System. Students are also given directions concerning the search engines that they may use. Students also seemed to find it much more exciting to prepare a Claris Works Slide Show, a HyperStudio Stack, or a video tape than just have a standard report. Some students choose models or displays, but everyone had to have something visual to assist in the presentation of the answers to their questions.

Curriculum Benchmarks:

(This thematic really involves many more benchmarks than are listed below, but this year we were limited in the number that we were to include. In actuality there are two more science benchmarks and nearly twenty more language arts benchmarks that are reviewed in this unit.)

MI.SCI.V.4.MS.2 Describe, compare, and explain the motions of planets, moons, and comets in the solar system. (Key concepts: Orbit, year, spin, axis, gravity, moons, rings, comets. Also see Motion of Objects benchmarks. Real-world contexts: Maps showing the motions of the planets, comets, moon and its phases.)

MI.SCI.V.4.MS.4 Explain current scientific thinking about how the solar system formed. (Key concepts: Clouds of gasses and dust, gravity, spinning, heavy and light elements, hot interiors of earth-like planets. Relative ages of the universe and solar system. Tools: Telescopes, binoculars. Also see Geosphere benchmarks. Real-world contests: Telescope observing and photos of star-forming regions; drawings and narratives about star explosions and star formation; accounts of searches for other planets around neighboring stars.)

MI.ELA.I.MS.3 Employ multiple strategies to construct meaning, such as generating questions, studying vocabulary, analyzing mood and tone, recognizing how authors use information, generalizing ideas, matching form to content, and developing reference skills.

MI.ELA.2.MS.1 Write fluently for multiple purposes to produce compositions such as personal narratives, persuasive essays, lab reports, and poetry.

Total amount of time this unit:

This thematic unit can be completed in fifteen (15) class sessions of approximately one hour each.

Materials/ Hardware/Software:

These lessons require the following materials:

- (1) the earth science textbook (We use EARTH SCIENCE , Scott Foresman, 1990)
- (2) use of duplicating machine for worksheets and research forms
- (3) student access to On-Line resources, including the internet, journals, and encyclopedias
- (4) student access to computers and a word processing program
- (5) student access to a program like Claris Works Slide Show, Hyperstudio, or Power Point if students decide to use these for a presentation.

Teacher Preparation: To prepare for this unit, the teachers involved in the interdisciplinary work must determine what the focus of the project will be. Then they need to develop lessons that will encourage the practice of reading skills and writing skills. (The ones we developed for this year are included at the end of this application. The reading worksheets are specific to the subject area, the writing worksheets are generic and may be used with any subject.) They need to have forms available for question development and for research summaries--those are generic and are included with this application. The teacher also needs to generate a list of web sites that are grade level appropriate as a starting point to begin research. The starting list suggestions for students to use to study the Solar System are included at the end of this application.

Prerequisite Student Skills: To complete this lesson students need the following skills:

- (a) students need adequate reading skills to comprehend what they read
- (b) students need to be able to write simple sentences and paragraphs
- (c) students need to be able to write a simple summary of what they have read
- (d) students need to be able to locate resources in the media center
- (e) students need a basic knowledge of getting around on the internet
- (f) students need a basic knowledge of using a word processing program—our students have access to ClarisWorks

Student Activities/Procedures

General overview:

Part 1: The first part of the unit focuses on reading skills (this year we are using it as MEAP preparation) in providing a common background knowledge which students use to develop research questions. This part takes four (4) days and is devoted to reviewing informational reading skills, organizing information in graphic organizers, and summarizing information.

Part 2: The second part is procedural. It involves dividing students into pairs, writing out the research questions, understanding the research restrictions, developing a research plan, and being introduced to the research summary forms. This part takes one (1) day. Students are introduced to the contents of the Research Folder on this day. Materials included in that folder are included at the end of this application.

Part 3: Part 3 is devoted to research, organizing information in the research folder, and completing research summary sheets, status interviews with the teacher, and discussion with group members about the answers to the questions. This part should take four (4) days. A copy of the Research Summary Sheet is included in the Research Folder. More copies are available for students as they need them.

Part 4: In Part 4 students develop a visual project, write and type an overview to the focus questions, write and type the answers to their questions, and develop their final presentation. The final presentation must include a visual that enhances the understanding of their investigation questions. Developing the presentation and doing the presentation should take about six (6) days. A format for the final written project is included in the Research Folder.

Student Activities/Procedures:

Day 1: Students will review the K-W-L reading strategy. They will read the sections two selections from their textbook (EARTH SCIENCE, Scott-Foresman, 1990) and complete Worksheet

1 which involves completing a cluster and Worksheet 2 which involves completing a web. The topics are “A Model of the Solar System” pp. 544-548 and “The Inner Planets” pp. 550-554.

Day 2: Students will review the SQ3R reading strategy. They will also review what is involved in writing a summary of information. They will practice using SQ3R before reading the section titled “Our Moon” found on pages 554-558. When they finish reading the selection, students will write brief summaries of the four main topics in this section using Worksheet 3.

Day 3: Students will practice using the SQ3R reading strategy and they read the section “Jupiter and Saturn,” found on pages 558-563. After reading, students will work in partners using Worksheet 4 which is a partial outline of the section they have just read. They will work in partners to add the details to the outline. For homework, they will use Worksheet 5 and the section titled “Uranus, Neptune, and Pluto” on pages 564-568. There are four essay-type questions on the sheet. Each student selects three and answers those questions completely and follows the rules of standard English in their writing.

Day 4: Students will practice their skills at locating information. Each student will have the class period to read the section titled “Asteroids, Meteors, and Comets” on pages 569-572 to practice taking a multiple choice test-type worksheet (Worksheet 6).

Day 5: Distribute Research Folders. This day is devoted to explaining the rest of the project, getting students organized into groups, getting students to think about focus questions, and to familiarize students with the outline of what they will be doing. Student worksheets and information pages used on Day 5 are included in the Research Folder. Samples are included at the end of this application. Two people (ideally) would constitute a research group. Three also works. Students need to be reminded to select a partner that will work because once the partnership is approved, that is it. One grade is given on the written component of the project and on the presentation, and all members of the group get that grade. Students also need to be reminded that when they select a research topic, it needs to be one to which they do not already know the answer. It also needs to be a question that is answerable only in paragraphs, not in one word. For example, a research question could not be “How many planet have rings?” But a research question could be “How do the rings on the planets that have rings compare?” Then that question needs to be broken down into more questions. Examples might include “Which planets have rings?” “What are the characteristics of the rings on each planet that has rings?” “How do these rings compare in composition and how were they were formed?”

Days 6-10: Research begins. Review rules of research as far as what is available and how it can be used.. Do a status report meeting each day at the beginning of the hour and at the end of the hour to determine which teams are ready to work and which need help. Review the Rules for use of On-Line Resources--this is a review because they already have learned those in Computer Classes. A list of suggested URLs for use at home and at school and a list of those sites “bookmarked” will be included in the Research Folder. (Copies of the List for use with the Solar System focus are included at the end of this packet.)

Days 11-15: These days are used to write, revise, and edit the written part of the project and to develop plans for the visual that must accompany the presentation as well as to prepare the presentation. Students will also sign up for presentation slots on Days 14 and 15.

Assessment/Evaluation:

The Six Worksheets count as individual “daily assignment” grades and are scored on a straight percentage basis.

The writing up of the **research questions counts as a “daily assignment” grade.** It is scored as an “A” if it needs no revision, a “C” if some refinement is needed, and an “F” if the questions are not acceptable. That “F” can be removed when students turn in an appropriate question list.

The **written answers to the research questions counts as a Writing Grade.** If the writing is clear, responds to the questions, and is without mistakes, the grade is an A. If the writing is clear, responds to the questions, and has three (3) errors or fewer, the grade is a B. If the writing is clear, responds to the questions, and has more than three (3) errors, the grade is a C. If the writing is not clear, but does not respond to the questions, and has three (3) or more errors, the grade is a D. If the writing is not clear, does not respond to the questions, and has more than three (3) errors, the score is an F. This grade counts as “Written Project” grade which means it counts the same as a major test. Any student who is not satisfied with the written project grade and wishes to rewrite and correct errors for a better grade may do so.

The **presentation also counts as a major test grade.** If the presentation is clear, well organized, and addresses the topic, the score is an A. If the presentation is clear, but lacks organization, yet addresses the topic, the score is a C. If the presentation is not clear, lacks organization, and does not address the topic, the score is an F.

The **visual also receives a grade which counts as a test grade.** If the visual is neatly done, enhances the understanding of the answers to the research questions, and is clearly understandable, the score is an A. If the visual enhances the answering of the research questions and is clearly understandable, but is not neatly done, the score is a B. If the visual is not neatly done, does not enhance the answering of the research questions, but is clearly understandable, the score is a D. If the visual is not neatly done, does not enhance the answering of the research questions, and is not clearly understandable, the score is an F.

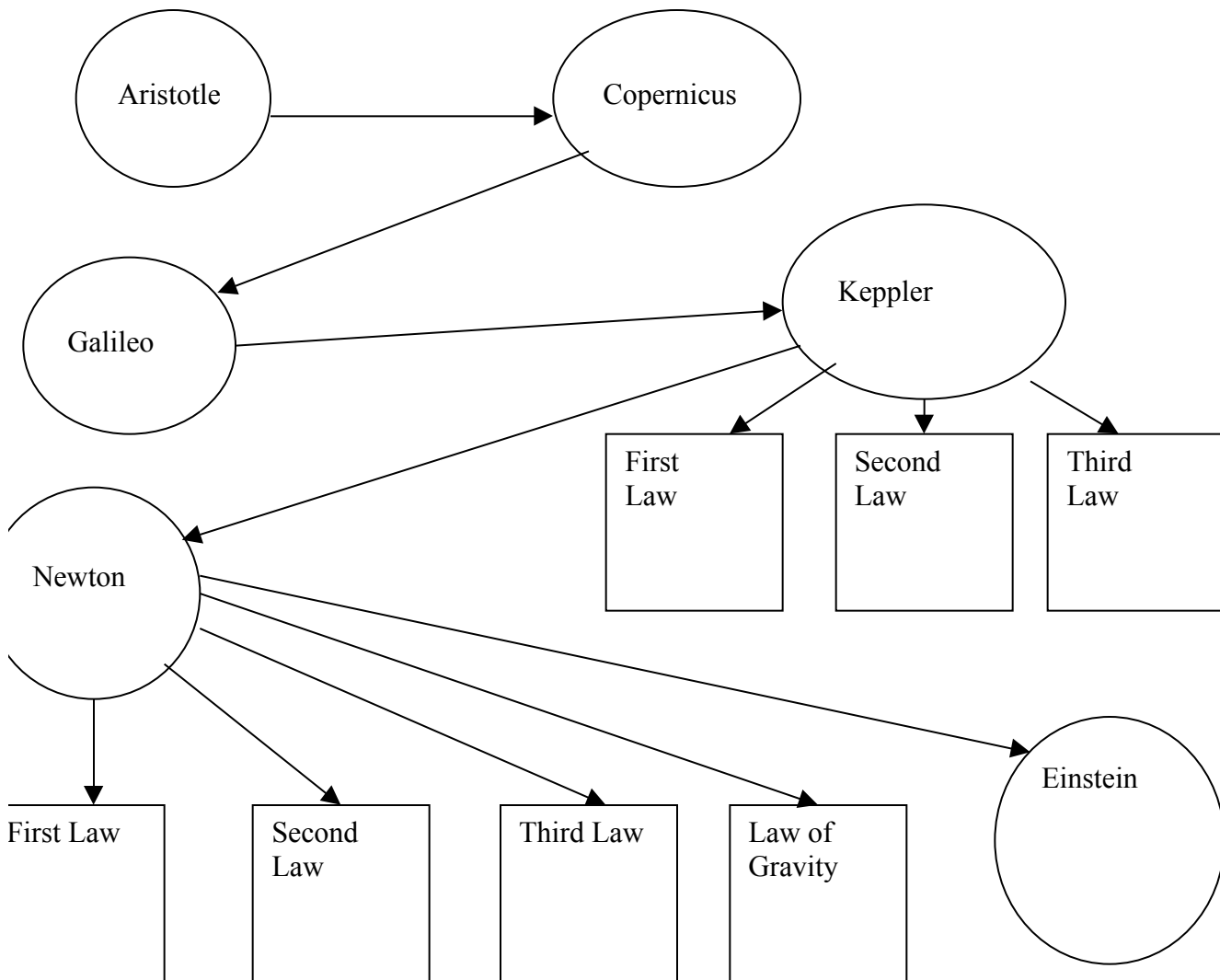
The **Research Folders** get turned in at the time the students make their presentation. If their research summaries are included as well as copies of On-Line resources that they used, the group receives a grade of “Satisfactory.” If the Research Folder does not contain those materials, the group receives a grade of “Unsatisfactory.” **The Research Folder counts as a test grade.**

GOTO NEXT PAGE

Name: _____

Worksheet 1 for Earth Science Section 23-1 "A Model of the Solar System" pp. 544-548

Directions: We will read the section and use the K-W-L reading strategy. As we read, make certain that you are keeping these questions in mind because you will be recording the answers in the circles below. Who were these individuals? When did they live? What "new ideas" about the structure of the solar system did they propose?

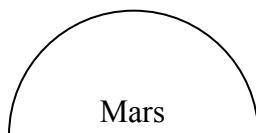
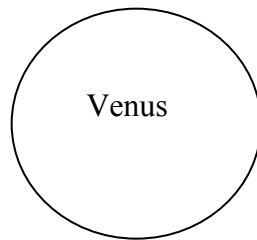
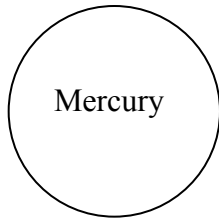


Question: On the back of this page explain the role that gravity played in the formation of the solar system.

Name: _____

Worksheet 2 for Earth Science section 23-2 "The Inner Planets" found on pages 550-554

Directions: We will use the K-W-L Strategy in preparation for reading this section. As you read the section, please make a web of all of the characteristics and traits of the three inner planets that are included in this section.



Name: _____

Worksheet 3 for Earth Section 23-3 "Our Moon" found on pages 554-558.

Directions: We will use the SQ3R strategy to prepare to read this selection. We will also review what it means to write a summary. The traits of a good summary will be written on the board. Read the selection. Then write a summary of each of the following sections.

1. Description of the Moon: _____

2. Formation of the Moon: _____

3. Phases of the Moon: _____

4. Lunar Eclipse: _____

Name: _____

Worksheet 4 for Earth Science, Section 23-4, "Jupiter and Saturn," found on pages 558-563

Directions: Before we beginning reading this section, we will use the SQ3R reading strategy to prepare for the reading. You will find a sketchy outline of the material below. Please complete the outline with details on the spaces provided.

Section 23-4, Jupiter and Saturn

I. Jupiter, the Giant Planet

A. Size: _____

B. Composition: _____

C. Why is it called a "Near-Star"? _____

D. Moons: _____

E. Great Red Spot: _____

F. Storms: _____

II. Jupiter's Moons

A. Io _____

B. Europa _____

C. Ganymede _____

D. Callisto _____

III. Saturn: The Ringed Planet

A. Rings

1. Appearance: _____

2. Composition: _____

3. Explanation for rings: _____

B. Saturn, the Planet

1. Clouds: _____

2. Composition: _____

3. Internal Heat: _____

C. Moons

1. Number: _____

2. Titan: _____

3. Dione: _____

4. Iapetus: _____

5. Hyperion: _____

6. Mimas: _____

Name: _____

Worksheet 5 for Earth Science, Section 23-5, "Uranus, Neptune, and Pluto," pages 564-568

Directions: We will again use the SQ3R Strategy before reading this section. We will also read the questions on this worksheet before we begin reading. You are to answer these questions completely in well-organized and well-written paragraphs.

1. Describe what scientists learned about Uranus from Voyager 2: _____

2. Compare the five largest moons of Uranus: _____

3. Summarize what scientists know about Neptune and how they intend to find out more. _____

4. Compare Pluto to the other outer planets. _____

Name: _____

Worksheet 6 for Earth Science, Section 23-6, "Asteroids, Meteors, and Comets," pages 569-572

Directions: Chose the reading strategy of your choice. Read the selection. Then select the correct answer to each question.

___ 1. The word "asteroids" means

- A. Minor planet
- B. Small, rocky object
- C. Star Like
- D. Small moon

___ 2. Asteroids range in size from

- A. smaller than 1 kilometer to 1000 kilometers
- B. 1 millimeter to 1000 kilometers
- C. 1 centimeter to 1000 centimeters
- D. 1 meter to 1000 meters

___ 3. Which of the following is NOT true of the asteroid belt?

- A. Its orbit is an ellipse.
- B. It is composed of about a million asteroids larger than a kilometer.
- C. It is composed of one type of material.
- D. It is between the orbit of Mars and Jupiter.

___ 4. Scientists once believed that the asteroid belt consisted of parts of a planet that broke apart, but they have discarded that belief because

- A. We now have absolute proof that the matter that became Jupiter was so massive that it affected the surrounding region of space causing the asteroid belt to form.
- B. The asteroids are made up of many different materials.
- C. There is too much mass in the asteroids to make just one planet.
- D. The orbit of some small asteroids cross the earth's orbit.

___ 5. Meteoroids are defined as

- A. pieces of rock that are found between the planets and asteroids.
- B. fireballs
- C. shooting stars
- D. another name for an asteroid

___6. Meteorites may come from all EXCEPT

- A. tails of comets
- B. the asteroid belt
- C. debris from the collision of asteroids
- D. volcanic action on earth

___7. A meteoroid becomes a meteor or fireball when

- A. it collides with an asteroid in space
- B. it passes through the earth's atmosphere
- C. it orbits the earth
- D. it hits the earth.

___8. To make a large crater when it strikes the earth, a meteorite must

- A. measure a meter or more across.
- B. have entered the atmosphere as a "shooting star"
- C. have once been part of the tail of a comet
- D. all of the above

___9. Meteors are best seen

- A. with a telescope
- B. with the Hubble Telescope
- C. with the naked eye
- D. with binoculars

___10. A comet is

- A. a ball of ice, dust, and gas
- B. formed from a dying star
- C. composed of ice rock, and dust
- D. composed of huge amounts of matter

___11. A comet has three parts which are the

- A. nucleus, asteroid, tail
- B. nucleus, meteorite, shooting star
- C. coma, tail, and gaseous material
- D. nucleus, coma, and tail

___12. A comet consists of

- A. a solid chunk of matter, vapor cloud, and dust
- B. a part of an asteroid, dust, and electrons
- C. ice, dust, and solar wind
- D. solar wind, matter, vapor

___13. The solar wind is a stream of electrons and ions which flow

- A. toward the sun
- B. to form the outer surface of the sun
- C. out from the sun
- D. none of the above

___14. The part of a comet that contains the most mass is

- A. the dust tail
- B. the coma
- C. the nucleus
- D. the gas tail

___15. Comets form

- A. between Saturn and Neptune
- B. outside our Solar System
- C. near the sun
- D. between Neptune and Pluto

___16. Which of these statements is true about comets?

- A. We discover new comets every year.
- B. Some comets return on a periodic basis.
- C. By analyzing the materials that make up a comet, scientists hope to learn more about the origin of our universe.
- D. All of the above
- E. None of the above
- F. Only a and b

___17. The Giotto Space Craft got to study which of these comets close up?

- A. Mrkos
- B. Perseids
- C. Halley
- D. Hudson Bay

18. As a comet nears the sun

- A. the tail increases in length and points toward the sun
- B. the tail increases in length and points away from the sun
- C. the tail decreases in length and point towards the sun
- D. the tail decreases in length and points away from the sun

___19. Meteor Showers

- A. Are made up of meteors that were once part of an asteroid
- B. Are made up of meteors that were once part of a comet
- C. happen when the orbit of the asteroid belt crosses the earth's orbit

D. happen only during the months of July and August

___20. The main purpose of Section 23-6 is to

- A. provide information about Halley's Comet
- B. explain how the massive meteor crater in Arizona was formed.
- C. provide basic information about asteroids, meteors, and comets
- D. help us understand that asteroids, meteors, and comets pose no threat to human beings or the earth.

Research Question Development Sheet and Introduction to Inquiry Based Research

Inquiry means to search for, to question, to study, to investigate, to examine a matter carefully. that's what you will be doing in this process. You will select a topic, develop questions about that topic, and then conduct a research investigation to determine the answers to those questions.

To begin your "Inquiry Based Research" follow the following steps:

Step 1: Determine the members of your group. You may have a group of two or three persons. Remember to choose group members that are willing to work. All of the members will get the same grade on the final written project, the visual, and the final presentation. So be careful in organizing your research group.

The members of this research group include _____

and _____

Step 2: After having read the sections in your earth science book, select with your partner(s) a **topic** that interests your research group. The topic must pertain to our Solar System. When you have completed this step, complete the next line:

The topic our group has selected is _____

Step 3: Develop a general question concerning the research topic your group selected. (For instance, if the topic you selected was Saturn's rings, your general question might be "What have scientists learned about Saturn's rings in the last ten years?") Once your group has developed a general question, record it on the next line.

The general question our research group has selected is _____

Step 4: Develop more specific questions that will help answer your general question. (For instance, if your general question was "What have scientists learned about Saturn's rings in the last ten years? Your more specific questions might be

(1) What new information have scientists learned about how Saturn's rings developed? (2) What are Saturn's rings composed of? (3) How did scientists learn this new information? (4) What space probes or satellites have passed near Saturn and what did information did they send back to earth?) **DO NOT ASK A QUESTION IF YOU ALREADY KNOW THE ANSWER. YOU MUST HAVE AT LEAST **THREE** SPECIFIC RESEARCH QUESTIONS.** Record your specific questions on the following lines.

Proposed research questions:

Step 5: **Discuss** the proposed research questions with your English teacher (or with your science teacher.) Have your teacher sign on the following line when the questions have been approved.

Approval of questions: _____

Step 6: **Begin your research.**

Step 7: **Revision or change of research questions** (if necessary). If you begin your research and discover that it is necessary or desirable to change your focus research questions, get the approval of your teacher. Write the proposed revised or new questions on the following lines. Then have your teacher initial the questions to indicate that those questions have been approved.

Proposed revisions or changes in the research questions:

Final Written Project Format

Your final written project must be typed or word-processed. Use a readable choice of print and a 12 or 14 point size. Your final written project should look like the following sections of this page. Please boldface the sections that are boldfaced in this sample.

Title (centered and boldfaced)

Group members
Names
Go here

Overview: provide general information about your topic and why you selected it. This should be in paragraph form.

General Research Question: State the question you developed and then explain why you selected the specific research questions that you chose. Then take each research question and answer it completely in paragraph form using the established rules of English. Use the following as an example.

Question 1: How do scientists think Saturn's rings developed?

Then answer the question in paragraph form. Do not boldface the answers. Double space and use the rules of standard English in writing your paragraph answers. Be sure to spell check your final written piece. Continue in the same manner with the rest of the questions.

Presentation of your Project: Rules

Your presentation focuses on the information you discovered in your investigation. You are sharing this newly found information with your classmates, therefore it **should not** include information that is already in your science book.

You must have a **visual aid** as part of your presentation. It may be one or more of the following:

- (a) a ClarisWorks Slide Show
- (b) a HyperStudio Stack
- (c) a video tape that your group designed and filmed
- (d) a skit or brief play that your group wrote
- (e) a simulation
- (f) a model
- (g) a poster or story board
- (h) an experiment

Your presentation must last a **minimum** of two minutes.

At the end of the presentation, the following items will be presented to the teacher for evaluation:

- (a) The materials you used in the presentation
- (b) Your Final Written Project
- (c) The Research Folder containing the Research Summaries and the Research Question Development Sheet

Students wishing to earn **extra credit** may elect to do one of the following

- (a) Present their research and visual at Technology Night on March 3.
- (b) Volunteer to help organize the Final Written Projects into a binder which will be kept in the science for student use.

Suggested Web Sites to Visit

<http://www.tcsn.net/afiner/intro.htm>

<http://sunearth.gsfc.nasa.gov/>

<http://seds.lpl.arizona.edu/billa/tnp/>

<http://www.eaze.net/~wspencer/AMAZSS.HTM>

<http://www.star.le.ac.uk/edu/solar/solarsys.html>