Making the Science Connection: Exploration and Technology

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We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.

-T. S. Eliot

INTRODUCTION

Exploration and technology are popular topics with kids of all ages. Kids watch exploration and technology on the silver screen when they see movies like Matrix Reloaded, Atlantis or Raiders of the Lost Arc. Kids engage in exploration and technology when they play video games like Wolverines Revenge, Dragon Ball-Z Ultimate Battle 22 on their Playstations. Furthermore, kids vicariously experience exploration and technology when they read books like *Star Wars* or *20,000 Leagues Under The Sea*. So, if we as teachers can connect these two thrilling topics to science concepts it would make learning that much more fun and interesting. Helping students see and understand the science in exploration and the science in technology is not always obvious. Often it requires research and direct instruction for students to grasp the ideas. Yet, in the long run it makes learning more exciting. Sharing our science experiences when we were young helps our students to understand the connection.

The meaning of science is very different for each of us. Much of our experience with science is what we learned in the classroom. It is the collection of insects or rocks in the third grade. Or maybe it was the experiments in high school when we would combine different solutions causing a reaction. No matter what science may mean to you it is what I teach every day. And because of that I feel that I must give my students all the information I can on whatever topic I may be teaching. My seminar entitled "The Science of Science Fiction" only reinforced for me how important it is to have the expertise when teaching students science. Today, we as educators have many resources to bring exploration and technology to life. Whether it is using computers or going on field trips, we can make it more interesting and make the connection. This is where my unit comes in.

This unit is intended to get students excited and engaged in science and to enable them in making the "science connection" to our natural world. By doing so, I hope they will ask many questions and not take things at face value. Students will make the science connection by observing and exploring everything around them. They will see how explorers were challenged by nature and how they dealt with it. They will research the

voyages taken by famous explorers and will make maps of their routes. They will replicate navigational tools and learn how they were used. They will read books to gather information and note in their journals accounts of significant events during their explorers' journeys. I hope they will seek the answers to their questions and be able to verbalize their findings. By giving students books with different perspectives they will make their own conclusions about past events. Books will empower students to make the connection. In addition, reading will help them better understand how science explains our world. It is also the intention of this unit to have students live and think as an explorer and weigh the pros and cons of being one.

Students will see how technology continues to play a very important part of exploration. Being able to take field trips to places like NASA Space Center, Port of Houston, and the Arboretum will be a critical part of this unit. Hands-on activities such as having students make tools used by explorers will bring exploration more to life. Students will see how these tools have been modified and are still used today. Students will research how recent inventions have allowed for more detailed exploration and have reduced the danger for explorers. Students will study how technology has changed in the past and they will compare it to today's advances in technology.

My Students

My students are diverse and bring different perspectives of life into the classroom. My students come from rich Hispanic cultures. They speak their mother tongue, Spanish, as their first language. As immigrants in a new land they are faced with many obstacles, language of course being the most obvious. Their greatest challenge is to master English, and *that* they are eager to learn. My students come from different parts of Latin America: El Salvador, Nicaragua, Honduras, and Mexico just to mention a few. One significant fact about most of my students is that they have traveled many miles from other countries to arrive in America. Yet, many of them do not see themselves as explorers or adventurers. As newcomers to the U.S. they are exposed to a society with different cultural mores. For some, assimilation has come easy. My students can be seen playing American card games like Dragon Ball-Z and Yu-Gi-Oh during recess. My students also play video games like Need for Speed, Motorcross Mania, Pokemon Heroes and Spider Man. For others, losing their cultural identity is too difficult: acculturation has been a better choice. My students celebrate customs found in their own countries like Dia De Los Muertos and Cinco de Mayo.

They live primarily in apartments; only a small percentage of my students' parents own their homes. These apartments are often in large complexes in close proximity to the school. This environment of confinement and isolation keeps my students away from the general population. They are secluded and have built a country within a city. My students have their own stores, bakeries, repair shops and grocery stores that foster their culture and language. Hence they have few opportunities to speak English or discover new experiences. My students spend most of their time at home, over eight hours, which

may be in an apartment that is probably about 700 to 1000 square feet of space. Despite the fact that my students' parents work more than one job, each of my students still receives free or reduced lunch at school. Currently they attend fifth grade where I teach them science. My class size consists of about 22 to 28 students per class period. They participate in a Developmental Bilingual classroom and are instructed in Spanish 50% of the day and in English 50% of the time. Science is taught in Spanish with the exception of one classroom. Expressing their ideas and thoughts does not come easy.

When you have students living in cramped quarters and have limited experiences in all content areas, what is a teacher to do? When you are teaching in two languages and have limited resources, where do you go? If you have students that just sit and stare at you, how do you reach them?

This is where my unit will spark their interest in exploration and technology. I have often heard "A happy classroom is a busy classroom." I agree with this statement. I would add that it is probably a classroom with little to no discipline problems. My unit will stimulate noise and movement; therefore, good discipline is critical. The unit contains portions where the students actively take part in each lesson. Activities consist of making maps of voyages taken as early as the 1400s or writing an essay about the pros and cons of exploring space. My students' limited experience warrants this unit's implementation. Some of my students are in fifth grade for the second time. These students have all but given up. Most of my students are "at risk" for dropping out. It is extremely important to have a curriculum that motivates them and holds their interest. It is also critical to have "hands-on" activities to assist them in grasping the concrete to abstract ideas. This unit is dynamic and flexible.

If you were to visit my classroom you would see between twenty-two and twenty-eight students working cooperatively in explorations and investigations. Science topics range from physical states of matter to understanding electricity and magnetism in real life. Students would be gathering information using various science instruments and tools. Students would be collecting data and analyzing their findings.

Procedure

During the nine-week unit the students will be engaged in several activities. The first activity will include a large KWL chart where students will brainstorm and list everything they know and want to know about exploration and technology. This will be followed by a discussion of each student's experiences on exploration. Here the teacher (facilitator) may interject his/her personal account of experiences they may have had as a child, so that students can make the connection any way they can. And when they can tie the content to something familiar it makes it much easier to learn.

The discussion will be continued with a timeline of past and present explorations. Here is where specific explorers that have traveled by land, sea or space will be

mentioned and talked about. Explorers like Christopher Columbus, Lewis and Clark, Shackleton, Cousteau, Columbia's Astronauts are just a few that will be included. The content of the timeline will be too large to cover in one day and may have to be spread into several days. Students will use the Internet to gather information on each explorer, one explorer that traveled by land, another by sea and another in space (or flight) will be used. After the preliminary background has been set the students will decide among themselves whether they would like to learn about past or present explorers. The students will then get into cooperative groups of four to five students each.

Cooperative grouping will facilitate students in gathering and analyzing data. While researching various topics, students will work individually. When the groups are formed and have been divided into past and present, the facilitator gives each group a copy of unit expectations. The expectations spell out what each group is to do during the nine weeks. The group will be in charge of creating their **environment**. Divide the classroom in half – each half represents the time in history they are studying. For example if they have chosen Christopher Columbus as their explorer, they may choose to make a reproduction of one of his ships. Or, they may want to dress up in period costumes. The costumes may be designed using recycled items. The second expectation is to have a **leader** chosen to be the one who asks questions of the teacher. The questions can be in written or oral form, and must pertain to their assignment(s). This will help in having the students work together and depend on each other for communication. The leader will be in charge of making sure the work gets done. The leader makes sure their team members have completed their jobs writing in the journal, presenting a daily report, or research being completed.

The purpose of the unit is to give the students the responsibility to learn from each other and to set their own timeframe (although guided by the teacher). The third expectation is have a **product(s)** that represent(s) their nine weeks of work on the unit. There will be short-term and long-term products during the nine weeks. Each will be explained to the students in detail leaving room for creativity and individual interpretation. One example of a short-term product is for each group to make a map detailing the voyage taken by the explorer they chose to study. This can easily be done by using a brown paper grocery bag. Cut the bottom and one side then wrinkle into a wad and soak in warm water. Let the paper dry outside or in a dry place. Have students draw and color a map on the parchment-like paper. Another short-term product may include making a navigation tool like the quadrant used in the time of Columbus to find latitude. The long-term product will be more intense and involve much more work on the part of each group member. Each group will gather information from books, Internet, field trips, and personal experiences. Then they will make a power point presentation demonstrating their findings, keeping in mind the questions asked on the KWL and hopefully other questions made during the nine-week period. An example of a question posed to the groups as a final product could be "How does Exploration and Technology impact you?" Evaluation of each product either short or long-term will be done through the use of a rubric.

Academic Skills

What students will learn in the unit is closely correlated to the Texas State Mandated Curriculum, Project Clear. As mentioned earlier, the unit is meant to integrate science, social studies, and language arts. I strongly feel that giving students alternatives to choose what they want to learn and do tends to be a great motivator. In this unit the students will have the chance to decide what they want to do as their final product. Again, the objectives covered will be from the science and social studies state mandated curriculum. Students will learn and understand the purpose of maps and globes: Where are we? How can we find out exactly where we are located? In the time of Columbus, explorers used the stars as the main means to navigate from place to place. The same type of system is used today: it is called the Global Positioning System – but instead of stars we use satellites. They will also find out how we use a Global Positioning System, which is a worldwide radio-navigation system formed by a constellation of 24 satellites and their ground station. The GPS today uses "man-made stars" as reference points to calculate positions accurate to a matter of centimeters. As students journey the life and times of their explorers, they will draw maps depicting the voyages taken by their explorer. Or, they may chart a round-trip voyage to Mars taking into account the most fuel-efficient route.

In addition to the stars, explorers used numerous tools such as the quadrant or astrolabe, compass and hourglass to travel by sea. The most important tool used by Columbus in his celestial attempts was the quadrant. This is a metal plate in the shape of a quarter-circle. From the center of the circle hung a weight on a string that crossed the opposite edge of the circle. The navigator would sight the North Star along one edge, and the point that the string crossed the edge would show the star's altitude, or angle above the horizon. Today instead of the quadrant we use the clinometer, which works under the same principles. Students will compare and contrast the navigational tools of the past and present using a Venn diagram. The students' knowledge of relative location will assist them in discovering how the average mariner located their position while in the middle of the ocean. They will also learn how astronauts navigate in space.

Obviously the science instruments on board the spacecraft depend on its science mission. Today's astronauts use direct sensing instruments to measure the spacecraft's own environment. This may include particle detectors (for ions and electrons), dust detectors, magnetometers to measure the planet's magnetic fields. Astronauts use remote sensing instruments such as imaging instruments to take pictures of the planets. Radio astronomy instruments look at radio waves coming from stars. Photometers and spectrometers analyze light to determine the chemical make-up of atmospheres. Lastly, spacecraft may have sensing instruments such as radar imagers (synthetic aperture radar or SAR) that can image the surface of heavily clouded planets such as Venus. Radar altimeters measure the height of the terrain allowing us to map Mars and Venus.

Students will know that information, critical thinking, and scientific problem solving are used in making decisions. As they live and think as explorers, students will learn the problems faced by their explorers. They in turn will be asked to evaluate the situation and enter into their journal how they would have responded to the given circumstances. Safety is a crucial part of exploration both in the past and in the present. Students will be given the opportunity to write their opinion on the recent Space Shuttle disaster. Another example, a spacecraft needs not only power to propel itself but also power to drive gyroscopes, pumps, lights and other machinery. What is the best form of energy that can be used? After researching and reading various books students will interpret and analyze data. Then they will write a well-constructed paper backing up their point of view with facts.

Reading Strategies

Throughout the unit students will read, read, read. They will select novels and read through literature circles, read aloud, and do independent reading. Usually I have a group of four to five novels that deal with the topic. Each student chooses a novel. By having four to five titles of each novel I am able to make literature groups (circles). The group decides how much time they will read each day and who will be responsible for what. For example the facilitator conducts the reading group, they make each member take turns and share their part of what they have read. The illustrator draws a picture that reflects on something significant that was read. Each job used to conduct literature circles offers students independence in their reading. It affords them the opportunity to be empowered and make opinions and question what they read. My read aloud selections are also related to the theme. In this unit students will use an author study to compare and contrast literary elements. As students research they will be exposed to independent reading where they gather information to present as an oral report.

Literature

As a teacher I am aware of the great need to foster a love of reading. One way I do this is to expose students to quality books related to exploration: books like *Christopher Columbus: The Voyage Of Discovery 1492*, by historian Samuel Eliot Morison, a narrative story written in the perspective of a mariner. *America In The Time Of Columbus: From Earliest Times to 1590* by Sally Senzell Isaacs is a book that describes the everyday lives of early Native Americans. *Exploring The New World*, written by Rebecca Stefoff, is a chronology of Columbus's voyages including maps. *Around The World In A Hundred Years: From Henry The Navigator To Magellan* takes a humorous view of ten explorers between 1421 and 1522. *Where do you think you're going, Christopher Columbus?* by Jean Fritz is an account of the politics of exploration. *Conquerors and Explorers*, written by Stewart Ross, is a book that separates reality from fantasy. *Encounter* by Jane Yolen expresses the perspective of the Taino Indian tribe when they first met the white man. *Follow The Dream: The Story Of Christopher Columbus*, by Peter Sis, gives an artist's interpretation of the Columbus voyage of

discovery and the opening up of new worlds. *The Green Book* by Jill Paton Walsh is a science fiction novel depicting the story of a girl and her family leaving Earth and going somewhere into Space.

Studying the space explorer of my unit will be easier to understand when students read books like *The Best Book of The Moon*, written by Ian Graham, in which students are given the perspective of astronauts who actually first walked on the moon. *Space Station Science: life in free fall* by Marianne J. Dyson, who at one time was a Mission Controller, gives insight about the Space Station. She explains in detail what it takes to keep the International Space Station in space. *Floating in Space* by Franklyn M. Branley is a nonfiction book covering gravity. *The Moon Book* by Gail Gibbons describes the moon phases as well as lunar and solar eclipses. *The Librarian Who Measured The Earth*, written by Kathryn Lasky, is a picture-book biography where the main character Eratosthenes seeks to figure out the measurement of Earth. *Alistair and the Alien Invasion* by Marilyn Sadler focuses on Alistair looking throughout the galaxies to find the most unusual plant. *Insects From Outer Space* by Vladimir Vagin asks the question as to whether alien insects are friend or foe. Another book, *Postcards from Pluto: A tour of the Solar System* by Loreen Leedy, leads students through the solar system explaining facts along the way.

Writing Strategies

Writing is also very important in my unit. This is more difficult for my students since they do not write much in English. So, in the beginning of the year I start my students with something I call "Power Writing." I use this strategy to improve their writing in English. I give my student a prompt such as "Write as much as you can about…". I give them five minutes to write. After the alarm goes off they count all the words on their page. They graph the number of words using graph paper. By doing this activity each day my students see a growth in their writing and they notice the type of topics they can write about more easily. Another type of writing my students do is journal writing where they write about content such as math, science, or social studies. In my unit students will write about their voyages by keeping a journal similar to the one used on the Lewis and Clark expedition. Here is an example from Lewis' journal:

> Thursday August 22, 1805
>
> This morning early I sent a couple of men to complete the coverage f the cash which could not be done well last night In the dark, they soon accomplished their work and returned. late last night Drewyer returned with a fawn he had killed and a considerable quantity of Indian plunder (DeVoto 219).

They will also write and present a report by researching an explorer. Students will use PowerPoint to make their explorer presentation. The short term writing products will be done in various formats; advertisements, brochures, game boards, or oral reports.

THE CONSEQUENCES OF EXPLORATION: PROS AND CONS

My primary intent for this unit is to give students the perspective of future exploration, where they themselves are the "explorers." They will be responsible for researching and gathering data that will facilitate their exploration and learning. Often, from the learner's view, exploration is seen as an adventure full of the promise for having fun. Exploring is almost always idealized when in reality the consequences of encounters are otherwise. My intent is to encourage students to at least have a realistic and balanced view of historical exploration. Outside of its idealized context, exploration was dangerous and devastating. For example, Shackleton's brave and noble journey to Antarctica was lethal to everyone on board: not much fun. Also, famous explorer Hernan Cortez carried disease and pestilence that amounted to the greatest known genocide. So, students should see that exploration and the ramifications thereof are not all positive.

Again, students should begin to understand how exploration has impacted our civilization in the past and present for both good and bad. By providing a balanced approach, they will in turn have a better idea of what is the best way to explore in the future, but also, what is the best way to avoid the pitfalls of past explorations. After all, they will at one time or another have a "say so" to our future exploration as they are the next generation.

Positive Consequences

Explorers explore to discover the unknown, to charter territory no one else has traveled. With this adventure come many positive consequences. For example, Marco Polo's wonderful stay in China was an illumination for then what was a dark Europe. It provided for Polo more possibilities of civilization. Exploration, apart from romanticism, can be positive for all those involved. Was it not the Indians who help the starving foreign puritans one winter of a long time ago? Inevitably, the introduction of one culture to another is bound, without exception, to have consequences. Marco Polo not only facilitated cultural exchanges, but as a liaison between Europe and China, he demonstrates to us that our differences can in fact be exciting and fun!

Discovery of water on Mars proved to be a positive consequence. After so many years it is now at least plausible to send people to live on Mars. Along with that, other questions have arisen. If we can do something, does it necessarily mean we should? Other positive consequences have been those discovered by explorers at sea. Creatures of the sea are getting increased attention from scientists looking for medicines and therapies of the future. Toadfish are being used to cure eye and heart conditions. At the same time an enzyme found in a cone snail used to paralyze its prey is critical for human blood clotting. The vitamin K generates the function of the enzyme in both humans and cone snails. It is through the use of new technology that we can travel father and more efficiently. New inventions have made it possible to go where we could not a hundred years ago.

Negative Consequences

Exploration and technology are not immune to tribulation. In history classes today, Columbus and the coming of the Spaniards are charged with genocide of the Indian population. "Although scholars debate the exact numbers . . . the Indian population fell from between fifteen and twenty million when the white man first arrived to a fraction of that 150 years later" (D'Souza). Unquestionably many Indians died in great numbers. The vast majority of Indians did not perish as the result of hard labor or deliberate destruction. Instead, these deaths were the effect of contagious diseases. In turn, the Indians passed on illnesses to the Europeans as well. The Indians also taught the white man about tobacco and cocaine: this accounted for the numerous deaths of Europeans over the next several centuries. Genocide may be an incorrect manner of describing this tragedy since the Europeans' transmission of disease was not deliberate.

The cost of exploration is not cheap. Astronauts today take years preparing for their flights. Equipment that is taken into space is no exception. Take for example the rover, which has been used to monitor and take pictures of Mars. Placement of the rover takes time and careful consideration.

> Since the rovers do not have the luxury of landing on a well-paved runway, JPL geologists and engineers must carefully choose an area without large rocks that could damage the rovers' airbag landing system. Also, an area that is too densely populated with rocks of any size could prevent the rover from moving freely. Winds in the lower atmosphere are also an important consideration, as are the slopes the airbag-clad lander impact against. Adequate exposure to the sun is vital for the solar-powered rovers. Geologists have chosen sites near the equator where there is sufficient sunlight. The sites are also relatively free of accumulations of iron-oxide dust particles that can coat solar panels and interfere with the rovers' mobility (*Mars Exploration*).

Of course the most devastating negative consequence of exploration is death. There is a high risk involved every time we venture into the unknown. Science in all its glory cannot prevent the inevitable, death. On June 16th the sixteen-day mission of Columbia and its crew was complete. But during entry, all their scientific experiments were destroyed along with the crew when the spacecraft attempted its reentry to earth.

LESSON PLANS

Lesson Plan 1: Making a Quadrant

Time: About 1hr and 30 minutes

Background
The basic quadrant is an ancient instrument used for measuring vertical angles – stars above the horizon or the height of a building or tree. Today we use a development of that technology – the clinometer – in schools for similar purposes.

Objective
Students will follow directions. Students will apply knowledge of longitude. Students will measure longitude using a quadrant.

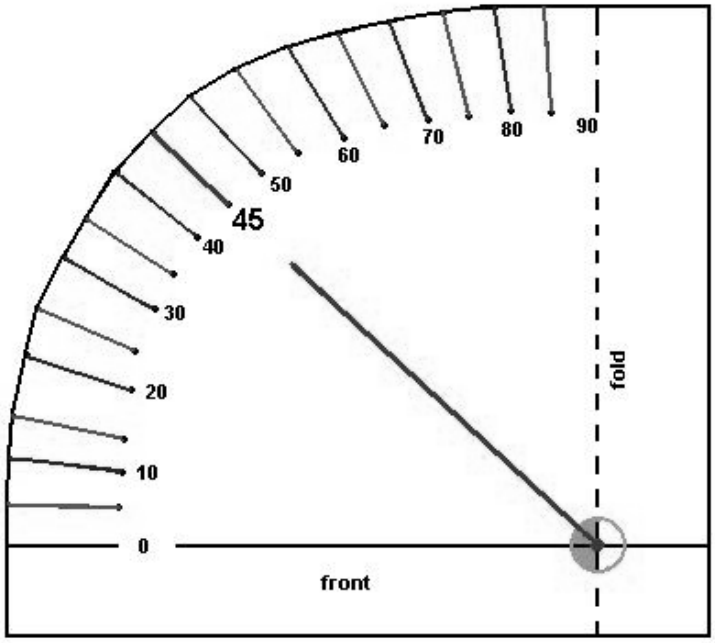
Materials
- Index card or cardboard
- Thread or string
- Paper fastener
- Metal Washer
- Scissors
- Pencil
- Ruler
- Hole punch
- Protractor
- Pair of compasses

Procedure
Cut index card using scissors to a quarter of a circle. Then hole punch two holes on edge to accommodate the sights, carefully aligned with the zero line of the quadrant. A third hole (small) is punched at the vertex of the quadrant.

Use a short (7-8 inches) length of fine cord or heavy thread to suspend the bob (metal washer). Check the two straight edges of your quadrant circle for square. If they are at exactly 90 degrees, then draw straight lines parallel to each edge passing through the center of the small hole at the vertex (the should be about ¼" in from each edge).

Mark a 6" arc using the largest beam compass. To use this compass, place a pen in it and line up the tip so that it sticks out about 1/16" less than the nail point, and clamp it in. Now put the point into the vertex hole, and holding the beam in one hand with the pen perpendicular to the card or cardboard, slowly turn the plywood blank under the pen to make an arc from between the zero degree and 90 degree lines. Next, using the other two beam compasses, make the 5 ¾" and 5 ¼" arcs.

Finally, a 3" radius arc is drawn using the edge of the 6" protractor as guide. Next draw the graduations at 5 degree intervals.



Quadrant scale

Lesson Plan 2: Bizarre New Planet

*This is a condensed version of "Strange New Planet," which is posted on the *Mission to Mars* website and is itself adapted from the NASA Education Brief "EB-112: How to Explore a Planet." For the full text, please see <http://athena.cornell.edu/educators/lp_05.html>.

Time: 2 hours

Background
Bizarre New Planet brings insight into the processes involved in learning about planetary exploration. This activity demonstrates how planetary features are discovered by the use of remote sensing techniques.

Objective
Students will engage in making multi-sensory observations, gathering data, and simulating spacecraft missions.

Materials
- Plastic balls, modeling clay, Styrofoam balls or rounded fruit
- Vinegar, perfume, or other scents
- Small stickers, sequins, candy, marbles

- Cotton balls
- Toothpicks
- Glue
- Towel (to drape over planets)
- Pushpins
- Viewer material (sheet of paper, paper towel roll or toilet paper roll)
- 5" x 5" blue cellophane squares (one for each viewer) and other selected
- Colors to provide other filters for additional information
- Rubber bands (one for each viewer)
- Masking tape to mark the observation distances

Procedure

Have students make a planet using the items mentioned above. Start with a melon or any ball shaped object. Add other material to make it more interesting. Use books or pictures to refresh students' minds as to what a planet looks like and what it is likely to have on it. A movie could also be used.

Put the object (planet) on a table in a far wall of your classroom or gymnasium. Use a towel to cover object. Remind students that their job is to use their senses to view this planet. Have each student choose his or her type of viewer.

> This step simulates earth-bound observations. Gather students against the sides of the room by groups or teams. These areas will be referred to as Mission Control. To simulate Earth's atmosphere, a blue cellophane sheet could be placed on the end of the viewers, taped or held in place by a rubber band. This helps to simulate the variation that occurs when viewing through the Earth's atmosphere. Remove the towel. Teams observe the planet(s) using their viewers for 1 minute. Replace the towel. Teams can discuss and record their observations of the planet. At this point, most of the observations will be visual and will include color, shape, texture, and position. Teams should write questions to be explored in the future missions to the planet. (*Strange New Planet*)

Each team will have a turn at walking quickly past one side of the planet still on the table. Approximately a distance of five feet from the planet needs to be maintained. This is their fly-by Mission. Teams record their observations.

> Each team takes two minutes to orbit (circle) the planet at a distance of two feet. They observe distinguishing features and record their data back at Mission Control. Teams develop a plan for their landing expedition onto the planet's surface. Plans should include the landing spot and features to be examined. (*Strange New Planet*)

Each team approaches their landing site and marks it with a pushpin. Team members take turns observing the landing site with the viewers. Field of view is kept constant by team members aligning their viewers with the pushpins located inside and at the top of their viewers. Within the field of view, students enact the mission plan. After five minutes the team returns to "Mission Control" to discuss and record their findings.

Assessment
Each team shares their data with the class in a team presentation. As a class, compile a list of all information gathered by the teams to answer the question "What is the planet like?"

Lesson Plan 3: Literature Circles

Objective
Students will share a variety of literature genres. Students will read for comprehension. Students will read for content knowledge.

Materials
Science related novels (fiction or nonfiction)

Procedure
A. Have students select one of four to five novels placed on a table. As students choose their novel they sit with the other team members who chose the same title. Various reading levels are preferred.
B. Students decide on jobs: Discussion Director, Literary Luminary, Connector and Summarizer, Illustrator.
C. It is the students' job to discuss how many pages they will read per day. Coming to an agreement may be facilitated by counting the number of pages and the number of days to be spent on the novel (two weeks).
D. Every day, each team member shares their part (job) with other team members.
E. The goals for the next day are set.

Job Descriptions
- *Discussion Director:* Job is to develop a list of questions that the group may want to discuss about the part of the book read.
- *Literary Luminary:* Job is to locate a few special sections of the text that the group would like to hear read aloud.
- *Illustrator:* Job is to draw some kind of picture related to the reading, it can be a sketch, cartoon, diagram etc.
- *Connector:* Job is to find connections between the part of the book read and the world outside.
- *Summarizer:* Job is to prepare a brief summary of what was read.

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