GRADE: 4
ACTIVITY TITLE: Rock N'Roll / Recherchons les roches!

KEY WORDS:	**MOTS CLÉS:**
hardness	la dureté
colour	la couleur
lustre	le lustre
texture	la texture
mineral	le minéral
streak	la rayure
igneous	ignée
sedimentary	sédimentaire
metamorphic	métamorphique

INTRO: Activity involves students observing, describing and sorting a variety of rocks. From these explorations, students will have an opportunity to further investigate properties of rocks.

Lesson adapted from:
More Picture Perfect Science Lessons, NSTA Press 2007
Bricker, P., "Rock Wonderings", Science & Children, Jan. 2004

INQUIRY TYPE: teacher initiated, partially designed; partially student designed, run and tested

MATERIALS RESOURCES:
In the Catalyzer:
igneous rock box
sedimentary rock box
metamorphic rock box
eyedroppers X 12
unglazed porcelain tiles (streak plates) X 5
picture book: If You Find A Rock by Peggy Christian

Provided by Teacher:
samples of interesting rocks (e.g., geode, fossils, etc.)
small paper bags
rulers
balances or scale
magnifying glasses
different kinds of paper
cups of water
cups of vinegar
pennies
nail files
nails
chart paper
sticky notes (2 different colours, e.g., pink and yellow)

Recommend picture book: Rocks: Hard, Soft, Smooth, and Rough by Natalie M. Rosinky (check libraries)

TARGET PROCESS SKILL: Inquiry - Experimentation (Plan & Conduct Investigations; Collect Data)
Inquiry - Research

STRAND: Earth and Space Science - Rocks and Minerals

BIG IDEA:
Rocks and minerals have unique characteristics and properties that are a result of how they were formed.

ENGAGE:

Part 1:

- Provide a sample of small, paper bags, each with a rock or mineral inside.
- Allow the children to take turns guessing the contents of the bag. Allow them to reach inside and touch the contents, and predict what the contents might be. Have children explain the reasoning for their predictions. (Children are likely to identify the contents as a rock for each bag.) By the time they get to the last bag, they will be confident that their predictions are correct.
- Ask about any noted differences in the contents. If the children can feel differences, are they sure that each bag contains a rock? How can they be more precise?
- Open the bags and shake out the contents.
- Explain that the simple name of rock is not good enough for a scientist. Using a Think-Pair-Share, have students consider what other methods could be used to identify the rocks and minerals more scientifically (i.e., think independently first, discuss with a partner, share as a whole group).
- Record class ideas on a chart. Post this chart for future reference throughout the unit.

Part 2:

(This portion of the lesson may be done during a Language block of instruction.)

Inform students that you have a book to read that will allow them to think about special rocks.

Read Aloud: "If You Find a Rock" by Peggy Christian

Pre-reading:

- discuss difference between rock hound (person who collects rocks) and a geologist (a scientist who studies rocks to learn about the earth)

During Reading:

- inform students that while you are reading, they should be thinking about the properties of some of rocks that made them suited for particular uses

After Reading:

- Revisit some of the uses for the special rocks presented in the book.
- Tell students that they are going to be "rock hounds" on the hunt for their own special rocks.
- They can go home and search for at least one rock with adult supervision, or select a rock from their own collection. Discuss these rules: The rock(s) must fit into the palm of your hand. No rocks are to be thrown. Recommend sending a letter home to inform parents of the assignment and outline the rules. (Have extra rocks available for those students who do not bring any in.)

EXPLORE:

Prep: Enlarge TM-3 Observation Journal and make multiple copies. (One per group.)

- Place students in groups of 3 or 4. Each student should share one of their rocks with their group members, explaining why they chose that particular rock.
- As a group, students choose one of the rocks to observe in more detail. (Students may vote on the rock to investigate as a team.)
- Distribute sticky notes. Explain to students that scientists must keep accurate documentation of their work, and that the sticky notes and the Observation Journal chart will be used to record their observations and questions.

- Also explain that scientists examine objects/specimens very carefully and in great detail. One way they do this is through their senses. Inform students that they will observe their sample rock using the senses of sight, smell and touch. Observations should be recorded on yellow sticky notes (one idea per yellow sticky) and placed under the appropriate heading. Have students use their senses of sight, smell, and touch to observe the rocks.
- While observing, groups should generate and share questions. Prompt responses with the questions: "What else would you like to know about your rock? What are you curious about? What do you wonder?" Students should be encouraged to list as many questions as they can about their rocks on the pink sticky notes (one question per pink sticky) and place these in the column under the Wondering heading.

(At this point, you may want to remind students of the questioning and observing skills that they worked on previously. Refer to STAGE 1 lessons of the Smarter Science program to review these skills and how they were developed.)

EXPLAIN:
Prep: Reproduce TM-1: Observations through Senses onto chart paper and post at the front of the room.

- Have each group share one observation of their rock. Place their corresponding yellow sticky note under the heading "Observations of Rock." Each sticky should be listed on separate lines (e.g., rough, small, gray and white, striped, round).
- Record the corresponding categories, such as texture, size, colour, shape, lustre. (Explain any terms students are not familiar with.)
- As a class generate word banks for each category term - these can be new ideas, or observations from rocks that had not been shared. (E.g., "texture" could be described as smooth, slick, rough, or bumpy.) These words can be written on yellow sticky notes as well.
- Each group should have an opportunity to share 1 or 2 questions that they have. These pink sticky notes can be added to the chart under the "Questions/Wonderings" headings.

EXPLORE:
- Students will continue to work in their groups; however, this time they will observe the other rocks (those that were not chosen previously). Have students consider how the rocks are alike and how their rocks are different.
- Groups should document additional observations (incorporating the descriptive words discussed previously from the Chart - TM-1) as well as any new questions/wonderings. These new addition as should be added to their Observation Journals.
- Have groups sort/classify rocks based on their observations.
- Allow groups the opportunity to see each other's sorting process by using a Gallery Tour strategy. (Refer to TM-2: Gallery Tour Description (Reference) more information.) See if students can determine what category (sorting rule) was used to classify each group's rocks.

EXPLAIN:
Prep: Book computer lab or library for students to be able to do some basic research. If using a computer lab, it is recommended that you "bookmark" those sites you would like your students to use. Please refer to the list below (Text Reference section).
Make copies of TM-4 Rock Research (one per pair/group depending on how you will organize class).

Part 1:
- Explain to students that there are many different ways to answer questions. Some questions can be answered by reading information from a book or article, or by asking an expert. Others can be answered by acting like a scientist. This involves making detailed observations and/or doing tests or experiments.
- Remind students of the question you had earlier: "What other methods could be used to identify rocks and minerals more scientifically?". Explain how previously we had sorted and grouped the rocks based on observations using our senses.
  Teacher Prompt: *We just used our senses of sight, touch and smell to make detailed observations about our rocks. We then classified these rocks based on our observations. Some of us sorted rocks by colour, others by texture. I'm wondering if I could further investigate the rocks by testing them in order to tell them apart?*

- Introduce the class to the different materials you have that could be used to test the rocks (e.g., hand lens, water, vinegar, eyedroppers, pennies, nail files, nails, streak plates, magnets).
  Teacher Prompt: *I have all of these different materials that I could use to test the rocks. I wonder how a geologist might use this equipment ? How could I find out? What could I do?*
- Prompt students to realize that they would need to do some research by looking in books or on the internet, or by asking an expert like a geologist.
- Explain how the graphic organizer for "Rock Research" can be used to record information.

- Allow students time to research the purposes of the various materials. You may choose to discuss the information they find as a whole class activity once research is complete.

EXTEND:

- Remind students what the initial question was, and how the information they located will help to answer that question.
  Teacher Prompt: *Remember, we have been looking for other methods that could be used to identify rocks and minerals more scientifically. We just did some research to find out how certain pieces of equipment or materials, like the streak plates and vinegar, could be used. Now we should try and identify our own rocks by doing these tests on them.*

- Show students the sample class recording chart (TM-5) so they better understand the information they will be collecting about their rocks. (You may choose to use or modify TM-6 Hardness Test as a reference or recording chart for testing for hardness. Note that both of the teaching masters were taken from www.rocksforkids.com.)
- Students should carry out the tests in their groups. Results should be recorded on the class chart (TM-5).

- The final step involves students having an opportunity to identify their rocks based on their observations and the results of their tests. One way to do this is to access an online rock identification test. Students follow the identification tree to narrow down their type of rock. A great rock identification test to try is: http://www.bwctc.northants.sch.uk/html/projects/science/ks34/rocks/key.html.
- Have students share what they think their rock is and how they came up with the identity.

Additional Activities:
Students should also be provided time to find answers to their own questions listed on pink sticky notes. These can be answered throughout the unit by doing research or other activities.

EVALUATE:

Diagnostic

- Activate and assess prior knowledge using the Think-Pair-Share tactic. (As described in the "Engage" section above.)
- After students have had an opportunity to predict what the mystery items might be, and their predictions have either been confirmed or disproved, have them consider what methods could be used to identify rocks and minerals more precisely.
- Give students 30 seconds to think independently, and then a couple of minutes to share ideas with a partner.
- Select a few partners to share their main ideas with the class. Record these on chart paper.
- This chart paper can be posted and referred to throughout the unit. Changes can be made (additions and modifications) as new learnings come about throughout the unit.

Formative

- The teacher should review and respond to the work of each student as they progress through the lesson.
- Students should record their observations and questions on the inquiry cards (Step 1 of TM-1: Inquiry Cards) or in a science journal. (The skills of observation and questioning were emphasized in Stage 1 of the Smarter Science program. The quality of observations and questions can be used as diagnostic information as well as formative. Provide suggestions to students about how these skills could be improved.)
- As students work through the "Extend" section to test their rocks, teachers should observe student work, dialogue about their ideas and plans, as well as provide specific feedback to improve learning.
- Have students complete a journal entry to reflect on their own learning. Reflections - What methods do scientists use to identify rocks? What do you think your rock is, and how do you know?

BACKGROUND INFORMATION:
Rocks are minerals, but not all minerals are rocks. Minerals are naturally occurring inorganic compounds ("non-living material"). Rocks are extensive mineral bodies composed of one or more minerals in different amounts, which form part of the earth's crust.

Rocks can be identified by properties such as colour, texture, presence of pores, and other characteristics. Colour is an easy one but not all that helpful. The size and shape of the particles that make up rock, are more meaningful. Rocks

and minerals can be identified through physical testing. In this lesson, students participated in 3 different types of physical tests.

1. Hardness/Scratch Test: This test determines a mineral's resistance to scratching. The Mohs' Scale of Hardness is used to rank the hardness of a mineral on a scale of 1 (the softest) to 10 (the hardest). This ranking is made based on the relative hardness of a mineral, that is, the hardness of a mineral compared with that of other minerals.

2. Streak Test: Sometimes the true color of a mineral is not obvious by looking at a specimen. Minerals are subject to weathering. This can change the surface colour of the material. Scientists use the streak test to determine the true colour of a specimen by dragging a sharp edge, grain, or the point of the specimen on the streak plate. Some specimens can be difficult to get a good powdered streak from. As with other tests, repetition usually pays off.

3. Acid Test: This test is used by geologists to confirm the presence of calcium carbonate in rocks. Calcium carbonate reacts with the acid to form carbon dioxide gas. The gas is evident in the form of bubbles or fizzing when drops of vinegar are placed on a mineral sample containing calcium carbonate.

LOOK FORS:
Students are:
- identifying differences of detail among rocks (Stage 1 Skill)
- asking a variety of questions about rocks (Stage 1 Skill)
- suggesting how answers to questions of various kinds can be found (Stage 1 Skill)
- making predictions about possible outcomes to investigations based on prior knowledge and data collected from various sources (Stage 1 Skill)
- identifying what to look for or what to measure to obtain a result in an investigation (Stage 2 Skill)
- recording and organizing information and results (Stage 2 Skill)

SEQUENCE:
Students should have a basic understanding of rocks & minerals. However, this could be used as an introduction to the Understanding Earth & Space Systems unit to motivate students to begin thinking about rocks and minerals.

TEACHING STRATEGIES:
Think-Pair-Share
Gallery Tour
Graphic Organizer - Charts

SAFETY:
Use care with nails when performing scratch tests.

BLACK LINE MASTER[S]:
TM-1: Observations Through Senses (Chart)
TM-2: Gallery Tour Description (Reference)
TM-3: Observation Journal (Chart/Handout)
TM-4: Rock Research (Handout)
TM-5: Investigating Rocks Recording Sheet (Chart)
TM-6: Hardness Test (Chart/Reference)

TEXT REFERENCES:
Rosinky, Natalie. "Rocks: Hard, Soft, Smooth, and Rough" Picture Window Books, 2002 ISBN 1404800158
"First Field Guide: Rocks and Minerals" Scholastic, ISBN 0-590-5484-8
"Rocks and Minerals, My First Pocket Guide" National Geographic, ISBN 004390655650-X
Baylor, B. "Everybody Needs a Rock" Alladin, ISBN 068971058
Pellent, Chris. "Rocks & Minerals" (Eyewitness Handbooks) Dorling Kindersley Publishers Ltd., ISBN 0751309877
Dussling, Jennifer. "Looking at Rocks" (My First Field Guides) Grosset & Dunlap ISBN 0448425165
Pough, F. "Peterson First Guide to Rocks and Minerals" Houghton Mifflin, ISBN 0395935431
Hooper, M. "The Pebble in My Pocket: A History of Our Earth" Viking 1996 ISBN 0670862592

Websites

Brooke-Weston Internet Projects - Rock Identification Science Project
- interactive site that allows students to identify different mystery rocks by examining photos and examining test results
(http://www.bwctc.northants.sch.uk/html/projects/science/ks34/rocks/list.html)

Rocks for Kids
- a site geared especially for kids (but great background information for teachers as well)
- click on the Table of Contents to easily access info on rocks and minerals
(http://www.rocksforkids.com/)

Bob's Rock Shop
- non-commercial site geared for rock-hounds (http://www.rockhounds.com/rockshop/table.shtml)

Mineral Information Institute
- lesson plans, photos, impact of mining on the environment, and so much more (http://www.mii.org/)

Rocks & Minerals
- lists different sites related to rocks & minerals
- sites organized by research/informational and lesson plan/activities
(http://edtech.kennesaw.edu/web/rocks.html)

Science & Tech Curriculum Expectations:
2.1 follow established safety procedures for outdoor activities and for working with tools, materials, and equipment
2.2 use a variety of tests to identify the physical properties of minerals *(e.g., hardness [scratch test], colour [streak test], magnetism)*
2.3 use a variety of criteria *(e.g., colour, texture, lustre)* to classify common rocks and minerals according to their characteristics
2.5 use appropriate science and technology vocabulary, including *hardness*, *colour*, *lustre*, and *texture*, in oral and written communication
3.1 describe the difference between rocks (composed of two or more minerals) and minerals (composed of the same substance throughout), and explain how these differences determine how they are used
3.2 describe the properties *(e.g., colour, lustre, streak, transparency, hardness)* that are used to identify minerals
3.3 describe how igneous, sedimentary, and metamorphic rocks are formed

Mathematics Curriculum Connections::
* measurements made of rocks
4m38 • estimate, measure, and record length, perimeter, area, mass, capacity, volume, and elapsed time, using a variety of strategies
4m40 – estimate, measure, and record length, height, and distance, using standard units
4m45 – estimate, measure, and record the mass of objects, using the standard units of the kilogram and the gram

Additional Numeracy Activities:
Graph a rock collection by weight, size, texture, color, layers, fizz, where they were found, etc.

Language Curriculum Connections:
* working in whole class, small group and partner activities
4e5 Active Listening Strategies 1.2 demonstrate an understanding of appropriate listening behaviour by adapting active listening strategies to suit a variety of situations, including work in groups
4e14 Interactive Strategies 2.2 demonstrate an understanding of appropriate speaking behaviour in a variety of situations, including paired sharing and small- and large-group discussions
4e15 Clarity and Coherence 2.3 communicate in a clear, coherent manner, presenting ideas, opinions, and information in a readily understandable form
4e16 Appropriate Language 2.4 use appropriate words and phrases from the full range of their vocabulary, including inclusive and non-discriminatory terms, and appropriate elements of style, to communicate their meaning accurately and engage the interest of their audience

* Listening to Read Aloud

4e6 Comprehension Strategies 1.3 identify a variety of listening comprehension strategies and use them appropriately before, during, and after listening in order to understand and clarify the meaning of oral texts
4e9 Extending Understanding 1.6 extend understanding of oral texts by connecting the ideas in them to their own knowledge, experience, and insights; to other texts, including print and visual texts; and to the world around them

* Observation Journal / Developing Word Bank

4e51 Classifying Ideas 1.4 sort and classify ideas and information for their writing in a variety of ways
4e56 Word Choice 2.3 use specific words and phrases to create an intended impression

* researching geologist techniques
4e50 Research 1.3 gather information to support ideas for writing using a variety of strategies and oral, print, and electronic sources

Additional Literacy Activities:
Students bring in their own rock and write a story about its' life and the changes it goes through to become what it is today.
Using the computer, students can make a "rock field guide," or create a power point presentation about rocks or the rock cycle.

Les observations par les sens

Observations des roches	Catégorie	Banque de mots	**Questions/à réfléchir**

Gallery Tour

(Beyond Monet, page 44)

(Grades K to 12)

Description

- a strategy to be used at the end of a lesson as a way of sharing completed group or individual work

Prior Knowledge Required

- none

Procedures

Step 1 Display the student work.

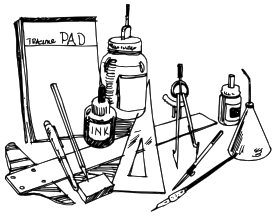
Step 2 Have students move around and look at the displayed work.

Classroom Management Considerations

- understanding that only positive comments are made about student work
- look with your eyes not your hands
- put students into groups and give a signal each time the group is to move to the next "station"

Materials

- student work



Key Benefits	Effective Uses	Extensions / Modifications
• enables students to see many work samples • allows students "show off" their work	• use any time student work is completed and can be observed through a brief glance	• group activity - one member stays behind to explain and discuss the group's work with the students who are touring • can be done with individual work • only half the class tours and then switches (also have different classes come to tour)

Teacher Notes and/or Reflections:

This handout is taken from: **Instructional Strategies for K to 12** *"Strategies for Teaching"* Recipe Cards - T.V.D.S.B., 2005-2006.

Journal d'observation

Ce que j'ai observé:	Je me demande .....

La recherche des roches - l'usage de matériaux

les matériaux	le but / l'utilité	la référence
rayage		
ongle, pièce de monnaie en cuivre, lime à ongle, clou		
vinaigre		
aimants		

Investiqué les roches

roche / groupe #	Observation à l'aide des 5 sens (texture, couleur, lustre, etc.)	Dureté (Quels items étaient capable de rayé la roche? Donne lui un numéro d'après l'échelle de Mohs'.)	Couleur du la rayure	Test d'acide (aucune réaction, fait des bulles, dissous)
1				
2				
3				
4				
5				

(Adapted from: **http://www.rocksforkids.com/)**

Continuer investiqué les roches

<u>Test de dureté</u>:
Écris un oui ou non dans chaque case et assigne un numéro d'après l'échelle de Mohs ci-dessous.

Spécimen	Est rayé par:			Est-ce que le spécimen raie le verre?	Numéro sur l'échelle de Mohs (l'échelle ci-dessous)
	ongle?	un pièce de monnaie en cuivre?	clou?		
1					
2					
3					
4					
5					
6					
7					
8					

L'échelle de Mohs	
Dureté #	Peut être rayé par.....
1	un ongle
2	
3	un pièce de monnaie en cuivre
4	un clou en fer
5	
6	du verre
7	
8	
9	
10	un autre diamant

GRADE: 4
ACTIVITY TITLE: Life on a Deserted Island / La vie sur une île déserte

KEY WORDS:	**MOTS CLÉS:**
pulley	la poulie
force	la force
motion	le mouvement
load	la charge
pulley system	le système de poulie
block and tackle	le palan à moufles
mechanical advantage	l'avantage méchanique

INTRO: This is a technology lesson with the purpose of allowing students to design and build their own functioning device that utilizes a pulley system. The device built must be presented as a labeled diagram prior to building, must include notes of alterations, and fit either survival or recreational categories.

INQUIRY TYPE: teacher initiated, partially designed; partially student designed, run and tested

MATERIALS RESOURCES:
In the Catalyzer:
plastic spools X 1 pkg of 50
twine X 1 roll
glue gun and glue (found in intermediate catalyzer)
jinx wood (found in intermediate catalyzer)

Provided by the Teacher:
nails
hammer
cardboard
buckets
cups
water (or rice or other dry ingredient)

TARGET PROCESS SKILL:
Technological Problem Solving (Develop Possible Plans; Select & Carry Out the Plan)

STRAND: Structures and Mechanisms - Pulleys and Gears

BIG IDEA:
- Pulleys and gears change the speed, direction, and motion of, and force exerted on, moving objects.
- Pulleys and gears make it possible for a small input force to generate a large output force. (Note: mechanical advantage should only be qualitative in grade 4).

ENGAGE:
Part A: Begin the lesson with the diagnostic assessment outlined in the "EVALUATE" section (see below).

Part B: Water Relay
- Play a relay game where children will first take a paper/plastic cup and fill it with water from a bucket. (Use rice or other dry ingredient if outside space is not available nor feasible.) They then carry the water to a drop location (empty bucket) and race back. The next child goes. The winner is the team who first fills their bucket.
- Discuss how many trips the groups had to make in order to fill their bucket. Next repeat the activity using water from a personal-sized water bottle. How many water bottles did it take to fill the bucket? How much water will each child drink in a day?
- Debrief the previous activity by discussing basic needs of human beings. Ask the class to come up with alternative ways to get water more efficiently.

- (Optional) Show a 5 min or so clip from movie Madagascar (the part where the animals first discover that they are lost

on an island and try to find ways to be rescued).

EXPLORE:
Prep: Set out the different building materials. (You may choose to have students bring in other materials.)

- Introduce the scenario to the students. Refer to TM-1 Lost!
  Teacher Prompt: What things in life are necessary for life and what things are for comfort? Are any things both necessary and for comfort? Think, pair, share the questions, 'What is important to build to survive on the island? What would make my life easier/more interesting?'

- Show students the different materials that they can use for their construction.

- Think-Ink-Pair…Square: Use this tactic to have students plan their devices.

  Teacher Prompt: Knowing the criteria that your devices have to meet, the materials you can use, and the information we have learned previously about pulleys, I want you to think on your own about what device you would like to design and build. Will it be for comfort or necessity? How will it incorporate a pulley to reduce effort? What will it look like? What materials will you use? How will it be assembled?

- Have students think individually on their own for a few minutes. Then have them sketch their device - encouraging them to draw more than one view/angle of their design. What does it look like from the front? the back? from above? from the side?
- Have students label the materials and the parts.
- Have students find a partner (or assign partners). Each partner will take turns sharing their design and reasoning with each other. Partners may provide feedback to each other.
- Square: Have pairs join together to make groups of 4 to share designs and provide feedback for each other.
- Give students an opportunity to reflect on their original design and make changes as necessary based on discussions they had with their partners/groups.

EXPLAIN:
- Reiterate the criteria that their device must meet. (Refer to TM-1 Lost! or the Evaluation Section below.)
- Discuss with students:
  - the importance of having a plan in place before actually building and constructing
  - that plans can change or be modified as the building takes place
  - a record of all changes, improvements, modifications must be kept in order to keep track of the design
  - that any changes made should improve the device in order to provide the user with an advantage
- Inform students that any changes they make should also be made on their sketches.

EXTEND:
- Have students build and test their devices throughout construction'.
- Continue to encourage students to record any problems encountered and changes that need to be made to meet the requirements of the assignment.

- Consider using the strategy of “carousel” or a “gallery walk” for students to share their devices with each other.

EVALUATE:
Diagnostic:
- Activate and assess prior knowledge by giving each student (or pair of students) the following sets of equipment: a piece of string, block (or mass), pulley (or spool). Ask students to assemble the materials into a simple machine.
- Quickly assess the collective prior knowledge of the group as well as any misconceptions the students may have about pulleys and simple machines.
- Based on the success of students pulley systems as simple machines, review and/or re-teach important concepts as necessary.

Formative:
- As groups are building their models, the teacher should circulate and note students as they design, build and test.
- A rubric, answering the following questions could be used:

- Does the device function as it was intended?
- Does it meet the criteria outlined in the scenario?
- Can the student explain mechanical advantage in a manner that shows complete understanding of the concept?
- Were established safety policies strictly followed?
- Was the student cooperative with peers/group? (Learning Skill only)
- Does the labeled diagram show in-depth understanding of the nature of a pulley and its function?

BACKGROUND INFORMATION:
If you have something heavy that you need to lift, tying a rope around the object gives you something to hold onto. Simple lifting (pulling upwards on the rope) requires you to lift not only the mass of the object, but to also overcome the force of gravity, which is constantly pulling the object down. If you attach a single pulley to the ceiling and throw your rope from the object over the pulley, you still have to lift the mass of the object and overcome gravity, but now you get to pull in a downward motion and gravity can now help you pull (hence, pulling down is easier than pulling up). If you attach a second pulley to the object and run the rope from the ceiling, down to the pulley on the object you wish to lift, then up to the ceiling, you will need twice the amount of rope as previously required, but now the load (your object) will feel half as heavy. With a few pulleys organized in this fashion (called a block and tackle), although increasingly more rope is required, the load feels lighter and lighter. This is known as mechanical advantage.

LOOK FORS: The students should be engaged in a dialogue that demonstrates increasing understanding of the concept of mechanical advantage as well as determining how they can best use this concept to build their device. The plans should be laid out in advance of building and any changes made should be reflected in new or altered plans. Students should be working together in a collaborative, respectful manner and established safety procedures need to be followed.

Students are beginning to:
- identify and explain a problem within a local, regional or global context (STAGE 1)
- suggest possible solutions and state how they might solve the problem ((STAGE 1)
- select a solution and provide a reason for the choice (STAGE 2)
- outline the steps of a plan to solve the problem (individually or in small groups) , including drawings and/or diagrams (STAGE 2)
- review and reflect the plan to ensure it meets the criteria (STAGE 2)
- identify tools and materials to be used, and explain their choices (STAGE 2)
- with guidance, carry out the plan / procedure (STAGE 2)
- use appropriate equipment to measure, construct and test models and devices (STAGE 2)
- records and organizes information and results in a variety of ways such as point form notes, sentences, labeled diagrams, tables and graphs (STAGE 2)

SEQUENCE (where in the unit does this lesson best fit?):
This is an excellent opportunity for formative evaluation. Any gaps in understanding that the students demonstrate may be address in future teaching.

TEACHING STRATEGIES:
think-ink-pair-square
optional: carousel / gallery walk

SAFETY:
Monitor children who are using the glue gun and the hammer. Remind them not to use a load with a mass that is too great for their pulley system to bear.

BLACK LINE MASTER[S]:
TM-1: Lost! (Handout/Overhead)

TEXT REFERENCES:

Science & Technology Curriculum Expectations:
2.1 follow established safety procedures for working with machinery
2.2 use scientific inquiry/experimentation skills (see page 12) to investigate changes in force, distance, speed, and direction in pulley and gear systems
2.3 use technological problem-solving skills (see page 16) to design, build, and test a pulley or gear system that performs a specific task
2.4 use appropriate science and technology vocabulary, including *pulley*, *gear, force*, and *speed*, in oral and written communication
3.1 describe the purposes of pulley systems and gear systems *(e.g., to facilitate changes in direction, speed, or force)*
3.2 describe how rotary motion in one system or its components *(e.g., a system of pulleys of different sizes)* is transferred to another system or component *(e.g., a system of various gears)* in the same structure

Mathematics Curriculum Connections:

Math
The water relay is an effective means of comparing relative volumes of different sized containers. Students may also begin to predict the amount of mechanical advantage to be had from various pulley arrangements.

Language Curriculum Connections:
The debate will be particularly effective if the students are taught a simple debate strategy. I use the following:
What is your opinion?
Why are you right?
What might the other side say that would make you seem wrong?
How can you show that the other side is wrong?
This works really well and is simple enough for younger children to follow. They do tend to become very committed to their argument, so be prepared to listen to the debate for a few days after the lesson.

The movie clip is an effective element of media literacy as the children can discuss the feasibility of creating the rescue devices that the lost animals create on the island. How reasonable is each device? How effective might it be in real life? This further serves to delineate the differences between fact and fiction.

Writing: A fun extension of this activity would be to have the children write journals or letters in role, as though they are lost on the deserted island.

Perdu en mer!

Ton navire a coulé, en te laissant en rade sur une île désèrte! Comment vas-tu survivre? Que faut-il pour survivre? Que feras-tu pour ne pas t'ennuyer? Que ferais-tu? Au secours!

La Tâche:

À l'aide du matèriel fourni (et ceux de la maison) invente quelque chose qui t'aiderat à survivre sur cette île déserte ou qui te fournirait de la distraction en attendant ton sauvetage.

The Conditions:

- Ton invention doit être identifiée comme étant quelque chose qui t'aideras à survivre et à te distraire.
- Ton invention doit contenir une poulie qui fonctionne.
- Tu dois suivre toutes règles de sécurité.
- Tu dois travailler de façon coopérative avec ton partenaire / ton groupe.
- Tu dois utiliser la terminologie scientifique en construisant et en expliquant ton invention.
- Tu dois créer un diagramme étiquetté de ton invention, avec les changements que tu as apportés pendant la construction de l'invention, pour que je puisse évaluer.

*Date de r*emise:_____