This project focuses on broadening the attitudes and viewpoints of your students with regards to Scientists and areas of scientific study. Students use pre/post surveys to identify their Science knowledge and background. Teachers use the surveys to help direct lessons that enhance areas in Science. A mini Scientist research report is part of this discovery process along with other short in-class activities. This project can be adapted to fit into specified Science curriculum units.

Funded by the National Science Foundation and the University of Nebraska
PART I: Participants and Setting

School: Pound Middle School

Lead Teacher: Anica Brown
Pound Middle School
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Lincoln, NE 68516
436-1217
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Resident Scientist: Kate Bradley
kbradle1@bigred.unl.edu

PART II: Activity

Name of Activity: Image of a Scientist

Activity Timeframe: First semester 2004

Activity Description

1. Pre-Student Scientist Survey.
   a. Students complete a Scientist survey before any Science unit begins (survey is included). This helps the teacher formatively assess where students are in the class with their attitudes about science and Scientists.
   b. Teacher collects data from survey.

2. Student Mini Scientist Research Project.
   a. Students broaden their perceptions of scientists and their fields of study through a short-term research project and present their information in a report format to their peers.
   b. Media specialist and /or computer tech and teacher collaborate to locate pre-selected Scientist names and backgrounds. More names are located than needed for class size. Students randomly select a name. Boys and girls can receive either male or female Scientists. (List of scientists is included)
   c. Times are scheduled in the media center/computer lab for research. In media, students are divided into two groups, one group with computers and the other using books. Students will switch research materials during the scheduled time so all students have access to all materials. In the computer lab, on-line websites can be established ahead of time and all students can have access. (website lists included)
   d. Students follow an outline to organize their information. (Outline included)
   e. Students can research outside of class to gather more information.
   f. Students are informed about plagiarism rules.
3. **Research Time Frame.**
   a. The time frame of this project is dependent upon the length of the unit you are teaching and how you can incorporate this into your schedule.
      
      **Example: 1st quarter**
      
      Two units were taught in 4 ½ week periods of 80 minute blocks of time. During second 4 ½ week unit, Electricity and Magnetism, there was more time to spend doing this mini research project. Students were given the outline, time requirements, due date, and we had scheduled two Thursdays to spend time, 80 minutes each, in the media. Students had to do the written report on their own time outside of class and have it ready to present before the end of the quarter.
      
      **Example: 2nd quarter Different group of students**
      
      Same two units were taught. Research project was scheduled for the end of the quarter when we have two remaining weeks after winter break and prior to semester break. Two days were scheduled in the media with two days in the computer lab for researching and word processing time.

4. **Post-Student Scientist Survey**
   a. Students complete the same pre-Scientist survey after the completion of the Science units and the sharing of their Scientist research projects. The teacher should compare these answers with the pre-assessment survey to note changes in attitudes toward Science and Scientists.

**Activity Design Rationale (Include pre-assessment and data)**

I designed a pre-survey/post survey to identify the attitudes and background knowledge my students had about scientists and their experiences and impressions of the fields of science. Since I have two different groups of students, first quarter and second quarter, I could adjust my survey, research plan, and science activities according to the individual needs of my students as well as my approach to teaching science in the classroom. My hope was to expose my students to more areas that use science on a daily basis, to include vocabulary in the classroom that enhanced the science activity and helped them make a connection to what scientists really do and how they think, and broaden their perspective of where and who might be a scientist and why.

From collecting my first quarter students’ answers, I could tell they were a group with some science knowledge but their experiences were limited to certain science activities they had done in elementary classes. The pre-survey told me that out of 22 students, 5 would consider studying science. Throughout the quarter, I immersed my students with language that let them know that the activities, thinking, questioning, and inquiring they were doing were the same things Scientists do. During the last half of the quarter, when we completed our mini research project, my students felt more knowledgeable about the world of Science and what it had to offer in a variety of ways. In the post survey data, 15 students considered studying science.
Sample of Expected Student Experience(s)

In my students’ pre-survey answers regarding their ideas of the kinds of characteristics, skills, and jobs scientists would have, their responses were general.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Skills</th>
<th>Jobs</th>
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<tbody>
<tr>
<td>responsible</td>
<td>read</td>
<td>cures</td>
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<tr>
<td>careful</td>
<td>measure</td>
<td>work with medicines</td>
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<tr>
<td>smart</td>
<td>observant</td>
<td>do tests</td>
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<tr>
<td>determined</td>
<td>knows chemicals</td>
<td>discover things</td>
</tr>
<tr>
<td>patience</td>
<td>solve problems</td>
<td>study things</td>
</tr>
<tr>
<td>works long hours</td>
<td>math</td>
<td>invent</td>
</tr>
<tr>
<td>always working</td>
<td>not distracted</td>
<td>does experiments</td>
</tr>
</tbody>
</table>

The place chosen by most students for scientists to work in was in a lab with a white lab jacket.

PART III: Assessment

Description of Assessment Used   Pre/Post survey is included

Overall Evaluation of Activity

1. Pre-Survey and Classroom Activities
   My students answered their pre-survey in general terms. They did not share much, if any, of their knowledge about science or scientists. From their answers I was certain they did not perceive science as a field of study they might be interested in someday. During the science units and hands-on activities, I used language in the classroom that let them know they were thinking and doing things like scientists do. I encouraged questioning, thinking about where we would find the answers, and predictions on solutions to ideas and activities. I encouraged them to share their knowledge with others when they felt success in their activity or when they did not succeed so others could share in their problem solving or ask a different question that might lead them in a new direction with a solution. We came back together to conclude our discoveries and perceptions of what we did and what we learned at the end of each activity.

   I also had the opportunity, through Project Fulcrum, to have a scientist in my classroom 8 hours a week. She would add suggestions when planning lessons, provide resources for activities, answer questions or locate someone that could. Students saw us working as a team as we explored with them in their experiments.

2. Other Activities
   During the first part of the quarter, students had an assignment to provide an article or news item related to any area in Science. They could get their information through radio, T.V., newspaper, magazine, or directly from an adult. They shared their articles in class with their peers. There were teachable moments from the news that
caught our attention and curiosity such as the tsunami disaster. We spent a brief amount of time discussing this topic and watched a video that shared what scientists are doing to help predict and warn people about tsunamis.

We had a few guests visit and speak about their science interests and fields of study. We also had an “Ask a Scientist” question box so students could deposit their written questions and we would field these to a scientist website to help get the answers.

3. Scientist Research

The research broadened their perspectives into a variety of areas that are related to science. They had a large group of people from diverse backgrounds as well as eras in history. I think the most encouraging part of this research was when they discovered that a scientist from the early 1900’s had discovered or invented something that helps us even today.

4. Post Survey

From the post survey I concluded that they had more interest in science as a field of study for themselves, and had definitely broadened their knowledge about a variety of scientists and backgrounds and the areas of study that use science. There were 15 students, in the post survey, who were now interested in thinking about studying science or being a scientist someday.

Collected Student Data (include representative examples of student work that supports the evaluation)

One of the questions on the survey was: (22 students surveyed)

Would you consider becoming a scientist someday?

Pre-Survey  
Boys – 9 NO - 3 YES
Girls -- 8 NO - 2 YES

Reasons why not? Boring, hard work, dislike science, dangerous, want a fun job.

Post Survey  
Boys – 4 NO - 8 YES
Girls – 3 NO - 7 YES

Reasons why they would? Good pay, more job opportunities, doing experiments, fun to figure out stuff.

Other questions relating to scientists had students listing the following: (a majority of students listing this data determined the top choices in each category)

Characteristics

<table>
<thead>
<tr>
<th>Pre-</th>
<th>Post-</th>
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<tbody>
<tr>
<td>responsible</td>
<td>responsible</td>
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<tr>
<td>hardworking</td>
<td>intelligent</td>
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<tr>
<td>patience</td>
<td>patience</td>
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<tr>
<td></td>
<td>doesn’t give up</td>
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</tbody>
</table>
Skills

Pre- (answers were general)
- math
- Intelligent

Post- math
- intelligent

Jobs

Pre- (lists were general)
- invents
- cure things
- works with chemicals
- experiments
- makes medicines
- works with animals
- discovers things
- digs up things
- uses math
- writes
- reads

Post- (lists were more specific)
- Zoologist
- Biologist
- Astronomer
- Geologists
- Physicist
- Chemist
- Naturalist
- studies parasites
- Mathematician
- works with warfare
- Architect
- Astronaut

Places

Pre-
- lab
- quiet room
- in an underground building
- uses bottles, test tubes
- dark place
- jungle

Post-
- works with computers
- colleges
- outside in the environment
- classroom
- beach
- rainforest
- volcano
- labs
- anywhere

What would you do differently if you were to repeat this activity?

Since I have a different group of students each quarter, I was able to make some changes for my second quarter class. I focused on:

- inviting more questions by my students in the classroom and opening up the questions for discussion among the whole class.
- doing the inquiry activities I had selected from the text first, prior to reading the book. This built background knowledge for my students, through hands-on experiences and introducing vocabulary, which they would draw from when reading the text.
- encouraging problem solving with their partner through inquiry and discovery.
- changing the format of the research project to an outline form to give my students more guidance as to what they needed to look for.

(same sample worksheet included)
giving students more ownership in the activity by allowing them to actively communicate in class what they wanted to change about the experiment and sharing the outcome.

using a “Question of the Day” (QOD) worksheet that gave me a better idea of what my students knew before the activity and what they learned from it afterwards. I used this worksheet as a formative assessment, having students turn it in to me at the end of the activity day, to help me decide what areas I needed to focus on again for understanding. I gave brief feedback on each worksheet and returned them the next day to be added to their Science folder. (sample worksheet included)

adding to the list of scientists for their research. (list included)

developing a Scientist Research Data sheet for each student to complete as they listen to their peers share their scientist report. Students write the name of each scientist, their field of study, and list 2 things they learned about each scientist. Students were actively involved in learning and retaining some information they felt was important to them. (sample worksheet included)

How can the activity be extended to increase the amount of inquiry?

This project can easily fit into a specified Science unit. You need to plan ahead to decide the best placement for this project. The pre/post survey is easy to administer and was used as an opening activity so the amount of classroom time was minimal. The research was important to include because it added to broadening the attitudes of the students about Scientists, what they do, and what areas of scientific study they focus on. The exploration and inquiry involved in each activity, prior to reading the text, aided in the discovery and thinking processes that helped in the understanding of concepts, questioning, and problem solving.

This project has a beginning, the pre-survey, middle, news articles and discovery activities within each unit, and an end, the mini research project followed by the post survey. Inquiry happens throughout the quarter immersing students into thinking about all the facets of Science. This project can be effectively added to any Science curriculum.
SCIENTIST SURVEY
Pre and Post

Write each of the following questions on a piece of paper and answer each question.

1. What characteristics do Scientists have?

2. What skills do Scientists need?

3. List the kinds of jobs Scientists do.

4. Describe the type of place you would find a Scientist working in.

5. Give me your impression of the field of Science. Would you consider becoming a Scientist someday? Why or why not?

6. On the back of your paper, draw a picture of what you think a Scientist looks like.
This will be a quick study to acquaint you with different scientists in a variety of fields. We will have time in the Media and computer lab to locate some information. You can also gather information on your own outside of class. The following is an outline you are to use to organize your information. From this outline you will neatly type or in a handwritten form produce a short report, no more than one page, about your scientist. You will share your report with your class. You may add anything else to your presentation that would relate to your scientist.

I. Introduction paragraph
   A. interesting lead to grab the audience’s attention

II. Scientist Background paragraph
   A. Scientist name:______________________________________________
   B. Birthdate: _________________________________________________
   C. Education:_________________________________________________
   D. Field of study:____________________________________________

III. Scientific Accomplishments paragraph
   A. __________________________________________________________
   B. __________________________________________________________
   C. __________________________________________________________
   D. __________________________________________________________
IV. Other interesting facts paragraph (this paragraph can be optional)
   A. 
   
   B. 
   
   C. 
   
   D. 

V. My thoughts and opinion of this scientist paragraph
   A. 
   
   B. 
   
   C. 
   
   D. 
# Quick Reference Citation Sheet

**Student Name: ________________________**

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<th><strong>BOOK</strong></th>
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List of Scientists

Jane Goodall
Shirley Ann Jackson
Jewel Plummer Cobb
Libbie Henrietta Hyman
Barbara McClintock
Enrico Fermi
Luther Burbank
An Wang
Carl Sagan
Amanda Jones
Soloman Carter Fuller
Roger Penrose
Julius Robert Oppenheimer
Frank C. Dukepoo
Phil T. Farnsworth
Karen Chin
Harriet Hemenway
Charles Babbage

Mae Jemison
George Washington Carver
Maria Goeppert Mayer
Sally Ride
John Muir
Edward Lorenz
Ellison Onizuka
Flossie Wong-Staal
Louis Pasteur
Jonas Salk
Nikola Tesla
Chien-Shiung Wu
Susan LaFlesche Picotte
Angella D. Ferguson
Lise Meitner
Madame C. J. Walker
Linus Pauling
Famous Scientists Websites

http://www.princeton.edu/~wn/display/alphabetic.html
http://www.achievement.org/autodoc/halls/sci
http://www.lucidcafe.com/library/categoryindex.html
http://www.biography.com/
http://go.grolier.com:80/
http://en.wikipedia.org/wiki/Charles_Babbage
http://www.atomicarchive.com/Bios/Oppenheimer.shtml
http://www.jewishvirtuallibrary.org/source/biography/Hyman.html
http://biodiversity.ueno.edu/~worms/bio/hyman.html
http://www.edwardsly.com/wongsta.htm
http://www.nebraskastudies.org/600/stories/0603_0100.html
http://members.aol.com/natamcan2/fm l0.htm
http://inventors.about.com/library/inventors/bljones.htm
Scientist Research Data

In the table, write the name of each scientist, their field of study, and two facts about each scientist that you found interesting from the report that was shared.

<table>
<thead>
<tr>
<th>Scientist</th>
<th>Field of Study</th>
<th>Fact one</th>
<th>Fact two</th>
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Sample of “Question of the Day” (QOD) Worksheet

The Nature of Magnetism Chapter 1 Section 1                    Blank space below is for drawing
QOD:  What is magnet and how does it work?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
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________________________________________________________________________
________________________________________________________________________
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________________________________________________________________________
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________________________________________________________________________
Word Bank: magnetism magnetic pole repel attract
          magnetic field atom element nucleus protons electrons magnetic domain
          ferromagnetic material

Activity:  What are the properties of a magnet?

Safety Concerns:

What do you know?

What do you want to learn?

Discoveries:

What did you learn? Results.
Word Bank:

What can you say about magnets and magnetic fields? **Conclusion.**