

A Guide to the

Phillips Petroleum Company Museum



Phillips Petroleum Company Museum

Teaching Materials

Overview

Welcome to the Phillips Petroleum Company Museum and to curriculum materials designed to introduce and to connect teachers and students with its rich history. Opportunities for learning extend from the young entrepreneurship of Frank Phillips through the innovations leading to petroleum-based products to the expanse of a vibrant petroleum industry marketed worldwide.

Prior to visiting the museum, students and teachers will gain insight into the culture of the petroleum industry and achieve an appreciation for the founding of an Oklahoma-based company. Lessons connected with all core subjects and documented with *Oklahoma Priority Academic Student Skills* objectives prompt student learning efficiently and effectively.

For lesson planning purposes, sequenced lessons, or **strands**, organized into a variety of time frames (*six-day, eight-day and 10-day strands*) to meet multiple needs will assist teachers in planning while effectively preparing students for a successful museum visit. While choosing a strand will simplify lesson planning, adding additional lessons to a strand, as time permits, will add to student learning opportunities. (*See pages immediately following.*)

During your museum visit, students focused on learning through **Study Projects** will gain more from this experience. Students may choose from three **Study Projects**, or teachers may assign students to groups with each focused on one project. As **newspaper reporters, marketing specialists, graphic artists** or **photo journalists**, students will collect data for use in producing final projects. (*See Study Projects section.*)

Museum Visit and Study Projects:

In preparation for your museum visit, consider assigning students to **Study Projects**. For your visit, students may choose to be newspaper reporters, marketing specialists, graphic artists or photo journalists. Each group will collect information (data) to utilize in the classroom when producing a final product. Study Projects, designed for completion within one to two class hours, may require more time, depending on teacher preference for depth of application.

- **Newspaper reporters will write and publish articles for a class newspaper about their visit.**
- **Marketing specialists and graphic artists will produce billboards or small posters of products using logos and performance expectations.**
- **Photo journalists will produce a photo journal using images and written descriptions to relate events in the history of Phillips Petroleum.**

Museum Exhibit Areas:

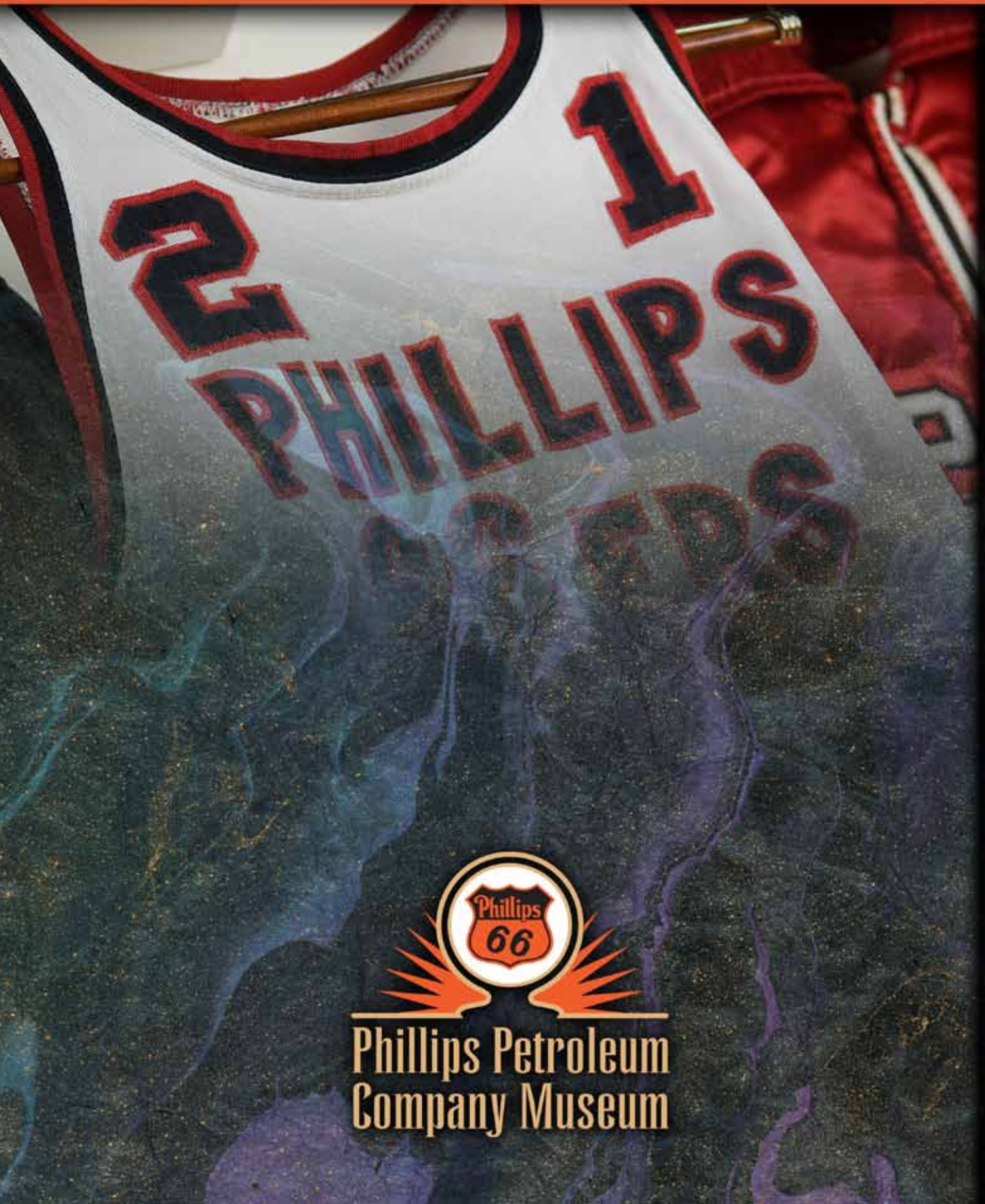
Using the Museum Site Map provided in the brochure, review descriptions of the 10 exhibit areas listed below. Each lesson documents connections to these exhibit areas to assist in making curriculum choices.

1. *Entrance and Orientation*
2. *Chronology of Phillips*
3. *Spirit of Performance*
4. *A Pioneering Attitude*
5. *Growing Strong*
6. *One Big Family*
7. *Bucking the Odds*
8. *Energy Provider*
9. *Taking to the Skies*
10. *Selling 66*

Lesson Overview and Museum Connections:

<u>Lessons</u>	<u>Recommended Class Hours</u>	<u>Museum Connections</u> <i>(by numbered areas)</i>
<u>Language Arts Lessons</u>		
<i>Frank Phillips: An Oklahoma Story</i>	<i>One/Two</i>	<i>All Areas</i>
<i>Remarkable Genius</i>	<i>Activities 1 and 2 Activity 3</i>	<i>Two One</i>
<i>Fuel Your Future: Careers in Oil</i>	<i>One</i>	<i>Areas 4, 5, 10</i>
<u>Science/Math Lessons</u>		
<i>Wildcat Drilling</i>	<i>Two</i>	<i>Area 7</i>
<i>So, You Want to Be a Scientist?</i>	<i>Two</i>	<i>Areas 4, 8</i>
<i>Petroleum to Plastics</i>	<i>Two</i>	<i>Areas 4, 8</i>
<u>Social Studies Lessons</u>		
<i>Petroleum: A Study in Time</i>	<i>Two</i>	<i>Area 2</i>
<i>From Earth to Products</i>	<i>One/Two</i>	<i>Areas 8, 9, 10</i>
<u>Museum Visit Study Projects</u> <i>Collect data during museum visit. Produce project following visit.</i>		
<i>Newspaper Articles</i>	<i>One/Two</i>	<i>All Areas</i>
<i>Advertisements</i>	<i>One/Two</i>	<i>Areas 3, 8, 9, 10</i>
<i>Photo Journal</i>	<i>Two</i>	<i>All Areas</i>

Attachments



Museum Visit

Study Projects

Newspaper Articles:

- Museum Visit – Collect information using “*Five W’s and How*” *Data Collection Chart*.
- Classroom – Write newspaper articles describing an event in the company’s history.
- Writing Tool – *Newspaper Article Graphic Organizer*.
- Content Elements – Include a Lead (Who, What, When, Where), How and Why.
- ***Students will write and publish articles for a class newspaper about their visit.***

Advertisements:

- Museum Visit – Collect information using *Product Search Data Collection Chart*.
- Classroom – Design advertisements for petroleum-based products.
- Supplies/Tools – Small poster board or other paper and art supplies for drawing.
- Content Elements – Include a logo and “performance” expectations for each product – What does the consumer want the product to do?
- ***Students will produce advertisements for products through billboards or small posters.***

Photo Journals:

- Museum Visit – Photograph items or areas of interest. *Digital cameras needed*.
- Classroom – Review photos and select images to journal a story or historical event.
- Organization Tool – *Photo journal storyboard*.
- Technology – Computer and printer.
- Final Product Options: Technology for viewing a PowerPoint® presentation or paper and cover stock for producing a hardcover photo journal.
- ***Students will produce a photo journal using images and written descriptions to relate events in the history of Phillips Petroleum Company.***

"Five W's and How" Data Collection Chart

Museum Visit

Headline: _____

Byline: _____

	Who?	What?	When?	Where?
LEAD				

	Who?	What?	When?	Where?	How?	Why?
Event # 1						
Event # 2						
Event # 3						

Outcome: _____

Newspaper Article Graphic Organizer

Headline: _____

Byline: _____

Lead: _____

Paragraph 2

Paragraph 3

Paragraph 4	
Outcome: _____	

Museum Notes

- Share your Prewriting Chart with a partner.
- Make sure your **facts are accurate**.

Headline

- Write your article first. Then decide on a headline.

Byline

- Write your first and last name.

LEAD

- Write your **LEAD**. (The first sentence in the first paragraph.)
- Include all basic facts. (Who? What? When? Where? How? or Why?)
- Write at least one more sentence with the lead (first paragraph).

Story

- Divide your story into sections by looking at your Prewriting Chart. (See Events.)
- Write the second paragraph. The third. The fourth. (Start a new paragraph for each new main idea or event.)

Outcome

- Write the **OUTCOME** of your event.

Product Search Data Collection Chart

Product	Trademark (logo)	Performance Expectation <i>What does this product promise to do?</i>	Other Information (Slogan, Jingle, ...)

Photo Journal Storyboard

Teacher Procedures

Option 1: Create a PowerPoint® presentation.

Option 2: Use a book format.

- Print photos.
- Use tag board, copy paper or construction paper for the pages.
- Attach photos with captions only on ONE SIDE of each page.
- Include a title page with credits.
- Include a cover with title, photo of photographers and authors, and names.
- Binding – Use a three-ring notebook or binder.

Storyboard

- Make copies of the storyboard pages.
- Two Options: Give one set to each Photo Journal Study Group.
OR Cut apart so that students can choose formats.
- Students paperclip photos to each format and then write captions or descriptions on the lines.
- Students attach photos to final paper (tag board, etc.) and write or attach typed captions.
- Provide binding options for students.

Student Procedures

- 1. Plan your Photo Journal.**
- 2. Choose 10 to 15 quality photos.**
- 3. Sequence photos. (Put them in an order.)**
- 4. Storyboard – See examples for arranging photos and captions, or create your own layout.**
- 5. Type or write captions to describe what each photo represents.**
- 6. Include a title page with names to give credit to the photographers and authors.**
- 7. Bind your pages.**
- 8. Create a cover with credits.**

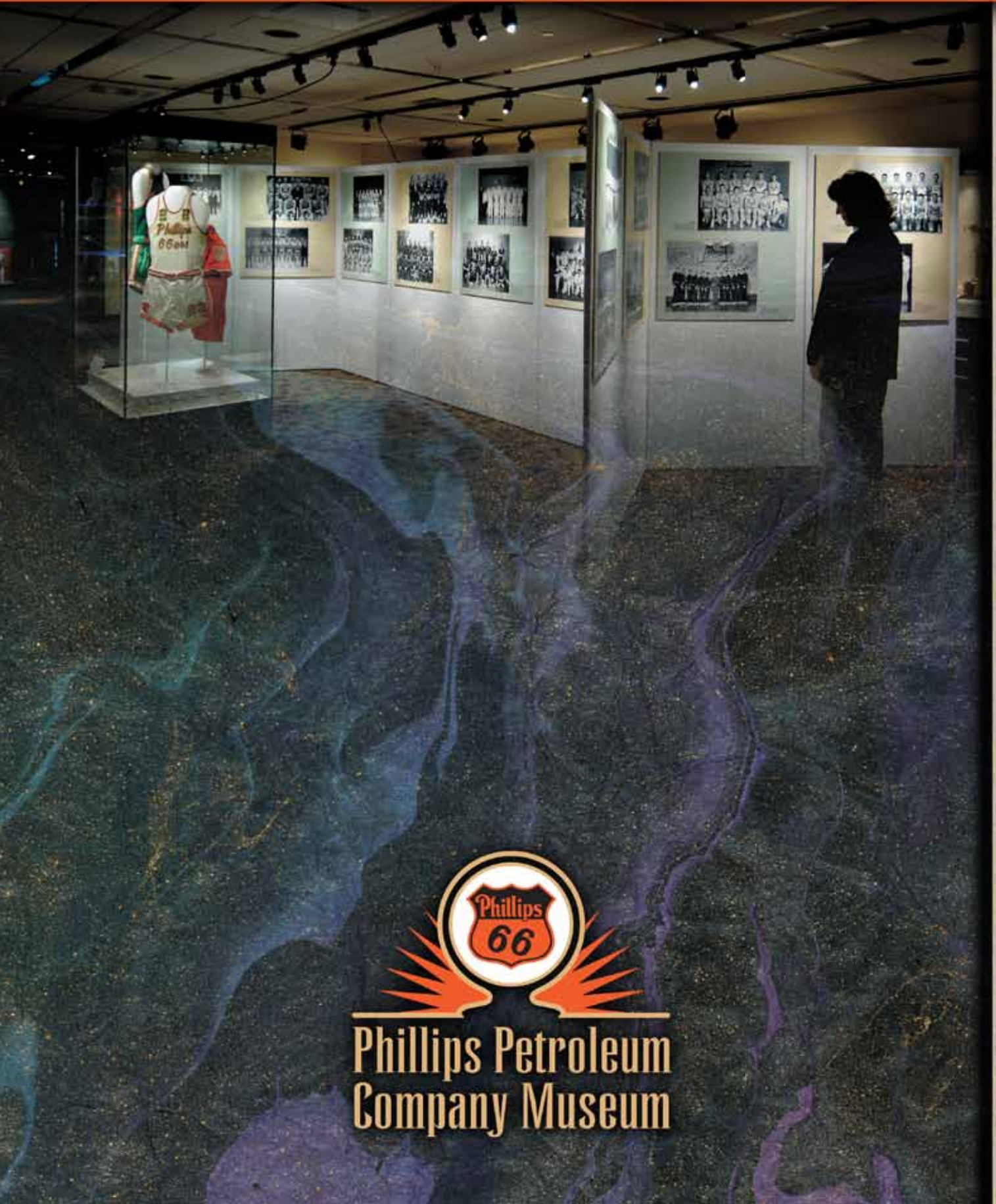
Photo Journal Storyboard

Title or Caption	
• Explanations • Descriptions	• Photo
	• Photo

Caption or Explanation	
• Photo	• Photo

Caption	
• Photo	• Photo or Narrative Description
• Photo	

Language Arts



Language Arts



Frank Phillips: An Oklahoma Story

Purpose:

This **Language Arts** lesson is designed to engage students in exploring the biographical background of Frank Phillips. Students will identify qualities in Frank Phillips that led to his becoming a highly recognized, successful entrepreneur in early Oklahoma history with the founding of the Phillips Petroleum Company. Students will read, interpret and organize information into BIO Poems. Finished products may be presented or displayed.

Museum Connections: All Areas of the Museum

Frank Phillips and L.E. Phillips, Co-Founders of Phillips Petroleum

Investigative Questions:

Who is Frank Phillips?

How did Frank Phillips discover oil and establish the Phillips Petroleum Company?

PASS Objectives: Grade 4 Cited

- Language Arts: **Reading/Literature**, Standards 3.2, 3.3, 5.1
- Language Arts: **Writing**, Standards 1.1, 1.3, 1.4, 1.5
- Social Studies: Standards 5.1, 5.2

Grade Levels: 4th-6th

Estimated Time:

- One class session if using attached Frank Phillips biography only.
- Two class sessions if other research material is provided for students.

Materials:

- Attachment 1 – **Frank Phillips** – Biography.
- Attachment 1B – **Frank Phillips Quotes** – Optional.
- Attachment 2 – **BIO Poem Concept Map** – One copy per student.
- Attachment 3 – **BIO Poem Structure** – One copy per student, student partners or group.
- Attachment 4 – **Acrostic Poems** – Optional poem formats.

Optional Materials:

- Reference books on Frank Phillips, Oklahoma, or other topics and people listed in the Enrichment and Extension and Internet Sources.
- Biographies and other nonfiction books.
- Biographies downloaded from reliable Internet sites.

PROCEDURES:

Group Dynamics: Students may work individually, as partners or in small groups.

Opening the Lesson:

- Introduce Frank Phillips and discuss his contribution to the petroleum industry in Oklahoma.
- Ask:
Who is Frank Phillips? Why is he an important person in Oklahoma history? What is Frank Phillips recognized for accomplishing?
- Introduce the word entrepreneur.

What is an entrepreneur? Why is Frank Phillips recognized as an entrepreneur?

What personal qualities do you think a person should have that would lead him or her to become an entrepreneur?

What makes a person an entrepreneur? Do you know anyone today who is an entrepreneur?

Developing the Lesson:

- Attachment 1 – **Frank Phillips Biography** – Read the biography silently, aloud or in groups according to teaching preference. Discuss facts, names, places and accomplishments.
- Ask students to share with partners or groups what they learned from reading the biography.
- Attachment 2 – **BIO Poem Concept Map** – Introduce the concept map by discussing each section. Using a transparency, model how to reread the biography to gather information, how to paraphrase and how to write short facts without copying each word from the biography.
- Allow time for students to complete the Concept Map.
- Attachment 3 – **BIO Poem Structure** – Using a transparency, model how to choose facts from the Concept Map to write into the poem structure.
- Strategy Suggestion: Have students highlight the most important information written on the Concept Map.
- Explain that facts can be combined or shortened.
- Lines can be repeated several times.
- Lines can be omitted.
- Focus on word choice.
- Leave out unnecessary words.

Closing the Lesson:

- Revise Poems – Encourage students to read aloud their finished products. Encourage revision using the following strategies:
 1. Delete unnecessary wording.
 2. Substitute more descriptive words for overused words.
 3. Add information where writing is unclear.
- Edit Poems – Check conventions (spelling, punctuation, capitalization) with a partner or small group.
- Presentation – Share poems by reading aloud, compiling into a book or displaying.

Assessment:

- Participation and completion of both the graphic organizer and a final product – a BIO Poem.
- OKSDE Writing Rubric available on Web site – focus on content, word choice and conventions.

Extension and Enrichment/Simplify and Focus:

Extension and Enrichment:

- Research the Frank Phillips ranch home, museum and wildlife refuge in Wolaroc, Okla.
- Research the Phillips 66ers basketball team sponsored by the Phillips Petroleum Company.

Simplify and Focus:

- Write BIO Poems in groups.
- BIO Poem – Reduce the number of lines. Use repetition when appropriate.
- Acrostic Poems – See Attachment 4.

Internet Sources:

Oklahoma Historical Society's Encyclopedia of Oklahoma History & Culture

- Phillips Petroleum Co./Frank Phillips/L.E. Phillips/Waite Phillips: <http://digital.library.okstate.edu/encyclopedia/entries/petroleum.html>

Frank Phillips

Attachment 1

Frank Phillips was born Nov. 28, 1873, in Scotia, Neb.

When Frank was a baby, his parents moved their small family to Iowa because grasshoppers ruined their farm. A few years later, young Frank worked for area farmers digging potatoes for 10 cents a day.

At age 14, he persuaded a barber in nearby Creston, Iowa, to teach him how to be a barber. Ten years later, he owned all three barber shops in Creston.

One of his barber shops was in the basement of a bank in Creston. The bank's president, John Gibson, had always liked Frank and his business sense. Shortly after Frank married Gibson's daughter, Jane, in 1897, Gibson asked him to join him in the bond business. Frank began selling bonds in the New England states and the Chicago area.

On a trip in 1903, Frank met an old friend, C.B. Larrabee, who was a missionary to the Osage Indian tribe west of Bartlesville, Okla. This area was supposed to be rich in oil that no one had discovered yet. Later that year, Frank and his father-in-law made two trips to Bartlesville, and Frank and his younger brother, L.E., organized the Anchor Oil & Gas Company.

They opened an office in Bartlesville in 1905 and tried to drill for oil. Every time they tried, they came up with nothing – no oil. They were running out of money. They decided to drill one more time. On Sept. 6, 1905, the Anna Anderson gushed, or spewed oil into the air, which made their company prosper. The Anna Anderson was the first of 80 consecutive producing wells drilled by the Phillips brothers.

They incorporated Phillips Petroleum Company on June 13, 1917, under Delaware law. The new company had assets of \$3 million, 27 employees and land throughout Oklahoma and Kansas.

Frank led the company as its president until 1939. He retired as chairman of the board in 1949 and passed away a year later at the age of 76. He became a nationally known businessman, but he never lost his ties to ordinary people. Throughout his life, he used his wealth to benefit others, especially the youth.

Frank Phillips Quotes

Attachment 1B

“One of my greatest regrets is that our organization has grown so big that I can no longer sit down on the edge of a derrick floor, or some other equally inviting place, and chat with each of you about the things that go on ‘behind the scenes’ in our company.”

“It was just swell of you to come – hurry back soon.”

“Let’s give George and his kids some money and let ’em take a whack at it.”

– Speaking about the hiring of a researcher, George Oberfell, and a team of scientists, the “Whiz Kids”

“... you don’t know how proud I am of every one of you, and I have just reason. You have made the Phillips Petroleum Company. You have just used me for a symbol, that’s all.”

– Speaking at his 66th birthday celebration

BIO Poem Research Concept Map

Attachment 2

PERSON RESEARCHED: _____

Childhood

- _____
- _____
- _____
- _____

Education

- _____
- _____
- _____
- _____

Why is this person important? – *Achievements, Disappointments, Experiences*

- _____
- _____
- _____
- _____

Personality – *What personal characteristics helped or hindered this person?*

- _____
- _____
- _____

What part of this person's life did you admire the most?

- _____
- _____
- _____

What other information did you find interesting?

- _____
- _____
- _____

BIO Poem Structure

Attachment 3

Name *(Complete Name)*

Four Words to Describe this Person *(personality)*

Related to ... *(Family Members)*

Related to _____

Who cared deeply about ... *(From any area of your research)*

Who cared deeply about _____

Who felt ... *(From any area of your research)*

Who felt _____

Who believed ... *(From any area of your research)*

Who believed _____

Who gave ... *(From any area of your research)*

Who gave _____

Who led others to ... *(From any area of your research)*

Who led others to _____

Who said ... *(From any area of your research)*

Who said, “ _____ *.”*

Owner of ... *(From any area of your research)*

Owner of _____

Resident of ... *(From any area of your research)*

Resident of _____

By _____

(Your Name)

Acrostic Poems

Attachment 4

P _____
H _____
I _____
L _____
L _____
I _____
P _____
S _____

By _____
(Your Name)

P _____
E _____
T _____
R _____
O _____
L _____
E _____
U _____
M _____

By _____
(Your Name)

Remarkable Genius

Purposes:

This **Language Arts** lesson will introduce students to the terms *intellectual property*, *copyright*, *trademark*, *patent* and *trade secret*. Students will examine their world for copyrights, trademarks and trade secrets, and they will explore why protecting and respecting intellectual property is important. Through the *United States Patent and Trademark Office* Web site, students will explore interesting facts about patents and trademarks awarded in the United States.

Museum Connections: *Area 4 – A Pioneering Attitude*

Area 5 – Growing Strong

Area 10 – Selling 66

Remarkable discoveries and patents granted

Display representing patents

Phillips 66[®] trademark and logo

Investigative Questions:

What is a patent? What is a trademark? Why should an inventor apply for a patent or a trademark?

PASS Objectives: Grade 4 Cited

- Language Arts: **Reading/Literature**, Standards 1.1, 3.2, 3.3, 5.1, 5.2
- Language Arts: **Writing**, Standard 2.6
- Social Studies: Standards 5.1, 5.2

Grade Levels: 4th-6th

Estimated Time:

- One to two class sessions in the classroom – Activities 1 and 2.
- One class session for exploring the USPTO Web site – Activity 3.

Materials and Technology Access:

ACTIVITY 1:

- **Items to illustrate *copyright* and *trademark*** – A book, CD of music, artwork, videogame.
- *Attachment 1 – Intellectual Property* – Overhead transparency.
- *Attachment 1 – Intellectual Property* – One copy per student group or partners.
- **Collection of media examples:** (*for group work*) Magazines or newspaper advertisements, fast food paper products, everyday items, such as school supplies and small toys.

ACTIVITY 2:

- *Attachment 2 – Phillips 66 Trademarks: Four Designs* – Overhead transparency.
- *Attachments 3A and 3B – Why 66? Fable or Fact?* – Overhead transparencies.
- *Attachment 3A – Why 66? Fable or Fact?* – Copies for student groups or partners.
- **Why 66? booklets:** One copy per group. Booklet describes the origin of the Phillips 66 logo.

ACTIVITY 3:

- **Computers with Internet access.**
- *Attachment 4 – Web tool* – One copy for each student or for partners.

DAY ONE PROCEDURES:

Group Dynamics: Students may work individually, as partners or in small groups.

Opening the Lesson:

- Write the word **IMAGINATION** on the board or transparency.
- **Ask**, *What is imagination to you? Think of a time when you created an idea for something – a new kind of toy, a new game, music, a new way of doing something.*
- Have students share with the class or in small groups to describe what they created.
- *Every day people all over the world use their imagination to create something new. When new ideas or inventions are **useful** and **produce a nonobvious result** or outcome, then the inventor should consider protecting his or her invention.*

Developing the Lesson:

ACTIVITY 1:

- **Introduce** the term **Intellectual Property** using *Attachment 1* as a transparency.
- **Ask**, *What do you think this means? What does the word intellectual mean? What does property mean?*
- Relate these terms to what students already know, then discuss the meaning of **Intellectual Property**.
- *Do you know that your creative ideas can belong to you legally? Today, we are exploring four ways **Intellectual Property** is protected by law.*
- **Introduce the terms *copyright* and *trademark***. Cover the terms **patent** and **trade secret** to introduce later.
- **Ask**, *What do you know about these terms? Can you give an example of a copyright? Where can we look for the copyright? What about a trademark? Can you give an example? How do you know when a trademark is registered?*
- **Illustrate terms:** Using a book, CD of music, artwork, videogame, or by using other items, discuss how these **intellectual properties** are protected by the **copyright** and **trademark** laws. Look for the copyright and trademark symbols.
- **Introduce the term *patent***. Discuss inventions. Share examples of common items in the classroom that are inventions.
- **Patents** – Optional facts to share:
 - Three types of patents:
 - Utility Patent – protects useful processes, devices, machines, medicines.
 - Design Patent – protects the design on manufactured items, such as the “look” of a doll, a skateboard, a backpack, a bicycle, a car.
 - Plant Patent – protects the development of new or newly discovered plant varieties, such as hybrid roses or new varieties of tomatoes.
 - The Cost: An inventor must pay the U.S. Patent and Trademark Office fees for a patent, which can amount to thousands of dollars.
 - Benefit: The patent allows the inventor to manufacture, sell and make a profit from the invention. No one else can profit without the permission of the inventor or patent-holder.
 - No Patent: The inventor risks someone else copying the invention and selling it for a profit.
 - Protection: 20 years only for Utility and Plant Patents; 14 years only for Design Patents. Patents cannot be renewed and become public property when time limits expire.
- **Introduce the term *trade secret***. Discuss the most famous trade secret – the formula for Coca-Cola®. Ask, *Can you think of other possibilities?*

• **GROUPS:**

- Attachment 1 – **Intellectual Property** – Distribute one copy per group or partners.
- Distribute a collection of media examples, such as magazines, newspaper advertisements, fast food paper products or everyday items, such as school supplies and small toys.
- Students will examine products to locate copyright and trademark symbols and list or draw these in the Copyright and Trademark boxes of Attachment 1.
- Students will examine products for possible patents that could have been granted. Note that this is not easily identifiable and students are only making assumptions. They will learn more through the Web site exploration. List or draw these in the Patent box of Attachment 1.
- Finally, explore and discuss the possibilities of Trade Secrets. Again, these are assumptions. List these in the Trade Secret box.

Closing the Lesson:

- **Groups** share results of exploration of *Media Examples*.
- **Review terms** for understanding – *Copyright, trademark, patent, trade secret and intellectual property*.

ACTIVITY 2:

- **Introduce** the *Phillips 66 Trademarks: Four Designs* using *Attachment 2* as a transparency. **Cover** dates and explanations.
- **Possible questions for introduction:**
 - Which of the four terms describes these? How do you know?
 - Why do you think there are four trademarks?
 - You know that the company was incorporated in 1917. When do you think the first trademark was established?
 - Which logo do you think was the first? Second? Third? Fourth?
 - If you were to guess a decade for when each of these was introduced, what would be each decade?
- **Distribute *Why 66?* booklets**, one copy per group.
- **Pages 12-13** – Students locate dates for when each shield was introduced. As students locate information, reveal dates and explanations on the transparency.
- **Distribute *Attachment 3A – Why 66? Fable or Fact?*** – Partners or groups will read fables and facts.
 - Pages 2-5 – Students read each fable and fact. After each fable and fact, students write a brief description of each on Attachment 3A.
 - With class, record information on the *Why 66?* transparency.
 - NOTE: Recording and review of each fable may occur one at a time or after students have read all fables.
 - Pages 9-10 – Students read and explain the “true story” of the Phillips 66 trademark. See the Who? Where? When? and What? on transparency.
 - NOTE: Transparency 3B includes answers and is provided as an option for sharing with the class.

Closing the Lesson:

- **Students verbally summarize** the true story of the Phillips 66 trademark using the questions on the transparency – *Who? Where? When? and What?*
- **Summarize** – Students will write a short paragraph explaining the origin of the Phillips trademark. They should include information presented in the *Who? Where? When? and What?*

Assessment:

- Participation in class and small group.
- *Activity 1* – Identification of **Copyright** and **Trademark** on products.
- *Activity 2* – **Students write a summary** explaining the true story of the Phillips 66 trademark decision.

DAY TWO PROCEDURES:

Group Dynamics: Students may work individually or as partners.

ACTIVITY 3:

Opening the Lesson:

- Meet in a computer lab or prepare students for visiting the official Web site for patents and trademarks.
- **Introduce Questions for Exploration.**
 - What United States president is the only president to receive a patent?
 - What are the “X-Files” in the United States Patent and Trademark Office? (USPTO)
 - Name a patent that was issued during your birth month.

Developing the Lesson:

- **Web site:** <http://www.uspto.gov>.
- **Scroll down** to see link for **Kids’ Pages** – located on the right side of screen.
- *Attachment 4 – Web Tool for Students* – **Distribute** copies for each student.
- **Students explore** Web site and share results.

Closing the Lesson:

- Students share with small groups or with class the results of the Web exploration to share “new” information learned.

Assessment:

- **Reflection** – On the back of the *Web Tool*, students quick-write for five minutes to describe what they learned.
On the back of this sheet, write what you have learned about patents, about people or about inventions.

Extension and Enrichment/Simplify and Focus:

Extension and Enrichment:

- Activity 1 – Instruct students how to paraphrase or document material from research so that copyright is respected.
- Activity 1 – Explore inventions and the actual process of applying for a patent.

Simplify and Focus:

- Activity 1 – Explore *Copyright* and *Trademark* only. Apply learning to *Patents* as legally protecting an inventor’s creation. Connect with Phillips 66 trademark and logo as one-lesson/one-day format.

Internet Sources:

- <http://www.uspto.gov/go/kids/>
- <http://web.mit.edu>

Intellectual Property

*Legal protection for
original ideas, designs or creations
to keep these from being stolen or misused*

Copyright

- Authored – books, music, film, artwork, dance compositions, video games.
- © Symbol for Copyrighted material.
- Lifetime of the Author plus 70 years.

Example: Harry Potter books

Your Examples:

Trademark

- A logo, slogan, symbol, color or sound – easily recognized for what the product is.
- ® Means a trademark is “registered.”
- Can be renewed forever if still used.

Example: McDonald’s Arches, Wendy’s Logo

Your Examples:

Patent

- An invention.
- Must be new, useful, give nonobvious results and describe how it works.
- Inventor owns the design for ...
- 20 yrs. Only – *Design Patent – 14 yrs. only*

Example: LCD television, MP3 player

Your Examples:

Trade Secret

- A formula, process or business procedure.
- Kept secret.
- Gives advantage over competition.
- Lifetime of the secret.

Example: The formula for Coca-Cola

Your Examples:

Phillips 66 Trademarks

Four Designs

1927

- “66” displayed on a banner at the first Phillips service station
- Disk-shaped shield



1928-1930

- First “Phillips 66” to appear on a shield-type sign



1930

- Shield – similar to highway signs
- Orange and black colors



1959

- Shield
- Red and white colors
- Modern styling
- Used in U.S. and worldwide



Why 66?

Attachment 3A

Fable	Fact
<u>Number 1 – Pg. 2</u>	
<u>Number 2 – Pg. 2</u>	
<u>Number 3 – Pg. 3</u>	
<u>Number 4 – Pg. 3</u>	
<u>Number 5 – Pg. 4</u>	
<u>Number 6 – Pg. 4</u>	
<u>Number 7 – Pg. 5</u>	

TRUE STORY FACTS

<u>Who</u>	<u>Where</u>	<u>When</u>
------------	--------------	-------------

What


- _____
- _____
- _____
- _____
- _____

Fable	Fact
“Frank Phillips was 66 years old when he started Phillips Petroleum Company.”	Company incorporated in 1917 Phillips was born in 1873. $1917 - 1873 = 44$ years
The Phillips brothers had only \$66 when they struck their first gusher.	Cannot be proven
“The first ‘Phillips 66’ gasoline was 66 octane.”	Octane could not be rated when the 66 was selected.
“A Phillips official won the company’s first refinery” by rolling ‘double sixes.’	Confused the story with another refinery not owned by Phillips
There are 66 books in the Bible.	No evidence
It took 66 laboratory tests to make the gasoline safe to use.	No one knows how many tests were conducted.
The first Phillips station sold 6,600 gallons of gasoline on its first day.	First station sold 12,000 gallons on its first day

TRUE STORY FACTS

<u>Who</u>	<u>Where</u>	<u>When</u>
Phillips official	“Near Tulsa on Highway 66”	The night before the meeting to decide on the logo
<u>What</u>		
<ul style="list-style-type: none"> • Road tested new Phillips gasoline. • Official: “This car goes like 60 on our new gas.” • Driver: “Sixty, nothing. We’re doing 66!” • Event reported at the meeting the next day. • Committee voted for “Phillips 66.” 		

Directions

Web site	http://www.uspto.gov
Find Link for ...	Kids' Pages 

Questions	Results
Who is the only President of the United States to receive a patent?	
From what document is this quote taken? <i>Congress shall have power ... to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.</i>	
List one patent issued during your birth month.	
Play a game that is patented. What is the name of the game? What is the patent number?	
Write one fact you learned about the Great Patent Fire of 1836.	
What are the "X-Files" in the United States Patent and Trademark Office?	
Where is the United States Patent and Trademark Office located?	

Reflection

On the back of this sheet, write what you have learned about patents, about people or about inventions.

Fuel Your Future: Careers in Oil

Purpose:

This **Language Arts** lesson will connect students to careers in the oil industry. Following brief research of careers through readily available resources, students will read descriptions of careers, interpret information and match descriptions to career names.

Museum Connections: *All Areas of the Museum*

Investigative Questions:

What kinds of people work in the oil industry?

What subjects do I need to study for working in the oil industry?

PASS Objectives: Grade 4 Cited

- Language Arts: **Reading/Literature**, Standards 1.1, 1.2, 1.4, 2.2, 3.2, 3.4, 5
- Language Arts: **Oral Language/Listening and Speaking**, Standards 3.1, 3.2

Grade Levels: 4th-6th

Estimated Time:

- One class session.

Materials:

- *Attachment 1 – Who am I? Career Cards* – One copy per group or partners, cut apart as matching activity.
- *Attachment 2 – Who am I? Career Descriptors* – One copy per group or partners, cut apart for matching activity.
- **Science textbook** – For research of careers.
- **Library books on careers in science.**
- **Dictionaries.**

Optional Resources:

- **Computers with Internet access.**

PROCEDURES:

Group Dynamics: Students may work individually, as partners or in small groups.

Opening the Lesson:

- **Brainstorm** a list of careers found in the oil industry. Find out from students what they know about these careers. *What education is necessary? What do people do in these jobs? Why do people choose these jobs (their likes and dislikes)?*

Developing the Lesson:

- **Explore** science textbook for information on careers in science.
- **Expand exploration** of careers to include other textbooks and bookmarked Internet searches.
- **Include library resources** for exploration. Distribute books to groups and allow students to explore.
- **Add** other careers and information to the brainstormed list and to the information gathered.
- **Distribute *Career Cards* and *Descriptors*.**
- **Read** the career names as a class.
- **Use of dictionaries:** If students use dictionaries, discuss how to determine the root of words, such as biologist. Extension – Discuss the suffixes -ist, -or, -er and meanings.
- **Explain** that students will read aloud cards and match to the jobs they think best match the descriptors.
- **Students take turns reading descriptors aloud**, rereading and discussing information to match with a career name.
- **Groups** share results with the class.
- Discuss results as a class.

Closing the Lesson:

- **Museum Connection:** Explain that when visiting the museum, they will see many careers mentioned in the text of the displays. Encourage students to be familiar with these careers so that they will understand more about the descriptions.
- **Other careers or jobs:** Brainstorm a list of other jobs that are necessary to any business and industry.
Examples: Finance, business management, information technology, accounting, clerical (secretary, bookkeeper), mail operations.

Assessment:

- Participation in exploration of careers through textbooks and other resources.
- Observation of reading and ability to associate descriptors with career names.

Extension and Enrichment/Simplify and Focus:

Extension and Enrichment:

- Students create a list of careers not included in this activity and write descriptors. Write new cards and descriptors to include in the matching activity.
- Make a list of Internet sources that best describe these careers.
- Research the origin of the word *engineer*.

Who Am I?
Career Cards

Attachment 1

Marketer	Chemist
Chemical Engineer	Inventor
Mechanical Engineer	Scientist
Petroleum Engineer	Environmental Scientist
Geologist	Geophysicist

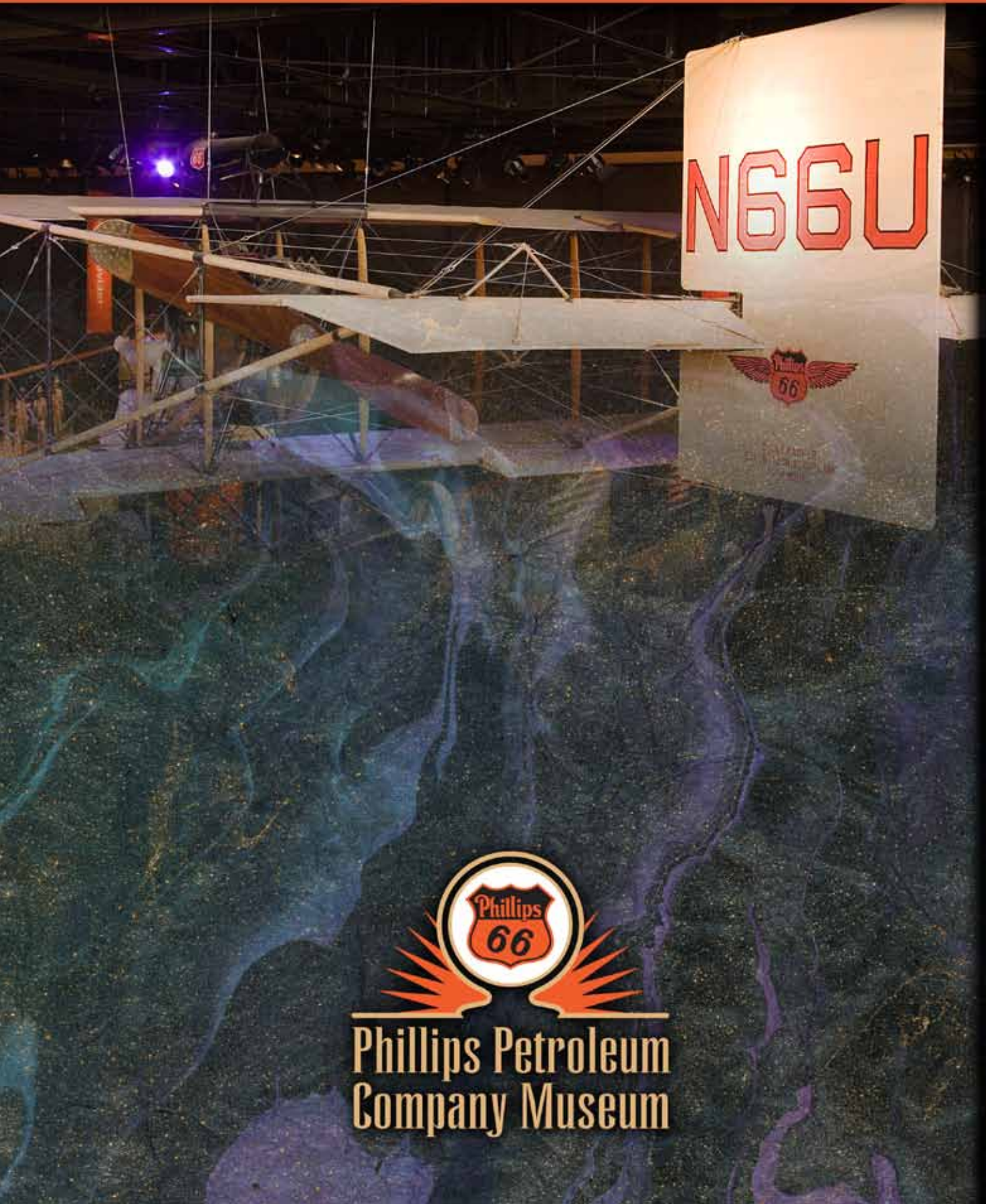
Who Am I?

Career Descriptors

Attachment 2

<p>I have a real interest in numbers and statistics. I study math, finance and accounting. I use my knowledge to find out about the customer. I collect data on what the customer buys and use that data to provide products that I know will sell. The more I know about my customers, the better I can meet their needs.</p> <p>Who Am I?</p>	<p>I study the properties of matter. I ask questions about physical substances. I want to know what substances are made of and how they behave. I want to know how matter changes with heat or light. I want to know if a substance is a solid, liquid or gas. I want to know if a substance is a mixture, solution or suspension.</p> <p>Who Am I?</p>
<p>I study the properties of matter to make new and better things. I use my knowledge of physical substances to create new and useful products. Sometimes I create new substances to use for building things. Sometimes I make new food products, cosmetics (makeup) or medicines.</p> <p>Who Am I?</p>	<p>I like to think of new ideas for making useful things. When I see a problem, I think of a solution. I am naturally curious. I like to make our world better by creating something new and useful. I make careful observations, ask questions, design tests, use technology and gather information. When science does not have the tools I need, I create those tools.</p> <p>Who Am I?</p>
<p>I am curious about how things work and how they are put together. I study the physics of machines to make new and better things. I want to know about potential and kinetic energy and how these affect the work a machine can do. I use my knowledge to design and make new and useful machines.</p> <p>Who Am I?</p>	<p>I like to solve mysteries. I study math and many different areas of science. I am unafraid to ask questions and unafraid that I may not find answers to my questions. I use science to look for clues. I use my knowledge to collect data, explain the data and solve problems.</p> <p>Who Am I?</p>
<p>I enjoy exploring and creating ways to get oil out of our earth. I study math, chemistry, geology and physics. I want to know how much oil and natural gas is in our earth. In the oil industry, I decide which methods will work best to get the most oil and gas out of a deposit. I use my knowledge to increase how much oil and gas we get out of the earth.</p> <p>Who Am I?</p>	<p>I care about our earth and how we take care of it. I study chemistry, geology and oceanography. I want to know how much damage is done to our earth. In the oil industry, I observe the environment. I look at how oil is transported, and I measure the movement of water. I use my knowledge to reduce the amount of damage to our air, water, soil, animals and humans.</p> <p>Who Am I?</p>
<p>I enjoy learning about our earth. I enjoy studying math, chemistry, biology and physics. I study rocks, minerals and fossils. I want to know about how our earth is put together. In the oil industry, I look at information about where wells have been drilled and whether or not they produced oil or gas. I use my knowledge to estimate where to drill for oil and gas.</p> <p>Who Am I?</p>	<p>I enjoy the outdoors and digging in the earth. I enjoy studying math and physics. I study rocks, minerals and fossils. I want to know about how our earth is put together. I use my knowledge in the oil industry to look for deposits of oil and gas underground. I estimate the location and size of these deposits by using sound waves.</p> <p>Who Am I?</p>

Science/Math



Science/Math



“Wildcat” Drilling

Purpose:

This **Science** and **Math** lesson is designed as a hands-on simulation to engage students in drilling for oil. Connecting with their knowledge of earth science, students will construct a simulated oil field. Data generated from searching and drilling for oil will be organized into a graph. Based on success or failure, students will calculate their profits and losses.

Museum Connections: *Area 7 – Bucking the Odds*

Risk-taking and level-headed to win in the oil business

Investigative Questions:

How do geologists know where to find oil? How many drillings are needed to actually find an oil-producing well? Is making a profit in exploration easy or difficult?

PASS Objectives: Grade 4 Cited

- Science Processes and Inquiry: **Observe and Measure**, Standard 1.1
- Science Processes and Inquiry: **Interpret and Communicate**, Standards 4.1, 4.2
- Science Processes and Inquiry: **Inquiry**, Standards 5.2, 5.4
- Earth/Space Science: **Properties of Earth Materials**, Standard 4.1
- Math Process: **Representation**, Standard 5.2
- Math Content: **Data Analysis and Probability**, Standards 5.1a, 5.1b, 5.2

Grade Levels: 4th-6th

Estimated Time:

- Two class sessions.

Materials:

- **For Groups: Boxes or Plastic Containers** (4”- 5” deep) – One per group of students/approx. 8x12x4 in.
- **OR ... For whole class: One 10-gallon aquarium tank.**
- **Soil, small pebbles, sand** (*Note: Pea gravel is available at home improvement stores for a few dollars.*)
- **Sharpened pencils, skewers or other tool** for drilling.
- **String and tape** to form grid lines across container.
- **Small, individual containers of chocolate pudding** (3-5 per group OR six for 10-gal. tank).
- **Substitutions for chocolate pudding:** Collect from restaurants the small hard plastic containers of salad dressings or jellies. Empty these and fill with black ink, nontoxic stain or black liquid shoe polish. Place each inside a sandwich baggie and seal with wide, clear tape.
- **Graphing paper** – ¼ inch.
- *Attachment 1 – Wildcat Drilling Group Data Collection* – One transparency, one copy per group.
- *Attachment 2 – Wildcat Drilling Class Data Collection* – One transparency.
- *Attachment 3 – Wildcat Drilling Group Graphing* – One transparency.

NOTE: Attachment 3 may be copied for each group, or students may use blank graph paper to create graphs.

Safety:

- **Remind students of safety guidelines for use of drilling tools.** Skewers and other sharp objects are for use in the investigation and should be handled properly.
- **Safety goggles** should be used if items chosen for drilling indicate the need.
- **Substance used to represent oil** should be nontoxic for the safety of all students.

PROCEDURES:

Opening the Lesson:

- **Link to prior learning:** Connect with learning about rock formation, sedimentary layers, technology and data collection.
- **Introduce vocabulary:** Seismic surveys, sedimentary rock, “wildcat” drilling.
 - **Seismic surveys** – Seismic surveys use technology to measure vibrations in the ground, or seismic waves, from explosions or other sound created through technology. These seismic waves reflect differently, depending on the types of rocks. Rocks and their formations reveal the likelihood of oil deposits.
 - **Sedimentary rock** – Sedimentary rock is formed from sediment, or particles of earth, that have settled, collected and deposited. These particles are created through weathering caused by water, wind or ice. Pressure deep within the earth causes these sediments to form into sedimentary rock.
 - **Petroleum** – Latin for “rock oil” – A dark, oily substance that occurs naturally in Earth’s sedimentary rock formations, consists mainly of hydrocarbons formed from decomposed living things, and also contains a complex mixture of organic chemical compounds; liquid form is **crude oil**; semisolid form is bitumen; solid form is **asphalt**.
 - **“Wildcat” drilling** – When technology is not used to determine a drilling site, the drilling is called “wildcat” drilling. Speculators, or oil seekers, who choose a site based on a “gut feeling” or a hunch that oil deposits are present are taking a risk in finding oil. Before technology advanced well enough to locate possible oil deposits, “wildcat” drilling was more common.

Developing the Lesson:

Groups

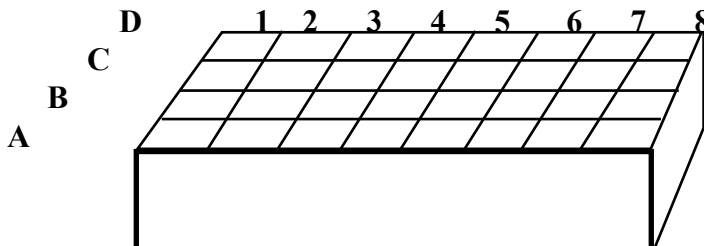
- **Containers** – Fill 1.5 gallon plastic containers in this order:

Bottom Layer	One inch of Sand
2nd Layer	One-half inch of Pea Gravel or small rocks Place 3-5 small containers of “oil” in random locations.
3rd Layer	One-half inch of Pea Gravel or small rocks. Be sure to cover the “oil” deposits.
4th Layer	One-half inch of Sand
5th Layer	One-half inch of Soil

- **Grid** – Create a grid over the surface of the soil by taping sections of string from side to side in both directions. Measure approximately every 1.5 or 2.0 inches to place each new string. *See diagram.* Label tape with letters and numbers to indicate grid sections.
- *Attachment 1 – Wildcat Drilling Group Data Collection* – Give one copy to each group.

Students will:

- **“Speculate”** – As *Wildcatters*, each group will record a plan for drilling. Groups will speculate on which site to drill first, second, and so forth. Each *drilling site* is identified by grid. For example, A-6 or C-4.
- **Drill** – Drill **in the order of speculation recorded** on the drilling chart.
Use a pencil, skewer or other tool for drilling.
Drill **only once within each selected grid.**
- **Record** the results of each drill on the *Wildcat Drilling Class Data Collection sheet – Attachment 1.*
- **Record totals** for each column.
- **Calculate Net Profit or Loss** (Total Profit – Total Loss).
- **Graph results** on graphing paper or copy of *Attachment 3.*
- *Attachment 2* – Collect group data and combine for a class report of total profit or loss.
- **Calculate percentages** from the number of oil hits and the number of dry wells.



Closing the Lesson:

- Each group will **share results** with the class.
- **Discuss findings.**
 - Were some groups more successful in finding oil than others?
 - How does this simulation reflect real-life speculation in the oil industry?
 - When is risk-taking wise or unwise?
 - What measures do you think companies take to make them more profitable?
 - Can you think of a time when you were a risk-taker and you were successful?
 - What about a time when risk-taking was unsuccessful?

Assessment:

- Given another opportunity for data collection, students will record results, calculate total profit or loss, and graph results.

Extension and Enrichment/Simplify and Focus:

Enrichment:

- Locate a video demonstrating how scientists measure the seismic waves during an earthquake or when exploring geological formations to locate petroleum.

Extension:

- **Graph** class profits/losses in a **bar graph**.
- **Analyze Data:**
 - How is the class result different from the individual group results?
 - What does this say about large companies versus small companies who speculate and take risks?

Resources:

Books:

- Ditchfield, Christin. "Oil." Children's Press, 2002.
This book defines how oil is formed, located, drilled, processed and made into products, as well as how oil affects our environment. Excellent photographs, one experiment, references, Web sites, glossary and index are included.
- Farndon, John. "Oil." NY: DK Publishing, 2007.
Readers will learn about finding and extracting oil through land and offshore oil rigs. They will learn about the transporting, refining and marketing of oil products. Oil products, such as plastics and polymers, are explained and illustrated.

Internet sites:

U.S. Department of Energy site:

- Information about fossil fuels.
- www.fe.doe.gov/education/energylessons/index.html

Wildcat Drilling

Class Data Collection

Attachment 2

Groups	Found Oil	Dry Well	Profit	Loss
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Total Successes/\$ Profit				
Total Misses/\$ Losses				
Net Profit/Loss = (Profit - Loss)				

	Found Oil	Dry Well
Whole Class	<u> </u> 20	<u> </u> 20
	<u> </u> %	<u> </u> %

Wildcat Drilling

Group Graphing

Attachment 3

Successes vs. Misses			
Number of Hits or Misses	Found Oil	Dry Well	
	20		
	18		
	16		
	14		
	12		
	10		
	8		
	6		
	4		
	2		
	0		

Net Profit or Loss	
Number or Dollars	3000
	2800
	2600
	2400
	2200
	2000
	1800
	1600
	1400
	1200
	1000
	800
	600
	400
	200
	0
	200
	400
	600
	800
1000	

So, You Want to Be a Scientist?

Purpose:

Through this **Science** lesson, students will gain insight into the work of scientists through a hands-on investigation. Using their knowledge of the properties of matter, students will observe and evaluate a mixture. As a final product, students will invent a use for this “unusual new substance,” name the new product and devise a method of marketing.

Museum Connections: *Area 4 – A Pioneering Attitude*

Area 8 – Energy Provider

Investigative Questions:

How do scientists discover new materials or substances?

What if a mixture behaves differently than what is expected?

How does this cause a scientist to question its molecular structure or to creatively explore new possibilities?

How do new substances lead to new products?

How do scientists determine when a new product will be useful to people?

How will this product be marketed?

PASS Objectives: Grade 4 Cited

- Science: **Observe and Measure**, Standard 1.2
- Science: **Experiment**, Standards 3.1, 3.2, 3.3, 3.4
- Science: **Interpret and Communicate**, Standards 4.3, 4.4

Grade Levels: 4th-6th

Estimated Time:

- Two class sessions.

Materials:

- *Attachment 1 – Data Collection for Investigation* – One transparency, one copy per group.
- Optional: Replace *Attachment 1* with large chart paper for each group.
- *Attachment 2 – New Product Marketing Advertisement* – One transparency, one copy per group.
- **One Recipe** of Investigative Mixture.
- **Procedures for Investigation** – Prepared with students or mixed ahead of time.
- **Data Collection Tools** – Ruler, tape measure, strainer, measuring cup, large spoon, paper towel, waxed paper, paper plate, stopwatch or timer – Students may use the classroom clock if easily accessible.
- **Optional:** Tools for mass, volume and temperature.
- **Butcher paper or newspapers** to cover desks.
- **White copy paper** for each group – To brainstorm and experiment with marketing advertisement.
- **Colored pencils or markers.**
- **Optional Book:** Dr. Seuss. *Bartholomew and the Oobleck*. NY: Random House Children’s Books, 1949.

Recipe for Investigative Substance:

Equipment	Recipe	Directions
Large bowl for mixing Measuring cup Plastic bowls with lids (2-3 cup capacity)	<u>For Six Groups of Students:</u> Makes 9 cups – 1.5 cups per group 6 ¾ cups water 12-15 drops of green food coloring 4 boxes cornstarch	Measure 6 ¾ cups of water into large bowl. Add About 15 drops of green food coloring <u>to the water first.</u> Add
<u>Clean-up</u> Small tubs of water in each group for hand washing. Brush off if dry. Do not pour into a drain!	<u>Tips for Overnight Storage</u> Refrigerate. May need to add water next day. Will need to remix slightly. Will mold if kept too long.	Four boxes of cornstarch – carefully sprinkling. Mix Tip bowl to combine mixture initially. Use hands to lift mixture from bottom of the bowl until mixed. Empty into small containers.

PROCEDURES:

Group Dynamics: Small groups.

Background Information:

The substance used in this investigation is often called Oobleck, colloquially named after the fictional green substance created by magicians in the book *Bartholomew and the Oobleck* by Dr. Seuss. Teachers may use the term Oobleck from the beginning of this investigation or may choose to call the mixture an “investigative substance.” Following the investigation, teachers may choose to read the book with older students, as well as younger students.

Also, as “teacher background only” information, an Internet search of the term Oobleck will yield videos posted by individuals who play with this substance using interesting tools, such as audio speakers for vibration and who fill pools with the substance to walk on it.

Opening the Lesson:

- **Introduce lesson** by asking the following questions. Record information on an overhead, the board or chart paper.
 - How do scientists discover new substances?
 - How do scientists know if a new substance is useful?
 - How is a new product marketed? Does it need a name? A usefulness? A logo?
- *Today, we are investigating a substance. Your job will be to investigate the properties of this substance.*
- *What is a property of matter?*

Developing the Lesson:

DAY 1 – Introduce the investigative substance. Students plan and conduct investigation.

- **Explain** that groups of students will:
 - Investigate a substance using their knowledge of the properties of matter.
 - Create a use for this unusual substance.
 - Name it as a product.
 - Design an advertisement to market this new product.
 - **Review science concepts.**
 - Investigation process.
 - Properties of matter and how to investigate these properties.
 - Optional: Concept of mixtures, solutions, suspensions.
 - **Purpose:** Each group’s job is to observe the physical qualities of this substance – color, shape, size – its change in size, texture, movement or consistency.
 - **Introduce substance** by handling the mixture for a minute or two. **Put it away.**
 - **Group Tasks** – Students assign responsibilities:
Task manager, recorder, checker, safety and clean-up manager, presenter.
 - **Cover desks** and **distribute** data collection materials, *Data Collection Charts* and bowls of investigative substance.
 - **Prediction:**
 - Students write one or two sentences stating what they expect to find through their investigation.
 - **Data Collection:**
 - In groups, students collect data from their observations of the substance.
Use the example questions and investigative tasks as prompts to assist students in this task.
- Appearance***
- Place substance on table and do not touch while writing descriptive words.
 - Oily, dull, sparkly, watery ...
- Texture***
- Divide substance for each group member.
 - Describe how the substance feels.
 - Oily, sticky, watery, slimy ...

Shape

- Place substance in different containers and observe how well it holds its shape or how it changes in shape.
- How long will this substance hold its shape?
- What shapes can be formed?
- What happens when this substance is held in a large spoon or placed onto a plate?

Effect on Other Objects

- Place substance on different surfaces and observe.
- What happens when this substance is placed on a paper towel? Waxed paper?
- What happens when a student holds the substance from the top? Does it stay in place? Does it flow downward?
- **Clean up following investigation.**
- **Presenters for each group share** results of investigation.
- **Collect charts.**

DAY 2 – Groups review **Data Collection Chart**, develop a use for the substance and create an advertisement for the new product.

- **Interpret Data – Using collected data**, students will **write** two to three sentences stating what they found.
- **Brainstorm uses** for this substance and **determine a name** for a new product.
- **Design a poster** to advertise this new product. Be sure to include the qualities observed during the investigation.

Closing the Lesson:

- **Groups share the results of their investigations.**
- Post chart papers showing data collection.
- Each group shares a **New Product** and **Advertising Poster** illustrating its qualities.
- **Ask students**, *How is your prediction the same or different from your conclusion? What do you now know about scientists and their work? How could this investigation be more challenging?*

Assessment:

- Students will be assessed on participation during investigation and on presentation of data.
- **Optional:** Through a *QUICKWRITE*, each student will write a summary of the investigation process and how he or she contributed to this process. Use of scientific terms and specific descriptions will indicate an understanding of documentation of investigations.

Extension and Enrichment/Simplify and Focus:

Simplify and Focus:

Move these two steps from the main lesson to an extension activity.

- **Brainstorm uses** for this substance and **determine a name** for this new product.
- **Design a poster** to advertise this new product. Be sure to include the qualities observed during the investigation.

Resources:

Books

- **Book:** Dr. Seuss. *Bartholomew and the Oobleck*. NY: Random House Children's Books, 1949.
- **Optional Book for Extension:** Sneider, Cary I. *Oobleck: What Do Scientists Do?* CA: University of California, 1993.

Internet

- www.Eduplace.com – For other investigative activities.

Data Collection for Investigation

Attachment 1

Prediction: _____

Appearance

Texture

Shape

Effect on Other Substances or Surfaces

Possible Uses for This Product

Conclusion: _____

New Product Marketing Advertisement *Attachment 2*

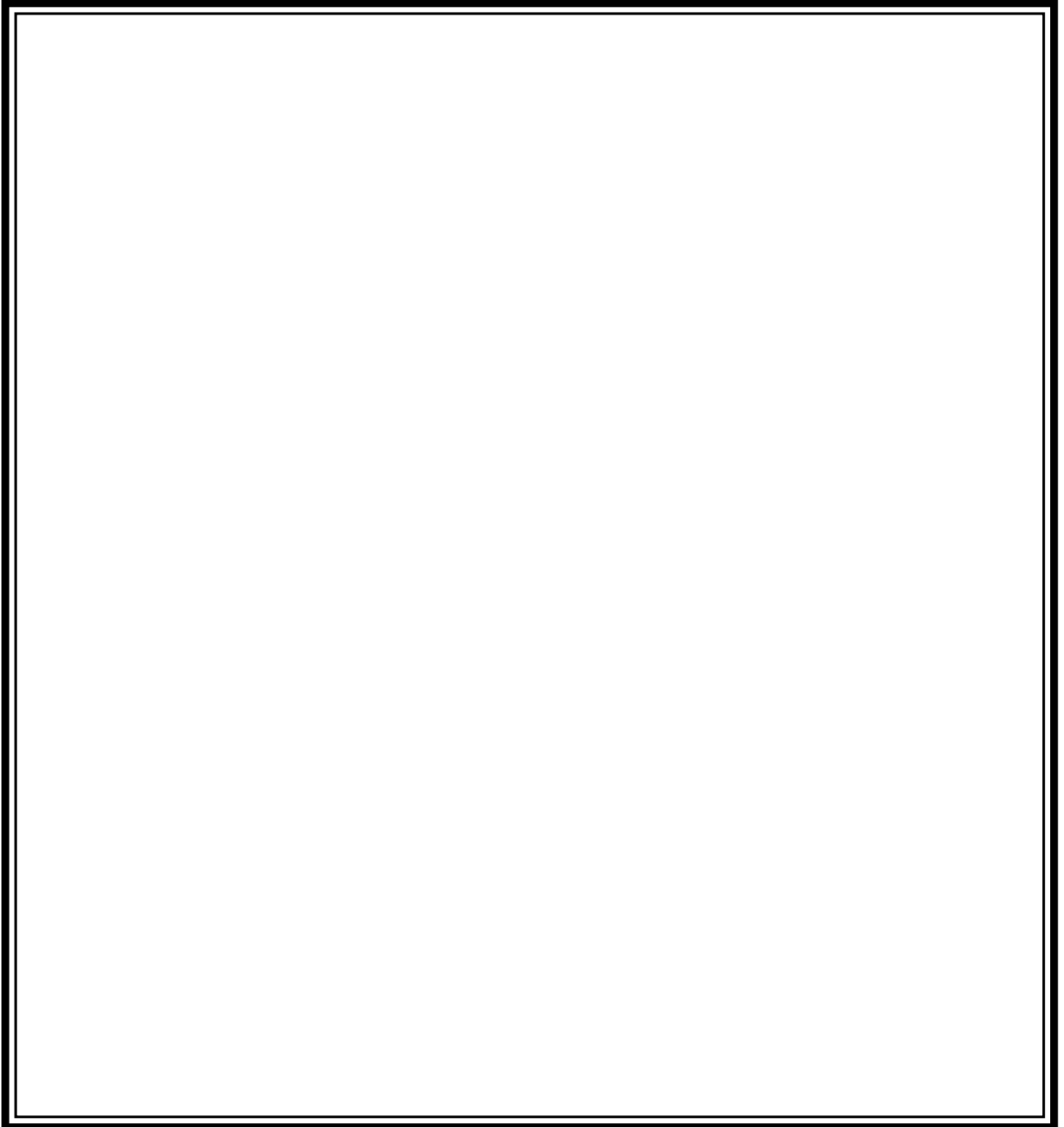
Give your new product a **name**.

Design a **logo** or **trademark**.

Create a **slogan** or **jingle** to sell your product.

Illustrate your new product being used in some way.

Describe what your new product will do. Use what you learned through the investigation.



Petroleum to Plastics

Purpose:

Through **Science** process skills, students will classify petroleum-based plastics and will observe and evaluate how plastics affect our world today. Museum connections will engage students in recognizing plastics as petroleum products and in recognizing the role of Phillips employees Paul Hogan and Robert Banks in discovering the plastic marketed as Marlex® in the 1950s.

Museum Connections: *Area 4 – A Pioneering Attitude*
 Area 8 – Energy Provider

Investigative Questions:

What is plastic? From where does plastic come? Who, when and how was the Marlex® plastic developed?
What type of plastic is Marlex®?

PASS Objectives: Grade 4 Cited

- Science Processes and Inquiry: **Observe and Measure**, Standard 1.2
- Science Processes and Inquiry: **Classify**, Standards 2.1, 2.2
- Science Processes and Inquiry: **Interpret and Communicate**, Standards 4.1, 4.2, 4.3

Grade Levels: 4th-6th

Estimated Time:

- Two class sessions.
- Three class sessions if students are using information sources to research, read and then write.

Materials:

- **Biographical research** on the 1951 discovery of crystalline polypropylene and high-density polyethylene by Paul Hogan and Robert Banks, marketed as Marlex®. *See Internet Sources.*
- *Attachment 1 – **Plastics Observation*** – Graphic Organizer – One for each student group.
- *Attachment 2 – **Recyclable Plastics*** – One copy per group.
- *Attachment 3 – **Hula Hoop® Hoopla*** – Diagram of Plastics Display in museum.

Optional:

- **Book:** Wallis, Michael. “Oil Man: The Story of Frank Phillips and the Birth of Phillips Petroleum.” Macmillan, 1995.

PROCEDURES:

Group Dynamics: Students may work as partners or in small groups.

Opening the Lesson:

- **Attention Getter:** Hold up, display or use these items. Ask, *What do these items have to do with the oil industry?*
Items: Hula Hoop®, lipstick, nylon hosiery, safety helmet, toy duck, etc.
- *What is plastic?*
Plastic is a substance made from hydrocarbons that have been extracted from oil.
Plastics can be molded into different shapes when heated.
- **Introduce** background information on Paul Hogan and Robert Banks as scientists/chemists who worked for Phillips and discovered a plastic we use today. Display names on the board or overhead, or copy information from Internet source – one per group of students.
- **Ask** students to share what they know about plastics and to **brainstorm/list** examples of plastics we use.
- **Collect examples of plastics** we use at home or school. Have students bring examples from home.

Developing the Lesson:

- **Group students** to observe and classify plastics.
- **Ask** students how they should group plastics – color, shape, size, type. **Students share results.**
- *Attachment 1 – **Plastics Observation*** – Distribute one for each group. Groups observe and collect data on plastics by listing items or drawing pictures.
- **Option:** As a class, students may graph the types of plastics collected as a whole.
- **As a class**, discuss recycling plastics – NOTE: May want to record answers on a chart.
What is recyclable? What is not recyclable? How do we know the difference?
- *Attachment 2 – **Recyclable Plastics*** – Collect data according to recyclable plastics. Discuss the numbers and coding. Students will look for these numbers on each plastic item. If items are not recyclable, there will be no number. Discuss the fact that many different plastics are used in products so that these cannot be broken apart for recycling.
- **Collect data** as a class on the overhead using *Attachment 2 – **Recyclable Plastics***. Record the number of items collected under each category. Add to the list any specific types of items we use today from each category.
- **Ask**, *How is the new grouping of plastics different from the first classification? Why?*

Closing the Lesson:

- *Attachment 3 – **Hula Hoop® Hoopla*** – Represents Marlex® plastics on display. Copy as a transparency.
- In groups, observe and discuss the types of items found in the display. As a class, have groups share observations and comments.
- **Ask:**
 - *Why were consumers so excited about plastic in the 1950s and 1960s when we have so much plastic available today?*
 - *Why were consumers so excited about plastic toys or plastic dishes?*
 - *Was recycling important then?*
 - *Why is recycling important today?*
- **NOTE:** The Marlex® plastic is HDPE and was marketed extensively in Hula Hoops® and milk jugs.
- Ask students to consider, *What new questions do you have about plastics? How could we find the answers to your questions?*

Assessment:

- Participation and completion of graphic organizer.
- Observation of ***Plastics Display*** and participation in class discussion.
- **Writing:**
 - Write a persuasive paragraph or essay with convincing reasons on the following topic:
Why the Bad Reputation of Plastics Is Wrong.
 - Write an expository paragraph or essay explaining facts on one of the following topics:
Creative Use of Recycled Plastics
What Plastic Has Done For Me
Advantages of Plastics for Food Products

Extension and Enrichment/Simplify and Focus:

- Formulate a definition for *Plastic*.

Internet Sources:

- **Paul Hogan** – “Mr. Marlex®” and **Robert Banks** – Research Chemist: http://membership.acs.org/N/NEOklahoma/NHCL/NHCL_background.htm

The U.S. National Institute of Environmental Health Sciences:

- Information on recycling and reducing waste.
- www.niehs.nih.gov/kids/recycle.htm

The Alliance to Save Energy:

- www.ase.org/section/_audience/consumers/kids

Plastics Observation

Attachment 1

GROUP MEMBERS: _____

Characteristic: _____	Characteristic: _____
Characteristic: _____	Characteristic: _____
Characteristic: _____	Characteristic: _____

Recyclable Plastics

Attachment 2

△ **1** – PET Polyethylene Terephthalate
Two-Liter Beverage Bottles

△ **2** – HDPE High Density Polyethylene
Milk jugs, trash bags, detergent bottles

△ **3** – PVC Polyvinyl Chloride
Cooking oil bottles, packaging around meat

△ **4** – LDPE Low Density Polyethylene
Grocery bags, bread bags, food wrap

△ **5** – PP Polypropylene
Yogurt containers, straws, margarine tubs, diapers

△ **6** – PS Polystyrene
Styrofoam cups, egg cartons, take-home boxes

△ **7** – Other
All other types of plastics

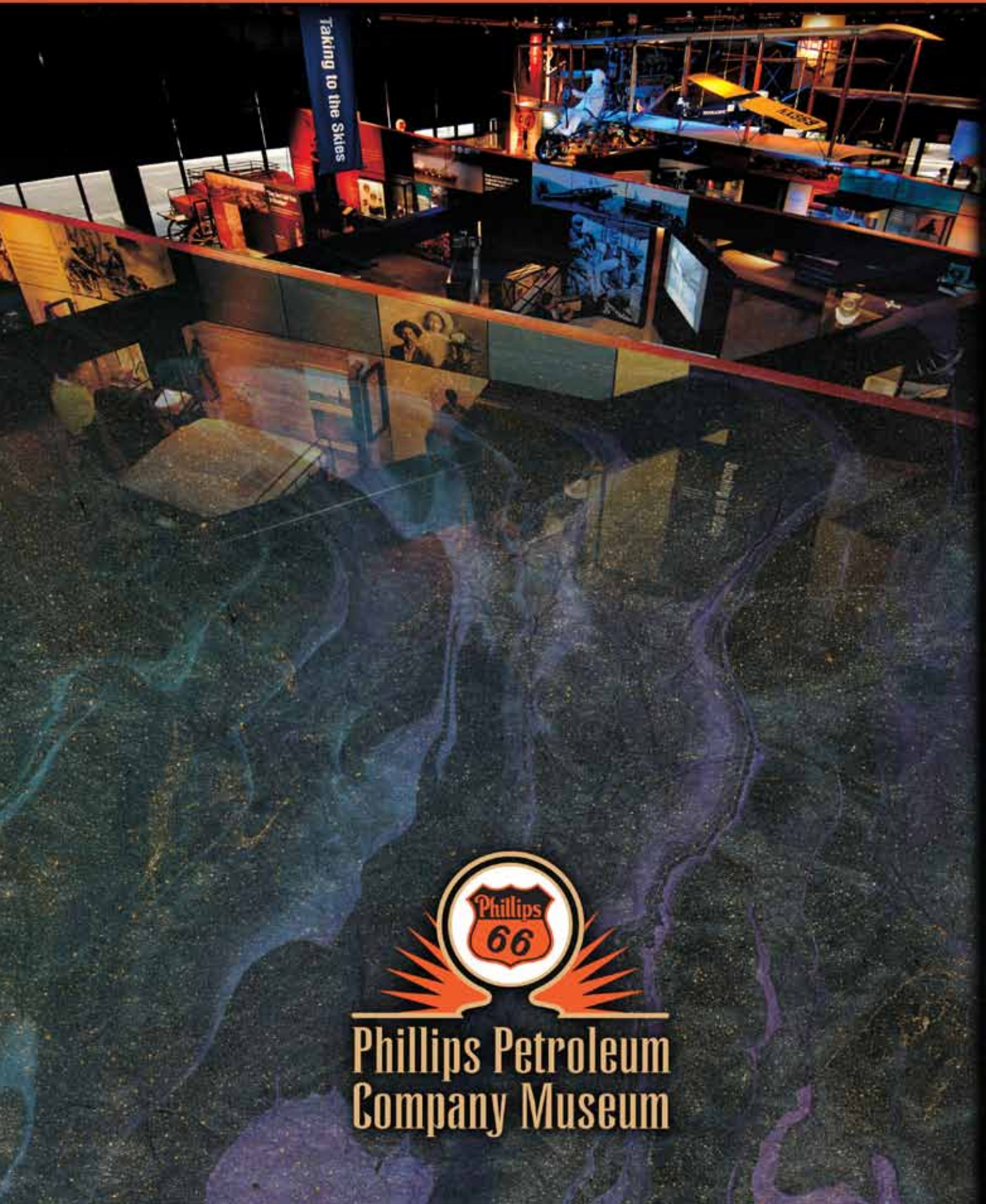
Hula Hoop® Hoopla

Marlex® Plastics Display

Attachment 3



Social Studies



Social Studies



Petroleum: A Study in Time

Purpose:

In this **Social Studies** lesson, students will apply skills in multiple disciplines. Presented through a timeline, students will sequence events that led two brothers, Frank and L.E. Phillips, from their first “gusher” and the development of Phillips Petroleum Company to the development of petroleum products and then to the company today, ConocoPhillips.

Museum Connections: *Area 2 – Chronology of Phillips Petroleum Company*

Founders of Phillips Petroleum Company
Patents Granted
Marketing Events
Worldwide Company

Investigative Questions:

When did the Phillips brothers first find oil and establish a company?

How often did patents affect the future of Phillips Petroleum?

How often did risk-taking affect the success of Phillips Petroleum?

What challenges did Phillips Petroleum face, and how did the company remain strong?

PASS Objectives: Grade 4 Cited

- Language Arts: **Reading/Literature**, Standards 1.1, 3.2, 3.3, 3.4
- Language Arts: **Visual Literacy**, Standard 3
- Social Studies: Standards 5.1, 5.2
- Math Process: **Connections**, Standard 4.4
- Science Processes and Inquiry: **Classify**, Standards 2.1, 2.2

Grade Levels: 4th-6th

Estimated Time:

- Two class sessions.

Materials:

- *Attachment 1 – Chronology of Phillips Petroleum* – One transparency, one copy per student or partners.
- *Attachment 2 – Telling the Story* – One Transparency, one per student or partners.
- **Highlighters** – One set per group or partners.
- *Attachment 3 – Time Through Pictures* – One per student.
- *Attachment 1B – Chronology of Phillips Petroleum* – For teacher use only.

PROCEDURES:

Group Dynamics: Students work individually or with partners.

Opening the Lesson:

- **Ask**, *What is the meaning of chronology?*
- **Introduce timeline structure** based on decades, with the exception of the first and last set of dates.
- **Ask** students to share what they know about timelines. *How do timelines help us to learn about topics?*
- **Introduce and discuss vocabulary** associated with the timeline.

Developing the Lesson:

- *Attachments 1 and 2 – Distribute* to each student or to partners.
 - Distribute highlighters – yellow, blue, green, pink.
 - Students read the timeline silently before reading the events aloud as a class or in groups.
- Assist students in understanding any events that are confusing or difficult to understand.
- **Circle important or key words** in each event.
- **Classify events** by highlighting descriptions according to the KEY on Attachment 2.
- **NOTE: Highlight in the order listed** to prevent some confusion in overlapping events.
- **Discuss** results of highlighting. Using the transparency, gather input from students to highlight events as a class.
- *Attachment 2 – Telling the Story* – Students **analyze and interpret events** by rereading and answering questions.
- **Discuss results** of timeline study. Using the transparency, gather input from students.

- *Attachment 3 – Time Through Pictures:*
 - Students work individually to select five events that cause them to visualize or think of a mind picture for this event.
 - Circling key words throughout the timeline will help students examine events more carefully, for example, basketball, service station, Alaska.
 - Students will draw a picture as a symbol for each of these five events.
 - Each picture will have the date and a caption.
 - To write a caption, encourage students to describe the main idea of the event through just a few words.
 - Finally, students will draw arrows connecting events in order of occurrence.

Closing the Lesson:

- **Evaluate Events:** As a class, draw conclusions about the company based on the events presented.

Event or Overall Evidence	Possible Conclusions
The company started in 1917 and is still operating today.	Two brothers worked diligently to create a strong company.
Employee Basketball Team, Men's Club and Women's Sorority.	Employees enjoy activities with fellow workers when they are not at work.
More than 15,000 patents.	Company believes in developing new products.
Discovery of Marlex® plastic.	Company makes a big profit in plastics.
Ekofisk in the North Sea and Venezuela oil fields.	Company does business all over the world – a worldwide business.

Assessment:

- *Attachment 1 – Chronology of Phillips Petroleum* – Observe ability to read, interpret and classify events.
- *Attachment 2 – Telling the Story* – Formal or Informal evaluation.
- *Attachment 3 – Time Through Pictures:*
Observe ability to:
 - Critically select events.
 - Create a representative picture or symbol.
 - Compose and write a main idea caption.
 - Order events.

Resources:

- Examples of timelines.

Chronology of Phillips Petroleum *Attachment 1*

<u>1905-1919</u>	<p>1905 – Brothers Frank and L.E. Phillips strike their first “<u>gusher</u>,” the Anna Anderson No 1.</p> <p>1917 – Phillips Petroleum Company is incorporated.</p> <p>1917 – The first “natural gasoline” plant is opened near Bartlesville.</p> <p>1919 – Employees create first official company <u>basketball team</u>.</p>
<u>1920-1929</u>	<p>1924 – Phillips receives its first U.S. patent.</p> <p>1925 – The first Research & Development (R&D) laboratory created.</p> <p>1927 – The first gasoline <u>service station</u> opens and soon carries the “66” logo.</p>
<u>1930-1939</u>	<p>1931 – First long-distance multiproduct pipeline runs from Borger, Texas, to East St. Louis, Ill.</p> <p>1937 – The Jane Phillips <u>Sorority</u> is formed by 150 Bartlesville women.</p> <p>1938 – Male employees form the <u>Phillips Men’s Club</u>.</p>
<u>1940-1949</u>	<p>1940 – Research develops high-octane <u>aviation fuel</u> – important to WWII victory.</p> <p>1946 – The first overseas oil production begins in Venezuela.</p>
<u>1950-1959</u>	<p>1951 – Enters the “plastics business” with discovery of <u>Marlex®</u>, the plastic of <u>Hula Hoops®</u>.</p> <p>1952 – First oil company to receive government permission to drill in Alaska.</p>
<u>1960-1969</u>	<p>1960 – Invention of product to prevent jet fuels from freezing.</p> <p>1962 – Phillips receives 5,000th U.S. patent.</p> <p>1969 – Discovery of Ekofisk in the North Sea, first major oil field in Western Europe.</p>
<u>1970-1979</u>	<p>1974 – Marketing starts first “Performance Story” advertising.</p> <p>1975 – Phillips receives 10,000th U.S. patent.</p>
<u>1980-1989</u>	<p>1983 – Patent for Marlex® plastic, discovered in the early 1950s, is finally granted.</p> <p>1987 – The Ekofisk complex is jacked up 20 feet in the North Sea, a first time ever engineering feat.</p>
<u>1990-2002</u>	<p>1998 – Phillips receives its 15,000th U.S. patent.</p> <p>2002 – Phillips Petroleum Company <u>merges with Conoco Inc.</u></p>

Key	
Orange	Employee and community involvement
Blue	Patents received
Green	Discoveries or inventions
Pink	First-time events in the history of Phillips
	Two events not highlighted
NOTE: Unerlined words are examples of KEY WORDS to prompt ideas for illustrations.	

Time Through Pictures

Choose **FIVE EVENTS** that create a **PICTURE** in your mind.

CIRCLE KEY WORDS in each of those events to help in creating a drawing.

EXAMPLE: In 1905, the word "gusher" may give a "picture" of oil shooting out of the ground.

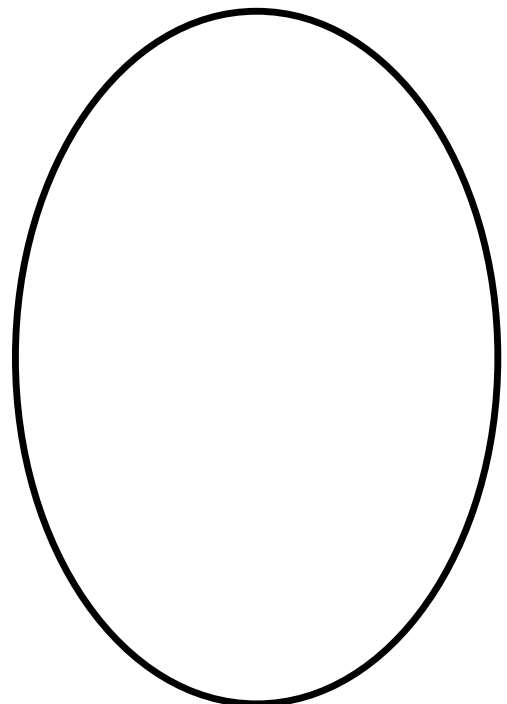
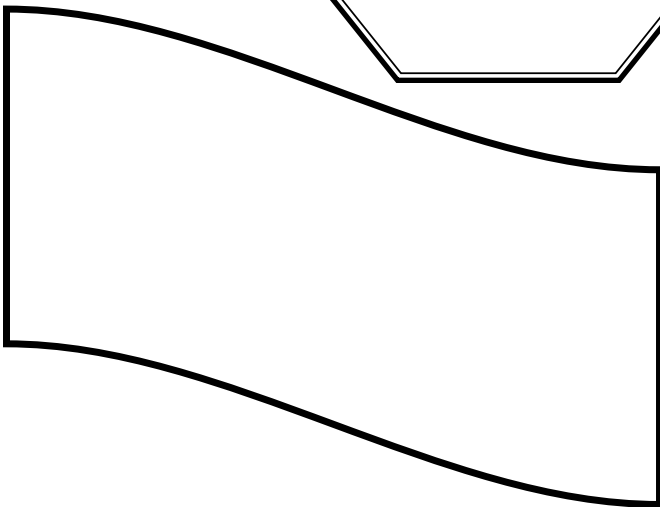
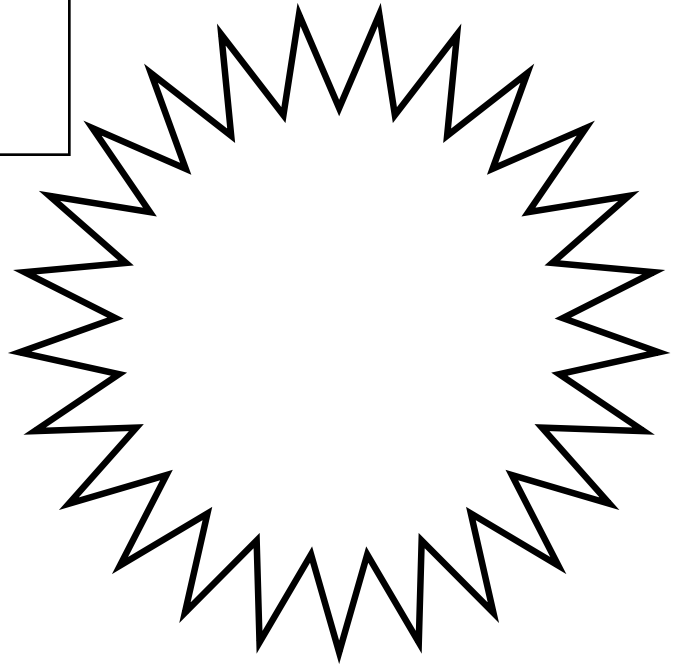
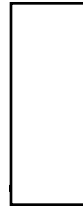
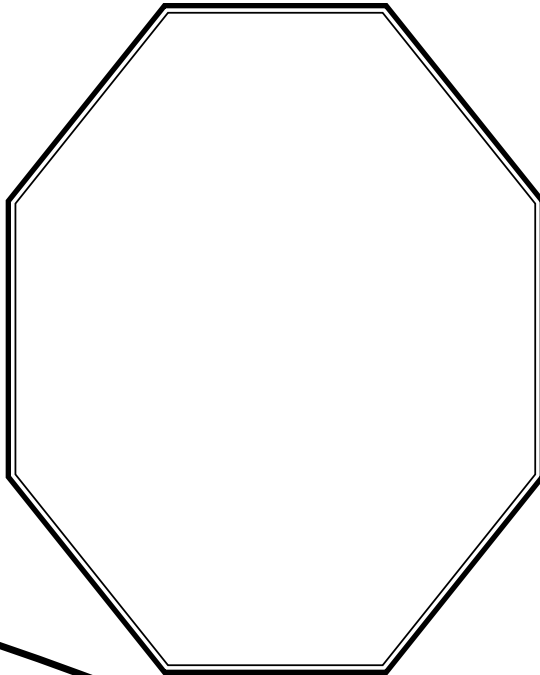
ILLUSTRATE each of these five events in a box.

DRAW ARROWS connecting one event to another in time sequence.

Write a **CAPTION** and **INCLUDE DATE**.



1905
"Anna Anderson"
Gusher



Chronology of Phillips Petroleum *Attachment 1B*

<u>1905-1919</u>	<p>1905 – Brothers Frank and L.E. Phillips strike their first “gusher,” the Anna Anderson No 1.</p> <p>1917 – Phillips Petroleum Company is incorporated.</p> <p>1917 – The first “natural gasoline” plant is opened near Bartlesville.</p> <p>1919 – Employees create first official company basketball team.</p>
<u>1920-1929</u>	<p>1924 – Phillips receives its first U.S. patent.</p> <p>1925 – The first Research & Development (R&D) laboratory created.</p> <p>1927 – The first gasoline service station opens and soon carries the “66” logo.</p>
<u>1930-1939</u>	<p>1931 – First long-distance multiproduct pipeline runs from Borger, Texas, to East St. Louis, Ill.</p> <p>1937 – The Jane Phillips Sorority is formed by 150 Bartlesville women.</p> <p>1938 – Male employees form the Phillips Men’s Club.</p>
<u>1940-1949</u>	<p>1940 – Research develops high-octane aviation fuel – important to WWII victory.</p> <p>1946 – The first overseas oil production begins in Venezuela.</p>
<u>1950-1959</u>	<p>1951 – Enters the “plastics business” with discovery of Marlex®, the plastic of Hula Hoops®.</p> <p>1952 – First oil company to receive government permission to drill in Alaska.</p>
<u>1960-1969</u>	<p>1960 – Invention of product to prevent jet fuels from freezing.</p> <p>1962 – Phillips receives 5,000th U.S. patent.</p> <p>1969 – Discovery of Ekofisk in the North Sea, first major oil field in Western Europe.</p>
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<u>1990-2002</u>	<p>1998 – Phillips receives its 15,000th U.S. patent.</p> <p>2002 – Phillips Petroleum Company merges with Conoco Inc.</p>

Vocabulary	Description
aviation	having to do with aircraft or flying
decade	a period of 10 years
engineering	using science to design, plan, construct
feat	remarkable achievement
gusher	an oil well in which the oil flows freely in large amounts without pumping
incorporated	describes when a company is legally established as a corporation
merge	to combine or put together
patent	an official government document protecting the rights of an inventor to make or sell an invention
petrochemicals	substances that come from petroleum or natural gas; example: gasoline
pipeline	a system of pipes to transport or carry oil or other petroleum products over long distances

From Earth to Products

Purpose:

Students will apply knowledge of **Social Studies** concepts to recognize and describe divisions of the oil industry – Research and Development, Exploration, Production, Refining, Transportation and Marketing. Beginning with oil industry descriptions and visual images, students will identify oil industry vocabulary and apply this knowledge to classify images and then to arrange a flowchart representing the movement of processes from exploration to the consumer.

Museum Connections: *Area 8 – Energy Provider*
Area 9 – Taking to the Skies
Area 10 – Selling 66

Investigative Questions:

How does the oil from our earth get to the gas station as gasoline?

What parts of movement represent Research and Development, Exploration, Production, Refining, and Marketing?

PASS Objectives: Grade 4 Cited

- Social Studies: Standards 1.1, 2.1, 5.3
- Science Processes and Inquiry: **Classify**, Standards 2.1, 2.2

Grade Levels: 4th-6th

Estimated Time:

- One to two class sessions.

Materials:

- *Attachment 1 – Resource to Product Word Cards* – One set per group of students, cut into cards.
- *Attachment 2 – Resource to Product* – One transparency, optional copies for groups.
- *Attachment 3 – Flowchart Visual Images* – One set per group of students, cut into cards.
- *Attachment 4A – Process Descriptions* – One set per group of students, cut into cards.
- *Attachment 4B – Process Descriptions* – Answers for teacher.
- *Attachment 5 – Process Arrows* – Copy as needed for each group, cut into cards.
- **Optional:** Overhead transparencies of word cards and flowchart cards.
- **Optional:** Library resources on the oil industry for independent or group exploration.

PROCEDURES:

Group Dynamics: Small group tasks/Large group discussion

Opening the Lesson:

- **Tell a personal story** or relate a short scenario about:
 - An experience at the gas station or at an automotive repair shop, a trip to an oil well site, someone in your family who works in the oil industry, buying the right kind of oil for your car, getting your first gasoline credit card, etc.
 - NOTE: Your personal story should lead into the lesson.
- **Investigative Questions** – Ask:
 - *How do you think oil from our earth gets to the gas station as gasoline?*
 - *What parts of this process represent Research and Development, Exploration, Production, Refining, and Marketing?* **NOTE:** Words should be displayed on board, transparency or cards.

Developing the Lesson:

- *Attachment 1 – Resource to Product Word Cards:*
 - **Distribute** to each group.
 - Introduce vocabulary briefly by pronouncing and repeating words aloud.
- *Variation:* Distribute one word card to each group. Assign each group only one process (or word card) to identify through pictures shown on the overhead.
- **Explain:**
 - *Today, we will investigate the oil industry through visual images.*
 - *We will also use the vocabulary used to describe the processes of this industry.*
 - *Your word cards name these processes.*
 - *We are now going to look at visual images to match these to your word cards.*
 - *Be ready to hold up one of your word cards to describe each of these pictures.*

- *Attachment 2 – Resource to Product – Transparency.*
- **Introduce** the terms again from the overhead.
 - Point out that these processes are often “paired” and given a “short form” name called an **acronym**.
 - For example, Research and Development is R&D.
- **Instruct students to view images on transparency. Ask students:**
 - *What do you see in these pictures that are clues to the processes being shown?*
 - *What do you know about these terms by studying the pictures?*
 - *If we order these pictures from a beginning point to an end point, what is the beginning? What is the end point?*
 - **Record information** inside the boxes as students share what they see.
 - **Label visual images** with the acronym for each.
 - **Draw arrows** from one process to another to indicate flow and interaction of these oil industry divisions.
 - Lead students to think critically by asking “why” and “how” questions.
- **Introduce** concept of a flowchart.

- *Attachment 3 – Flowchart Visual Images.*
 - Distribute to groups.
 - **Task 1** – Students arrange cards face up on desks. Take a few minutes to study images and discuss within groups.
 - **Task 2** – Students classify images by oil industry divisions using **Word Cards** as headings for classifications.

<u>Research & Development</u> Chemist Laboratory	<u>Exploration</u> Seismography Geophysicist Geologist	<u>Production</u> Drilling Offshore Drilling	<u>Refining</u> Refinery Chemical Plants Plastics Plant	<u>Transportation</u> Trucks and Tankers Pipelines	<u>Marketing</u> Gas Stations Advertising Logo
------------------------------------------------------------	-----------------------------------------------------------------	----------------------------------------------------	------------------------------------------------------------------	-------------------------------------------------------------	---------------------------------------------------------

- Discuss results with students.
Are there some areas of the industry that overlap? Which divisions are the easiest to identify?

- *Attachment 4A – Process Descriptions.*

- *Attachment 5 – Process Arrows.*
 - Distribute to groups.
 - **Task 3** – Students will use the **Word Cards, Visual Images, Descriptions and Arrows** to create a flowchart.
 - Explain the task of organizing cards from an origin point to an end point.
 - **Check for understanding** by circulating from group to group.
 - **Groups** will “talk through” the processes by using the **Descriptions** and the vocabulary displayed on word cards.

Closing the Lesson:

- Groups share results with the class. Encourage students to use oil industry vocabulary.
- Point out that each flowchart may be different, but still correct.

Assessment:

- Given descriptors or pictures, students will identify each process using oil industry vocabulary.

Extension and Enrichment/Simplify and Focus:**Extension:**

- Create an oil industry flowchart on butcher paper. Label the divisions. Draw arrows to show flow and interconnections.
- Assign students the task of developing a flowchart for steps in another content area.

Research & Development

Exploration

Production

Refining

Transportation

Marketing

Resource to Product

R&D
E&P
R&M













Research and Development
Exploration and Production
Refining and Marketing
Transportation

- Each of these pictures represents a division of the oil industry.
- Can you determine which picture represents each division?
- How did you make your decisions?
- What does each division do? Write the word to describe the function of each.

Research and Development
Transportation

Exploration
Refining

Production
Marketing

Flowchart Images

- Need images for the following categories.
- Need a total of 12 images minimum.
- Smaller images, such as products, can be grouped.
- Images will be copied, cut apart and used to make a flowchart on top of student desks.
- **TWO PURPOSES:**
 1. Students will classify images, so they need more than one in each category.
 2. Students will connect images to create a flowchart of exploration to consumer.

<p><u>Research and Development</u> Chemistry Laboratory</p>	<p><u>Exploration</u> Seismography Geophysics Geology</p>	<p><u>Production</u> Drilling Offshore Drilling</p>
<p><u>Refining</u> Refinery Distillation Process Chemical Plants Plastics Plants</p>	<p><u>Transportation</u> Trucks and Tankers Pipelines</p>	<p><u>Marketing</u> Gas Stations Advertising Logo</p>

Process Descriptions

<p>Locate and drill new sites to increase the amount of oil a company removes from the earth.</p>	<p>More products are made when more raw materials, such as petroleum, are found.</p>
<p>A company uses trucks, ships and barges to move crude oil to the refineries.</p>	<p>Companies use trucks, pipelines and train cars to move gasoline to the gas stations.</p>
<p>Drilling new wells increases the opportunity for mining more oil. An oil company adds to its profit when they are careful with the cost of drilling.</p>	<p>A company discovers new ways to locate oil reserves and more efficient methods of extracting oil from the earth.</p>
<p>This process looks at a product for its uses. The company sets a price and advertises the product. Finally, the product is sold to the consumer through a business.</p>	<p>Oil has impurities or particles of substances that must be removed to make it more useful. Oil is cleaned before making products from the oil.</p>
<p>A company competes with other companies to create new ways to refine and develop products.</p>	<p>A company looks at what the consumer wants and plans new products that the consumer will buy.</p>

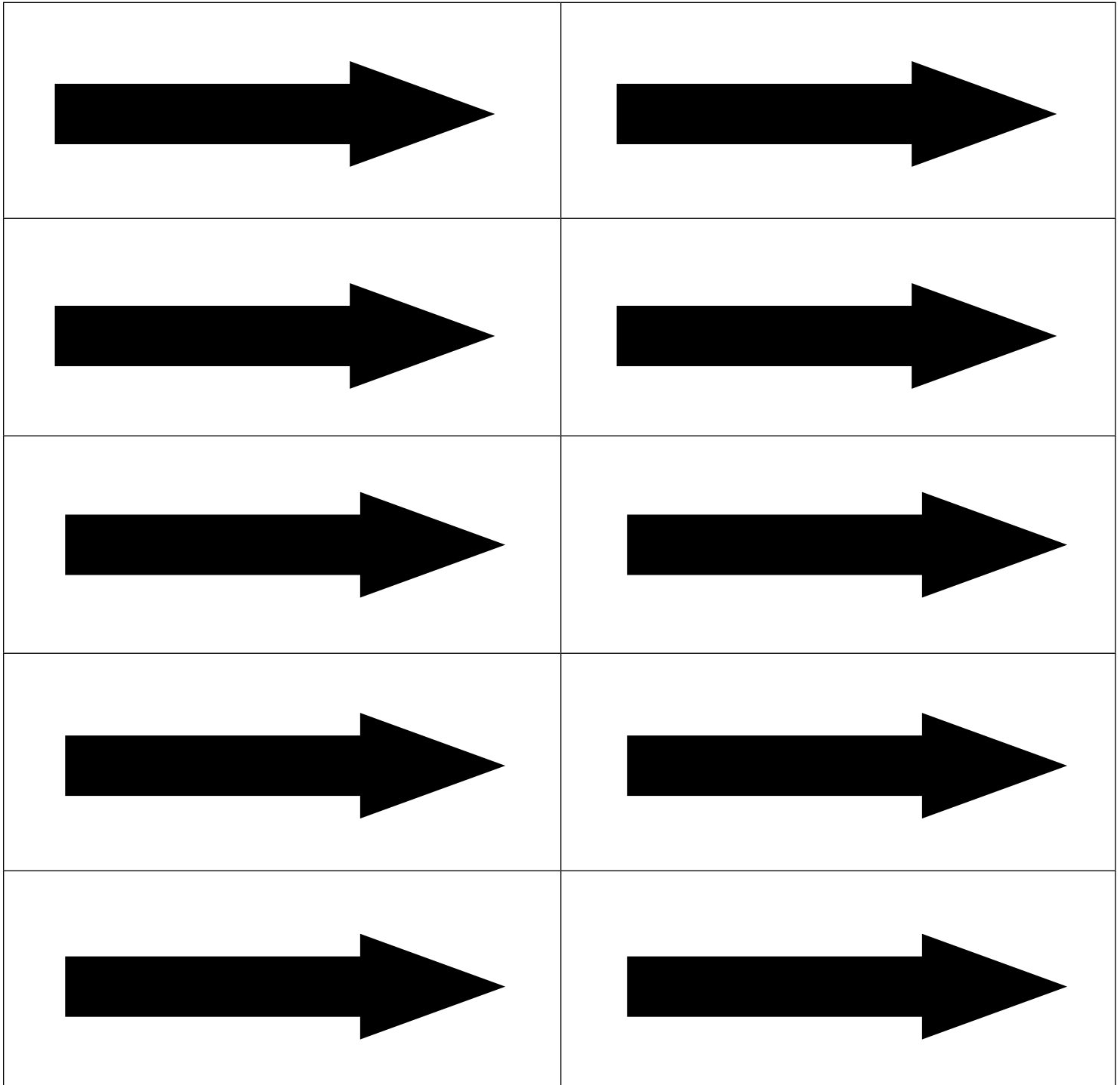
Process Descriptions

<p>Locate and drill new sites to increase the amount of oil a company removes from the earth.</p> <p>Exploration and Production</p>	<p>More products are made when more raw materials, such as petroleum, are found.</p> <p>Exploration</p>
<p>A company uses trucks, ships and barges to move crude oil to the refineries.</p> <p>Transportation</p>	<p>Companies use trucks, pipelines and train cars to move gasoline to the gas stations.</p> <p>Transportation</p>
<p>Drilling new wells increases the opportunity for mining more oil. An oil company adds to its profit when they are careful with the cost of drilling.</p> <p>Production</p>	<p>A company discovers new ways to locate oil reserves and more efficient methods of extracting oil from the earth.</p> <p>Research and Development</p>
<p>This process looks at a product for its uses. The company sets a price and advertises the product. Finally, the product is sold to the consumer through a business.</p> <p>Marketing</p>	<p>Oil has impurities or particles of substances that must be removed to make it more useful. Oil is cleaned before making products from the oil.</p> <p>Refining</p>
<p>A company competes with other companies to create new ways to refine and develop products.</p> <p>Research and Development</p>	<p>A company looks at what the consumer wants and plans new products that the consumer will buy.</p> <p>Marketing</p>

Flowchart Arrows

Copy and cut apart for one set.

Student will use arrows to connect and interconnect processes.



Glossary



Glossary



Glossary

A

asphalt – The solid form of *petroleum*.

aviation – Having to do with aircraft or flying.

B

black gold – An informal term for petroleum, which is considered a source of wealth.

boomtown – A town that grew rapidly when people moved to where oil was discovered; is said to “spring up overnight.”

C

compressed natural gas – CNG.

crude oil – Unrefined liquid *petroleum*.

D

derrick – (*See oil derrick.*)

distillation – The process of separating or purifying a liquid through boiling and condensing the vapor.

drill bit – A tool used to bore holes in hard substances, such as rock.

E

E&P – Exploration and Production.

engineering – Using science to plan, design and construct.

entrepreneur – A person who sets up and runs a business and finances business operations to make a profit.

exploration and production (E&P) – To search for natural resources, extract those resources, and then produce or make products that can be used.

F

fossil fuel – A carbon substance found naturally in the Earth and made from the remains of decomposed animals and plants.

fuel – A source of energy that, when burned, provides heat or power.

G

gasoline – A flammable, liquid fuel made from petroleum.

geologist – A person who studies the structure of the Earth, its rocks, soil, mineral and history.

geothermal – Of or relating to the heat produced in the interior of the Earth.

gusher – An oil well in which the oil flows freely in large amounts without pumping.

H

hydrocarbon – An organic chemical compound containing hydrogen and carbon atoms.

I

innovation – A new idea, invention or way of doing something.

international – Involving other countries; crossing national boundaries.

L

laboratory – A place for testing and research.

liquefied petroleum gas (LPG) – A mixture of petroleum gases liquefied under pressure.

logo – A design used to advertise or promote products or a company.

lubricating oil – Oils applied specifically to moving parts to reduce the friction or wear.

M

marketing – The business of advertising and selling products.

N

natural gas – Hydrocarbon gases found trapped in the pore spaces of some sedimentary rocks that also have petroleum (oil) deposits; gases are usually methane and ethane.

O

octane – A number used to measure the quality of a fuel or the amount of liquid hydrocarbon found in petroleum.

offshore – Located away from land and in a body of water.

oil – The colloquial, or slang, word for *petroleum*.

oil derrick – The structure built over an oil well used to raise and lower pipes, drills and drilling equipment.

oil fields – Land or sea areas where petroleum is being extracted.

oil platform –

oil rig – The drilling equipment used to drill for oil.

oil shale – A black or dark brown shale or dark sedimentary rock from which petroleum can be extracted through distillation.

oil spill – The spilling-out or release of oil into the environment due to human influence. Spills also occur naturally when oil seeps to the surface. Oil spills damage the environment and take years to clean up.

OPEC – Organization of Petroleum Exporting Countries.

P

patent – An official government document protecting the rights of an inventor to make or sell an invention.

petrochemicals – A substance derived from petroleum or natural gas; Example: gasoline.

petroleum – *Latin for “rock oil.”* A dark, oily substance that occurs naturally in Earth’s sedimentary rock formations, consisting mainly of hydrocarbons formed from decomposed living things, and also containing a complex mixture of organic chemical compounds; liquid form is *crude oil*; semisolid form is *bitumen*; solid form is *asphalt*.

petroleum industry – A business based on extraction and refining of petroleum pipeline.

pipeline – A system of pipes to transport or carry oil or other petroleum products over long distances.

polymer – A chemically bonded compound made with natural or synthetic substances.

production – The making of something; the process of manufacturing a product for sale.

propane – A flammable, colorless hydrocarbon gas used for fuel.

R

R&D – Research and Development.

R&M – Refining and Marketing.

refined products – Products produced through the refining or purification of petroleum.

refinery – An industrial plant where oil is purified through processes.

refining – To remove impurities through a process; to make a substance more useable.

refining and marketing – R&M.

research and development – R&D.

reserves – (in geology) A supply of natural resources that is known to exist but has not been extracted.

resins – Synthetic resins (plastics) are produced chemically from petroleum; natural resins are secreted from tree or plant sap.

roughneck – (*slang*) An unskilled worker on an oil-drilling rig or oil well.

S

seismic – Vibrations in the earth caused by an earthquake, a tremor or by human influence.

seismic surveys – Seismic surveys use technology to measure vibrations in the ground, or seismic waves, from an explosion or other sound created through technology. These seismic waves reflect differently depending on the types of rocks. Rocks and their formations reveal the likelihood of oil deposits.

sour crude/heavy crude – Oil that is foul-smelling, toxic and acidic due to the levels of sulfur.

subleasing – To rent property from someone who already is renting the property.

sweet crude – Oil that contains little or no sulfur.

T

tanker – A ship, truck or airplane designed to carry large quantities of liquid or gas.

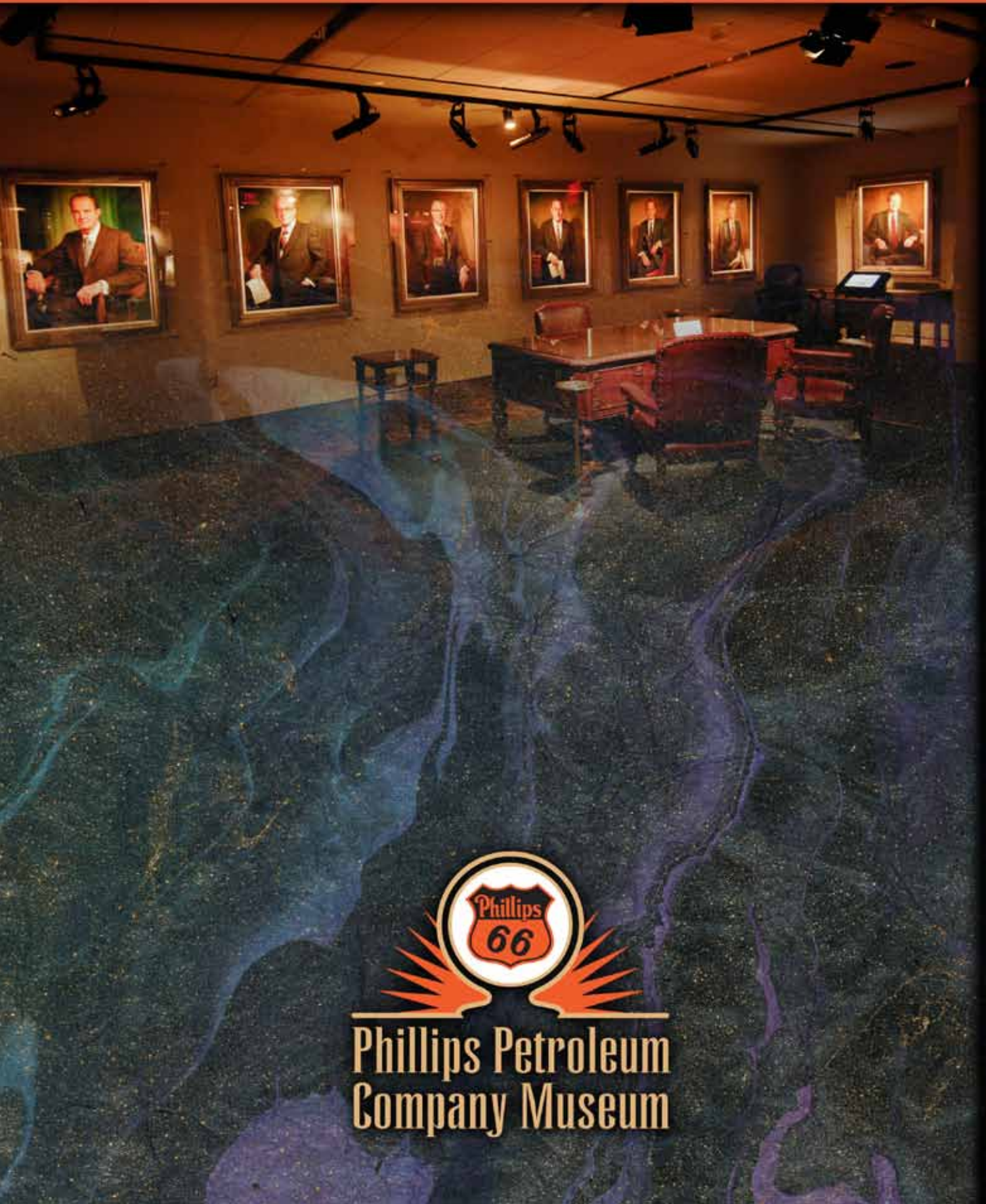
technology – The use of machines or devices to manufacture or produce a product.

terrain – The surface features of the ground or a piece of land in terms of its physical character.

W

“wildcat” drilling – When technology is not used to determine a drilling site, the drilling is called “wildcat” drilling. Speculators, or oil seekers, who choose a site based on a “gut feeling” or a hunch that oil deposits are present, are taking a risk in finding oil. Before technology advanced well enough to locate possible oil deposits, “wildcat” drilling was more common.

Appendix



Appendix



Phillips Petroleum
Company Museum

Bibliography

Ditchfield, Christin. "Oil." Children's Press, 2002.

This book defines how oil is formed, located, drilled, processed and made into products, as well as how oil affects our environment. Excellent photographs, one experiment, references, Web sites, glossary and index are included.

Dr. Seuss. "Bartholomew and the Oobleck." NY: Random House Children's Books, 1949.

A king orders something special from his royal magicians, but instead, he gets an "ooey-gooney, green oobleck." The recipe is included so that students may experiment with the properties of oobleck.

Farndon, John. "Oil." NY: DK Publishing, 2007.

Readers will learn about finding and extracting oil through land and offshore oil rigs. They will learn about the transporting, refining and marketing of oil products. Oil products, such as plastics and polymers, are explained and illustrated.

Graham, Ian. "Fossil Fuels: A Resource Our World Depends On." Heinemann, 2004.

Newmark, Ann. "Chemistry." NY: DK Publishing, Inc., 2005.

Sneider, Cary I. "Oobleck: What Do Scientists Do?" CA: University of California, 1993.

Students analyze the physical properties of oobleck made from cornstarch and water. Through their experiments, students experience and discuss what scientists do when they investigate a problem or discover new products.

Thomas, Joyce Carol. "I Have Heard of a Land." NY: Harper Collins, 2000.

This anthem is a story of a brave African-American woman who staked her claim in Oklahoma Territory.

Wallis, Michael. "Oil Man: The Story of Frank Phillips and the Birth of Phillips Petroleum." Macmillan, 1995.

Wertz, William C. ed. "Phillips: The First 66 Years." Phillips Petroleum, 1983.

This book explains the nature of chemistry and its history. Readers investigate mixtures, molecules, elements and compounds. Following investigations of chemical reactions, readers will learn about the first plastics and the chemical industry.

Lesson Planning Strands

Choose a plan to meet the needs of your students.

Lessons are sequenced with attention to vocabulary and concepts to provide optimum connections.

Six-Day Plan

Days	Language Arts	Science/Social Studies
Day 1	<i>Frank Phillips: An Oklahoma Story</i>	<i>So, You Want to Be a Scientist? – Day 1</i>
Day 2	<i>Remarkable Genius – Activity 1</i>	<i>So, You Want to Be a Scientist? – Day 2</i>
Day 3	<i>Remarkable Genius – Activity 2</i>	<i>Petroleum to Plastics</i>
Day 4	<i>Remarkable Genius – Activity 3</i>	<i>From Earth to Products</i>
Day 5	<i>Soc. Studies: Petroleum: A Study in Time</i> <i>(as a Lng. Arts lesson – Reading Skills)</i>	<i>Soc. Studies: Petroleum: A Study in Time – Day 2</i> <i>(as a Soc. Studies lesson – Timeline Skills)</i>
Day 6	<i>Museum Visit</i>	<i>Museum Visit</i>

Eight-Day Plan

Days	Language Arts	Science/Math/Social Studies
Day 1	<i>Frank Phillips: An Oklahoma Story</i>	<i>Wildcat Drilling</i>
Day 2	<i>Remarkable Genius – Activity 1</i>	<i>Wildcat Drilling</i>
Day 3	<i>Remarkable Genius – Activity 2</i>	<i>So, You Want to Be a Scientist?</i>
Day 4	<i>Remarkable Genius – Activity 3</i>	<i>So, You Want to Be a Scientist?</i>
Day 5	<i>Fuel Your Future: Careers in Oil</i>	<i>Petroleum to Plastics</i>
Day 6	<i>Soc. Studies: Petroleum: A Study in Time</i> <i>(as a Lng. Arts lesson – Reading Skills)</i>	<i>Soc. Studies: Petroleum: A Study in Time – Day 2</i> <i>(as a Soc. Studies lesson – Timeline Skills)</i>
Day 7	<i>Study Groups: Explanation of Data Collection during Museum Visit</i>	<i>From Earth to Products</i>
Day 8	<i>Museum Visit</i>	<i>Museum Visit</i>

10-Day Plan

Days	Language Arts	Science/Math/Social Studies
Day 1	<i>Frank Phillips: An Oklahoma Story</i>	<i>Wildcat Drilling</i>
Day 2	<i>Frank Phillips: An Oklahoma Story</i>	<i>Wildcat Drilling</i>
Day 3	<i>Remarkable Genius – Activity 1</i>	<i>So, You Want to Be a Scientist?</i>
Day 4	<i>Remarkable Genius – Activity 2</i>	<i>So, You Want to Be a Scientist?</i>
Day 5	<i>Remarkable Genius – Activity 3</i>	<i>Petroleum to Plastics</i>
Day 6	<i>Fuel Your Future: Careers in Oil</i>	<i>Petroleum to Plastics</i>
Day 7	<i>Soc. Studies: Petroleum: A Study in Time</i> <i>(as a Lng. Arts lesson – Reading Skills)</i>	<i>Soc. Studies: Petroleum: A Study in Time – Day 2</i> <i>(as a Soc. Studies lesson – Timeline Skills)</i>
Day 8	<i>Museum Map and Overview of Museum Trip</i>	<i>From Earth to Products</i>
Day 9	<i>Study Groups: Explanation of Data Collection during Museum Visit</i>	<i>From Earth to Products</i>
Day 10	<i>Museum Visit</i>	<i>Museum Visit</i>



Phillips Petroleum Company Museum

*Be curious always!
For knowledge
will not acquire you:
you must acquire it.*

— Sudie Back