Science, Invention and Growth

Grade Level: 6th grade
Presented by: Alicia Wilson and Jane Conner, Forestville Elementary School, Great Falls, Virginia
Length of Unit: 16 days

I. ABSTRACT

Science, Invention, and Growth, a study of the science of our past and its effect on our present and future, is an integrated science/language arts unit. Students will research the life of a highlighted Core Knowledge Scientist and then present a written and oral first person report detailing contributions made and potential influence on our future (to coincide with the study of the Industrial Revolution enhancing developments in world history). Students will research using print material and technology, take notes and outline in order to summarize and paraphrase information learned, and use direct quotations when appropriate.

II. OVERVIEW

A. Concept Objectives

1. Students will develop an understanding of contributions scientists have made to society and appreciate the impact these contributions have made on the present and future.
2. Students will celebrate the spirit of innovation by studying and “interacting” with famous inventors and scientists.

B. Core Knowledge Sequence to be covered

1. Science
   a. Science Biographies K - 6
   b. Cause and Effect relationships
2. English
   a. Gather relevant data through library and field research
   b. Acknowledge sources and avoiding plagiarism
   c. Write a personal letter
   d. Give a short, well-organized, and well-supported speech
3. Art
   a. Use texture, shape, form, design, and symmetry in their own work

C. Specific skills to be taught

1. Defining innovations
2. Note taking
3. Outlining
4. Researching information on individuals and their places in history
5. Utilizing print material and technology for research
6. Sequencing events
7. Paraphrasing
8. Oral Communication
9. Cause and effect
10. Listening skills

D. Standardized Test/State Connections

1. State SOL Connections for Science and Language Arts
2. Fairfax County, Virginia Program of Studies to investigate and draw conclusions
3. Editing and Revising student work
4. Use of dictionary, thesaurus, technology and media center for research purposes
5. Test taking skills
6. Recall of information

III. BACKGROUND KNOWLEDGE

A. For Teachers

1. Student research lesson
2. Familiarity with Core Knowledge Scientists
B. For Students
2. Writing and research - Gr. 4-5
3. Industrial Revolution - Gr. 6

IV. RESOURCES

V. LESSONS
Science Lesson One: The Importance of Innovators
A. Objectives:
   1. Lesson Content: The Importance of Innovators
   2. Concept Objective:
      a. Students will develop an understanding of contributions scientists have made to society and appreciate the impact these contributions have made on the present and future.
   3. Skill Objectives:
      a. Students will learn what an innovator is.
      b. Students will web innovators and innovations of our past and present.
      c. Students will extend their web for one innovation to include possible influence on our future.

B. Materials:
   1. newsprint
   2. web template
   3. video: Thomas Edison

C. Prior Knowledge:
   1. Will vary with students' understanding of scientists
   2. Current event discussion in science

D. Key Vocabulary:
   1. innovation - a new method, idea or device
   2. innovator - one who introduces something new
   3. inventor - to produce as new for the first time through use of imagination
   4. invention - a product of the imagination

E. Procedures/Activities:
   1. Teacher will place a web template on the overhead.
   2. Class will web innovations/inventions and innovators/inventors.
   3. Small groups will choose one innovator/inventor and include possible future influences.
   4. Students will view video.

F. Assessment/Evaluation:
   1. Group completion of the webs on newsprint.
   2. Completion of web on Thomas Edison - his past - our present - possible future - during after watching the video.

English Lesson One: Taking Notes and Writing Bibliographic Entries
A. Objectives
   1. Lesson Content: Notetaking and bibliographic entries
   2. Concept Objectives:
      a. Students will celebrate the spirit of innovation by studying and "interacting" with famous inventors and scientists.
   3. Skill Objectives:
      a. Students will learn about plagiarism
      b. Students will practice taking notes from printed resources
      c. Students will write bibliographic entries from sources used
B. Materials
1. Two short articles about the life of Thomas Edison
2. "Taking Notes" worksheet for each student (Appendix A)
3. Pencil and paper
4. Overhead projector and transparency of "Taking Notes" worksheet
5. Bibliographic format (Appendix B)

C. Prior Knowledge
1. Students should understand that when taking notes, not every word from a source is written
2. Students should understand how to divide a topic into subtopics

D. Key Vocabulary
1. Note taking - change information you have heard or read about into information you can do something with
2. Plagiarism - copying someone else's writing or ideas and then using them as if they were your own

E. Procedures/Activities
1. Teacher will discuss note taking and plagiarism with students
2. Students will read two brief articles about the life of Thomas Edison
3. Teacher will hand out "Taking Notes" worksheet and model taking notes about Thomas Edison's "Early Life" on overhead
4. Students will complete "Taking Notes" worksheet independently
5. Teacher and students will discuss notes from articles
6. Students will cite articles used in bibliographic form

F. Evaluation/Assessment
1. Teacher will assess student participation during note taking activity
2. Teacher will assess students' notes

F. Standardized Test/State Test Connections
1. Gathering information
2. Summarizing, paraphrasing, and quoting accurately from informational sources

Science Lesson Two: Men and Women of Our Past

A. Objectives
1. Lesson Content: Research
2. Concept Objective
   a. Students will develop an understanding of contributions scientists have made to society and appreciate the impact these contributions have made on the present and future.
3. Skill Objectives:
   a. Students will discover the importance of Scientists of our past.
   b. Students will research to determine the effect of a scientist from our past on the present.

B. Materials
1. Web of Thomas Edison
2. Research Rubric
3. Research Requirements
4. Media Center Material

C. Prior Knowledge
1. Use of Media Center
2. Note-taking skills from English Lesson 1

D. Procedure/Activities
1. Teacher will discuss expectations for research project (Appendix C)
2. Students will choose a scientist from Core Scientist List (Appendix D)
3. Students will select appropriate books (biographies and autobiographies) from the Library
4. Students will complete outline of scientist with highlighter (Appendix E)

E. Assessment/Evaluation
1. Completion of outline
English Lesson Two: Organizing Notes and Writing a Report

A. Objectives
   1. Lesson Content: Organizing Notes and writing a report
   2. Concept Objective:
      a. Students will develop an understanding of contributions scientists have made to society and appreciate the impact these contributions have made on the present and future.
      b. Students will celebrate the spirit of innovation by studying and "interacting" with famous inventors and scientists.
   3. Skill Objectives:
      a. Students will learn how to organize notes for a biography
      b. Students will select appropriate information from notes to use in writing a biography
      c. Students will write a brief biography about Thomas Edison
      d. Students will correctly organize bibliographic entries

Materials
1. Notes about Thomas Edison from English Lesson One
2. Bibliographic format
3. Scissors and glue
4. Manila paper (12x18)
5. Pencil and paper

Prior Knowledge
1. Students should have a basic understanding of Thomas Edison’s scientific contributions
2. Students should recognize elements of a good biography

Key Vocabulary
1. Autobiography - the writer’s story of his or her own life
2. Bibliography - works cited page which lists alphabetically books and materials used in a report
3. Biography - the writer’s story of someone else’s life
4. First person point of view - someone in the story is telling the story
5. Third person point of view - someone outside of the story is telling the story

Procedures/Activities
1. Students will prepare manila paper by dividing it into sections from “Taking Notes” worksheet (Early Life, Adult Life, Contributions, Impact on the Future)
2. Completing one section at a time, students will cut out each individual note from both sources about Thomas Edison
3. Students will arrange cut out notes into a logical order
4. Students will paste ordered notes under proper subtopics on manila paper
5. Teacher will review with students elements of a good written biography
6. Students will write a mini report from their organized notes about Thomas Edison
7. Students will complete a formal bibliography

Evaluation/Assessment
1. Teacher will assess students’ organized notes
2. Teacher will assess mini report
3. Teacher will assess bibliography for correct format

Standardized Test/State Test Connections
1. Organizing information into well written paragraphs
Science Lesson Three: Influence on Our Future

A. Objectives
1. Lesson Content: Core Knowledge Scientists
2. Concept Objective:
   a. Students will develop an understanding of contributions scientists have made to society and appreciate the impact these contributions have made on the present and future.
   b. Students will celebrate the spirit of innovation by studying and “interacting” with famous inventors and scientists.
3. Skill Objectives:
   a. Students will hypothesize the influence of their scientist on our future
   b. Students will add their hypotheses to their note sheets.

B. Materials
1. Thomas Edison notes from English and web
2. Students notes on their scientist

C. Prior Knowledge
a. Use of Almanacs and Time Lines

D. Key Vocabulary
1. hypothesis - an educated guess
2. hypothesize - to make a thoughtful guess
3. influence - to effect someone or something

E. Procedures/Activities
1. Warm Up - When Did That Happen? (Progression of inventions) (Appendix F)
2. Class will brainstorm influence of Thomas Edison on our future
3. Each student will use almanacs and time tables to identify past influences on their chosen scientist and hypothesize to determine possible influences on our future (go forward in time from current date)
4. Students will create a time line for their scientist from past to future (20 plus years) (Appendix G)

F. Assessment/Evaluation:
1. Completion of notes on future influences
2. Completion of Time Line

English Lesson Three: Writing a Friendly Letter

A. Objectives
1. Lesson Content: Writing a friendly letter
2. Concept Objective:
   a. Students will celebrate the spirit of innovation by studying and “interacting” with famous inventors and scientists.
3. Skill Objectives:
   a. Students will learn correct form for writing a friendly letter
   b. Students will write a friendly letter to scientist they have researched

B. Materials
1. Student research about scientist from Science Lesson 2
2. Paper and Pencil
3. Computer and word processing program for final copy of letter

C. Prior Knowledge
1. Students should be familiar with scientist’s life and contribution(s)
2. Students should be familiar with word processing program

D. Key Vocabulary
1. Heading - writer’s address and the date placed in the upper right hand corner of the letter
2. Salutation - greeting which begins with “Dear” followed by the name of the person receiving the letter and a comma, and placed on the lefty side under the heading
3. Body - main part of the letter where writer presents information and ideas
4. Closing - written below body of letter to the mid-right with first word capitalized, and followed by a comma
5. Signature - name of writer signed beneath closing

E. Procedures/Activities
1. Teacher will discuss with students specific purpose or focus of letter
2. Students will draft, revise, and edit letter to scientist
3. Final letter will be completed on the computer
4. Students will complete envelope for letter in correct form

F. Evaluation/Assessment
1. Teacher will check to see that students are prepared to write letter
2. Teacher will assess student letters

G. Standardized Test/State Test Connections
1. Writing for a specific purpose
2. Correct form of friendly letter and envelope

G. Science Lesson Four: Is There a Final Frontier?
A. Objectives
1. Lesson Content: Core Knowledge scientists
2. Concept Objective:
   a. Students will acknowledge discoveries of yesterday and today can affect our future
   b. Students will develop an understanding of contributions scientists have made to society and appreciate the impact these contributions have made on the present and future.
3. Skill Objectives:
   a. Students will make comparisons of discoveries and determine possible effects on future using individual time lines

B. Materials
1. Time Line on Individual Scientist
2. Time Line Samples

C. Prior Knowledge
1. How to read a time line

D. Procedures/Activities
1. Students will imagine they are aliens from the future attempting to place the technological and scientific developments of Earth into chronological order
2. Students will work in groups of four or five and place their individual time line into a larger more complete one
3. Two groups will combine their time line into one larger one
4. Entire class will organize data into one time line (with teacher input)

E. Assessment/Evaluation
1. Cooperative group work
2. Accurate combination of time lines

English Lesson Four
I. Objectives
1. Lesson Content: Core Knowledge scientists
2. Concept Objective:
   a. Students will celebrate the spirit of innovation by studying and "interacting" with famous inventors and scientists.
3. Skill Objectives:
   a. Students will review the life and contribution(s) of a scientist
   b. Students will write an acrostic poem of facts about scientist's life

B. Materials
1. research about scientist from Science Lesson 2
2. Paper and pencil
3. White construction paper (12x18)
4. colored markers

C. Prior Knowledge
   1. Students should have knowledge of scientist
   2. Students should be familiar with form of acrostic poetry

D. Key Vocabulary
   1. Acrostic poetry - poetry where title is printed vertically, letter by letter, and each letter is used to construct a phrase or sentence which describes the topic
   2. Poetry - writing which is imaginative and emotional, often written with vivid and colorful words and arranged so they have a pleasing sound and rhythm

E. Procedures/Activities
   1. Teacher will review construction of acrostic poem with class using Thomas Edison as an example
   2. Students will create acrostic poem with scientist they have researched (poetry must be factual)
   3. Students will illustrate completed poem

F. Evaluation/Assessment
   1. Teacher will assess factual knowledge about scientist
   2. Teacher will assess acrostic poetry form

G. Standardized Test/State Test Connections
   1. Understanding of vivid and colorful imagery
   2. Recognizing different form of poetry

VI. English and Science Culminating Activity: Oral Presentations and Creation of Character Dolls

A. Objective
   1. Lesson Content: Oral Reports
   2. Concept Objective:
      a. Students will develop an understanding of contributions scientists have made to society and appreciate the impact these contributions have made on the present and future.
      b. Students will celebrate the spirit of innovation by studying and "interacting" with famous inventors and scientists.
   3. Skill Objectives:
      a. Students will be able to present synthesized information in the first person voice to the class
      b. Students will design and make a character doll of their scientist

B. Materials
   1. Research on individual scientist
   2. Template for Character Doll (Appendix H)
   3. Art materials to include: construction paper, tagboard, and yarn

C. Prior Knowledge
   1. Basic art instruction dealing with proportion
   2. Time period of individual scientist

D. Procedures/Activities
   1. Students will review and organize research on scientist to present information in the first person form. They will become the scientist.
   2. Using the template given by the teacher, each student will design a character doll to use as a prop during the oral presentation.
   3. Students will design the character doll in appropriate time period clothing as fits their profession using materials in the classroom
   4. Students will be videotaped during their presentation

E. Evaluation/Assessment
   1. Students will be assessed on use of first person in presentation and knowledge of their scientist as per assignment
   2. Completion of Character in time period clothing
   3. Timeliness and wise use of class time will be evaluated
VI. HANDOUTS/WORKSHEETS

Appendix A  Taking Notes Worksheet
Appendix B  Bibliography Format
Appendix C  Science/English Biography Research Project
Appendix D  Core Knowledge Scientists
Appendix E  Outline of Scientist Highlight
Appendix F  What Happened When?
Appendix G  Time Line Instructions
Appendix H  Template for Character Doll

VII. BIBLIOGRAPHY

A. Audio-Visual Aids:
   Invention. Videotape. Discovery Channel, 1980. 3 volumes 90 minutes.

B. Books:
   ISBN 0-671-74919-6
   Lipson, Greta Barclay and Jane A. Romatowski. Calliope. Green Apple, Inc.,
   Reid, Struan and Patricia Farn. Inventors From DaVinc to Biro. New York:
   Reid, Struan and Patricia Farn. Scientists from Archimedes to Einstein. New York:
   Wilmington: Great Source Education Group, 1995.

C. Compact Disks:

D. Encyclopedia:

E. Internet Addresses:
   B.J. Pinchbeck's Homework Helper [Online]
   http://bjpinchbeck.com/framespace/science.htm
   4000 Years of Women in Science [Online] http://www.astr.ua.edu/4000ws
   Science and Nature:Scientists [Online]
   http://www.yahooligans.com/Science_and_Nature/Scientists
Appendix A

Science, Growth, and Invention

Take notes from the two articles about Thomas Edison. Make sure you do not copy the exact words and that you organize your notes into subtopics.

<table>
<thead>
<tr>
<th>Early Life</th>
<th>Adult Life</th>
<th>Contributions</th>
<th>Impact on the Future</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix B
Science, Invention, and Growth

Suggested Elementary Guide to Preparing Bibliography/Works Cited
(FCPS Library Advisory Council, 1998)

When doing research and writing a report, it is always necessary to name the source(s) of your information. The list of sources is called a bibliography/works cited. A bibliography should be listed alphabetically. The second line of an entry should be indented. Skip a line after each entry.

FOR A BOOK:
Author's last name, first name. Title of book. Place of publication: Publisher, copyright year.
If you only use part of a book:

FOR AN ENCYCLOPEDIA ARTICLE THAT IS SIGNED:
Article author's last name, first name. "Title of article." Name of encyclopedia. Copyright year. Volume number, pages(s).

FOR AN ENCYCLOPEDIA ARTICLE THAT IS NOT SIGNED:
"Title of Article." Name of Encyclopedia. Copyright year. Volume. page(s).

FOR A MAGAZINE OR NEWSPAPER ARTICLE:
Article author's last name, first name. "Title or headline of article." Name of magazine or newspaper. Date of magazine or newspaper, page(s).

FOR AUDIO-VISUAL MATERIALS:
Title of material. Type of material. Place of publication: Publisher, copyright date.

FOR A CD-ROM:
"Article title." CD-ROM title. CD-ROM. Copyright date.

FOR AN INTERVIEW:
Name of person interviewed (last name first). Kind of interview. Date.

FOR AN INTERNET ADDRESS:
Author's last name, first name. "Title of item." [Online] Available http://address/filename, date of document or download.

Your finished bibliography should be alphabetized by the first word of the entry.
Appendix C

Science / English Biography Research Project

You will be researching a scientist from the Core Scientist List attached. Each student will research a different individual. You will be expected to use at least three (3) resources. Only one of these may be an encyclopedia. (CD ROMS are considered encyclopedias for this project.) A biography or an autobiography is a suggested resource. This project will be a written and oral assignment. The written portion is to be in ink or typed on the computer. When you make your presentation, you will also have a character doll which you have designed to look like your scientist. You will be given several in class workdays to make the doll and to work on notes and draft during both Science and English classes.

<table>
<thead>
<tr>
<th>Grading Rubric:</th>
<th>Science</th>
<th>Grading Rubric:</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>10 points</td>
<td>Notes</td>
<td>10 points</td>
</tr>
<tr>
<td>Oral Presentation</td>
<td>25 points</td>
<td>Written Report</td>
<td>25 points</td>
</tr>
<tr>
<td>Character Doll</td>
<td>25 points</td>
<td>Letter</td>
<td>25 points</td>
</tr>
<tr>
<td>Time Line</td>
<td>10 points</td>
<td>On Time</td>
<td>10 points</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>70 points</strong></td>
<td><strong>Total</strong></td>
<td><strong>70 points</strong></td>
</tr>
</tbody>
</table>

We will begin the research with note taking in Science and English. You will write the paper in English. We will work on the character doll and time line in Science.

**Due Date ____________**

**Deadlines:**

- Notes Due ____________
- Oral Presentation ______
- Time Line
- Letter
- Written Report
- Character Doll
Appendix D
Science, Invention, and Growth

Core Knowledge Scientists

Aristotle
Benjamin Banneker
Alexander Graham Bell
Elizabeth Blackwell
Niels Bohr
Rachel Carson
George Washington Carver
Copernicus
Francis Crick
Marie Curie
John Dalton
Charles Darwin
Leonardo Da Vinci
Charles Drew
Thomas Edison
Albert Einstein
Michael Faraday
Alexander Fleming
Robert Fulton
Galileo
Jane Goodall

William Harvey
Mae Jemison
Edward Jenner
Percy Lavon Julian
Ernest Just
Lewis Latimer
Antoine Lavoisier
Anton van Leeuwenhoek
Carl Linnaeus
Barbara McClintock
Elijah McCoy
Lise Meitner
Gregor Mendel
Dmitri Mendeleev
John Muir
Isaac Newton
Florence Nightingale
Albert Schweitzer
Booker T. Washington
James Watson
Daniel Hale Williams
## Appendix F

### What Happened When?

<table>
<thead>
<tr>
<th>Event</th>
<th>Year</th>
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<tbody>
<tr>
<td>television</td>
<td>1920's</td>
</tr>
<tr>
<td>polio vaccine</td>
<td>1952-1955</td>
</tr>
<tr>
<td>compact disc</td>
<td>1983</td>
</tr>
<tr>
<td>3000 B.C.</td>
<td>wheel</td>
</tr>
<tr>
<td>1846</td>
<td>sewing machine</td>
</tr>
<tr>
<td>telescope</td>
<td>1608</td>
</tr>
<tr>
<td>airplane</td>
<td>1903</td>
</tr>
<tr>
<td>1893</td>
<td>zipper</td>
</tr>
<tr>
<td>1920's</td>
<td>frozen foods</td>
</tr>
<tr>
<td>1945</td>
<td>atomic bomb</td>
</tr>
<tr>
<td>100 B.C.</td>
<td>paper</td>
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<tr>
<td>1826</td>
<td>photography</td>
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<tr>
<td>1849</td>
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<td>1902</td>
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<td>tape recorder</td>
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<td>telephone</td>
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<td>magnetic compass</td>
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<td>1890's</td>
<td>motion picture</td>
</tr>
<tr>
<td>1823</td>
<td>calculating machine</td>
</tr>
</tbody>
</table>
Appendix G

Scientist Time Line

You will create a time line for the Scientist you have researched, to observe that events follow a logical sequence.

You will be given 10 index cards.

Cards 1 - 3 will describe events before the scientist's birth

Card 4 - will describe the birth of the scientist

Cards 5 - 9 detail events in the life of the scientist

Card 10 hypothesize possible effect on the future based on the work of the scientist

Each card will be illustrated and include a pertinent sentence.

Sample:

Thomas Alva Edison is born.
February 11, 1847
Appendix H

Science, Invention, and Growth